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16. Abstract

This report looks at the problem of damage to underground facilities caused by excavation and related activities and the efforts that have been made in recent years to limit and control it through laws, regulations, and damage prevention programs, such as one-call systems. The emphasis and focus of the study is on outside forces damage to U.S. natural gas pipelines, whose safe performance is the regulatory responsibility of the U.S. Department of Transportation. Outside forces damage is the most important cause of U.S. gas pipeline accidents.

To help develop a better understanding of outside forces damage and the impact of damage prevention programs on it, a statistical regression model of the level of outside forces incidents faced by gas distribution system operators participating in one-call systems, the most important type of damage prevention program in operation in the U.S., was specified and estimated. Variables in the estimated regression model included construction levels, state damage prevention law requirements, population levels, gas system pipeline mileage, gas system size, number of underground operators in one-call systems, one-call request times, calls made to one-call systems per system telephone operator, and one-call system advertising levels.

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PREFACE

This report, prepared by the Economic Analysis Division of the Transportation Systems Center, U.S. Department of Transportation, examines the problem of excavation damage to buried facilities as it pertains to gas pipelines and the solutions that have been developed to limit and control it. The basic purpose of the report is to develop and present insights into the damage prevention process that can be used by government and industry to improve their damage prevention efforts.

Numerous people cooperated in the researching and preparation of this report. The author would like to thank them all again for their assistance.

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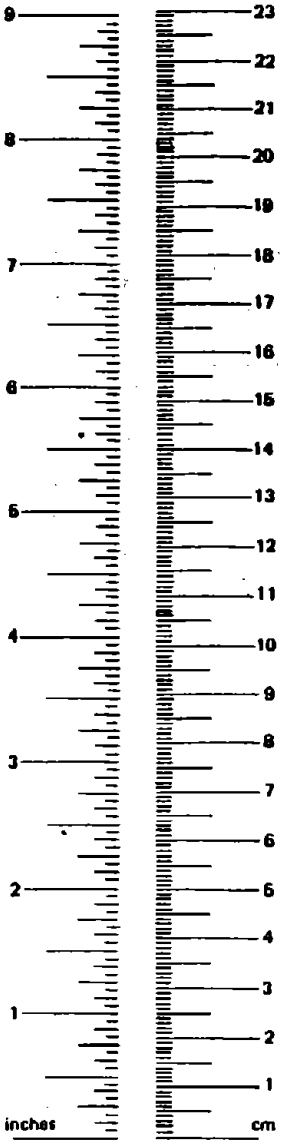
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

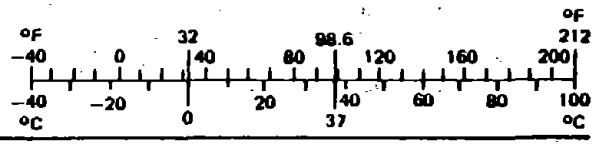
Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in. = 2.54 cm (exactly). For other exact conversions and more detail tables see NBS Misc. Publ. 286, Units of Weight and Measures. Price $2.25 SD Catalog No. C13 10 286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	36	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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EXECUTIVE SUMMARY

This report examines outside forces damage to underground facilities and the efforts that have been made by industry and government to limit and control it through laws, regulations, and damage prevention programs, particularly one-call systems. The focus of the report is on outside forces damage to U.S. natural gas pipelines, whose safe performance is the regulatory responsibility of the U.S. Department of Transportation (U.S. DOT). To help develop a more complete understanding of outside forces damage and damage prevention, a statistical model of the level of outside forces incidents experienced by gas distribution system operators participating in one-call systems was specified and estimated.

Much plant and equipment in the U.S. is located underground. Most, if not all, is vulnerable to outside forces damage. Outside forces incidents can have serious consequences. They can result, in addition to damage to underground facilities, in damage to excavating equipment, loss of product or service, environmental damage, third-party property damage, injuries, and/or death. Outside forces damage is the leading cause of serious gas pipeline accidents (those requiring reporting to the U.S. DOT) in the U.S. Between 1975 and 1984, inclusive, about 63 percent of all incidents reported to the U.S. DOT were the result of outside forces damage.

Excavation is the single most important cause of outside forces damage to underground facilities. Outside forces damage can also result from such things as earthquakes, land subsidence, vandalism, and freak occurrences. A significant proportion of the excavation damage that occurs is caused by underground operators and their contractors.

Excavation damage occurs for a number of reasons. Some occurs because excavators did not determine if underground plant underlies their excavation site. Other excavation damage occurs because of inaccurate or inadequate marking and staking of underground facilities at excavation sites. Additional reasons for excavation damage include (1) equipment operator carelessness, (2) equipment operator incompetence, (3) equipment operator malice, (4) unavoidable problems and mistakes, (5) equipment problems, and (6) poor operating procedures.

Because of the potentially serious nature of outside forces damage, outside forces damage prevention is an important concern of both industry and government. The primary focus of damage prevention efforts, as might be expected, has been on excavation damage. Today, many, if not most, underground operators have programs in operation designed to help prevent excavation damage.

Three basic types of damage prevention programs exist. The simplest is the informal program, which is primarily an ad hoc arrangement between individuals in various organizations who undertake to keep each other informed about excavation activity. Informal programs can be expected to have only a very limited impact on excavation damage. A second type of damage prevention program is the single company program. A company with this type of program has become formally involved in the promotion

of damage prevention. The primary weakness of this type of program is that it covers just one underground operator. The third type of damage prevention program is the multi-company program. In this type of program, a number of underground operators formally band together and coordinate at least some of their damage prevention activities. This type of program is generally the most successful of the three in limiting and controlling excavation damage.

The most important type of multi-company damage prevention program is undoubtedly the one-call system. A one-call system is

> ...a communication system established by two or more utilities, governmental agencies or other operators of underground facilities to provide one telephone number for excavating contractors and the general public to call for notification of their intent to use equipment for excavating, tunneling, demolition or any other similar work. [It]...provides the participating members an opportunity to identify and locate their underground facilities.

The first one-call system, the UTILITY COORDINATING COMMITTEE of Rochester, New York, was founded in 1964. Since then, the number of one-call systems in operation has increased considerably. As of 1984-85, there were 98 one-call systems in operation in the U.S. One-call systems could be found in all but six U.S. states. Thirty states had statewide one-call coverage in 1984-85, provided by either single or multiple systems; fourteen states had more limited coverage.

One-call systems are either in-house, member-owned-and-operated, or contractor operations. Most systems today are either in-house or contractor operations; member-owned-and-operated operations are fairly new.

One-call systems appear to be fairly successful in reducing excavation damage to underground facilities. A 1978 American Public Works Association survey found that most one-call participants observed a reduction in damages following the start of their system participation. Some observed reductions of as much as 60 or 70 percent. In addition, gas pipeline operators participating in one-call systems have reported that the systems can help reduce damages by between 24 and 67 percent.

A number of legislative and regulatory efforts have been made to promote damage prevention. These efforts have been made by all levels of government, from local to Federal. At the state level, as of 1985, 31 states and the District of Columbia had enacted laws aimed at the promotion of excavation safety and damage prevention.

Federal damage prevention regulations have been issued by both the Occupational Safety and Health Administation and the U.S. DOT. The U.S. DOT's regulations, which went into effect in April 1983, establish minimum requirements for damage prevention programs that must be set up by gas distribution, transmission, and gathering system operators

for their operations in Class 4 and some Class 3 locations. While participation in a one-call system is not mandated, pipeline operators are explicitly permitted by the regulations to use the services of a one-call system to meet any of the requirements of the regulations.

The U.S. DOT's damage prevention program regulations emphasize what might be called the "one-call process" for gas pipeline damage prevention, since they mandate the development of a damage prevention program with many of the more important attributes and characteristics of a one-call system. To develop insights into the operation of the one-call process, a statistical model of the level of outside forces incidents experienced by gas distribution system operators participating in one-call systems was developed.

The statistical model used was a regression model. To provide a more flexible functional form for the model and to bring the distribution of the regression residuals closer to normality, the dependent and non-dummy independent variables of the model were transformed using the Box-Cox Transformation. The model was estimated using gas system and one-call data for 1980, 1981, and 1982. The sample used consisted of 363 observations on gas distribution systems operating in 26 states and participating in 41 one-call systems (and system "overlaps"). The dependent variable of the model was the number of outside forces incidents occurring to a gas distribution system operator during a year. Twenty-three independent variables, excluding the constant term, are explicitly included in the estimated model. These variables can be broken into five categories: exposure variables, state damage prevention law variables, gas company variables, one-call system variables, and year variables. The performance of the model proved to be quite good.

The statistical modelling of gas distribution system incident levels yielded a number of significant findings. Key among them are

- The level of incidents is affected by both the level of construction and by the amount of pipeline mileage: as mileage or construction increases, so do incident levels.

- The existence of a state damage prevention law decreases the level of incidents, all other things equal; however, state requirements that underground operators respond to all excavation notices and participate in one-call systems do not appear to provide any incremental improvement in safety beyond that provided by the existence of the basic state damage prevention law.

- Government owned/operated gas distribution systems have neither higher nor lower incident levels than non-government gas distribution systems.

- Neither in-house nor contract one-call operations are superior to the other in performance.

- The level of advertising and promotion (in real terms) engaged in by one-call systems has a positive impact on incident levels: the higher the advertising budget, the lower the incident levels (a one percent increase in one-call system advertising expenditures

can be expected to result in an approximately .2 percent decrease in member gas distribution system incident levels).

- Neither a one-call system's request time (the time requested between notification and the start of excavation) nor its average number of incoming calls per telephone operator significantly affect the level of gas distribution system incidents.

- The type of coverage provided by a one-call system affects the level of gas distribution system incidents; the best performance, all other things equal, is found in non-statewide systems operating in states with no areas uncovered by a one-call system, while the worst performance is found in non-statewide systems operating in states with areas uncovered by a one-call system.

From these findings, it would appear that the easiest and most effective way in which one-call systems could help reduce the incident levels of their gas distribution system members (and, presumably, of the rest of their membership, as well) would be to increase their advertising. Improvements, it appears, could also be had by expanding the coverage of non-statewide one-call systems until the states in which they operate are completely covered by one-call service. In addition, improvements might also result if statewide one-call systems could make their activities more responsive to local needs and conditions. The lack of significant impact on incident levels of the type of one-call operation (in-house or contract), request time, and the average number of incoming calls per system telephone operator would seem to imply that one-call operators have considerable latitude in choosing the operational parameters of their systems.

1. INTRODUCTION

Today, much essential plant and equipment in the U.S. is located underground. These facilities, which range from telephone and television cables to sewer, water, and electric lines to subway tunnels to petroleum and natural gas pipelines, are all vulnerable to damage by outside forces. Undoubtedly the single most important cause of outside forces damage to underground facilities, in terms of both numbers and severity of accidents, is excavation.[1]

As part of its ongoing effort to improve the safety of the natural gas pipeline system in the U.S., the U.S. Department of Transportation (U.S. DOT), in recent years, has devoted considerable attention to reducing outside forces damage, particularly excavation damage (or dig-ins), to gas pipelines. In compliance with the requirements of the Natural Gas Pipeline Safety Act of 1968[2] (NGPSA), as amended, on April 1, 1982, the U.S. DOT issued a final rule requiring all operators of gas pipelines in Class 3 and 4 locations (with minor exceptions) to have or participate in an outside force damage prevention program (DPP).[3] This final rule became effective on April 1, 1983. The rule sets forth the criteria of the minimum safety standards that must be met by the required gas pipeline damage prevention programs. These criteria are based, in large part, on the operational procedures of the more successful "one-call" systems in the U.S.[4] A one-call system is basically

> ...a communication system established by two or more utilities, governmental agencies or other operators of underground facilities to provide one telephone number for excavating contractors and the general public to call for notification

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[1] See Courtney, Kalkbrenner, and Yie, especially Chapters 1 and 2.

[2] 49 U.S.C. 1671 et. seq.

[3] FEDERAL REGISTER, Vol. 47, No. 63, April 1, 1982, pp. 13818-13825. The complete text of the final rule is included in this report in Appendix A.

[4] FEDERAL REGISTER, April 1, 1982, p. 13819.

> of their intent to use equipment for excavating, tunneling, demolition or any other similar work. [It]...provides the participating members an opportunity to identify and locate their underground facilities.[5]

The effectiveness of the outside forces damage prevention programs is of considerable interest to the U.S. DOT.[6] Information on effectiveness, along with information on program operation, could be used by gas pipeline operators to identify and institute program changes that could increase program effectiveness and thereby enhance pipeline safety. Evaluation of the effectiveness of the damage prevention programs is extremely difficult, however, because of the relatively complex nature of the processes involved.

The purpose of this study is to develop insights into the effectiveness of damage prevention programs that can be used in the assessment and enhancement of program performance. This is accomplished, basically, by determining the relationship between outside forces damage and some of the more important factors that may influence it, including some directly relating to the damage prevention program itself.

The approach taken for this effort was to detail and examine the nature of outside forces damage and the efforts that have been made to contain it and then to use the information to specify and statistically estimate a firm-level model for a subset of the gas distribution system operators participating in one-call systems between 1980 and 1982, inclusive. The gas distribution systems included in the sample were those that operated in a state where all one-call systems in operation during the sample period supplied starting dates for the gas distribution system members. To provide a flexible functional form for the estimated model and to handle certain statistical problems that were indicated by the data, the model that was estimated for this study was specified using the Box-Cox Transformation.[7]

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[5] "One-Call Systems Directory, 1984-85," p. 3.

[6] FEDERAL REGISTER, April 1, 1982, p. 13824.

[7] See Box and Cox.

2. OUTSIDE FORCES DAMAGE AND GAS PIPELINES

Outside forces damage is a problem for all operators of underground facilities. In addition to damage to underground plant and equipment, it can result in loss of product or service, damage to the environment, third-party property damage, injuries, or even death.[8] It can be a particularly serious problem for gas pipelines, since, due to the nature of the product being transported, the risks of death, injury, or substantial property damage are generally higher for gas pipeline operators than for most other operators of underground facilities.[9]

Outside forces damage is the most important cause of gas pipeline accidents occurring in the U.S. As Table 1 illustrates, there are more serious incidents resulting from outside forces damage than from all other sources, combined.[10] In no year of the ten included in Table 1 did the percentage of serious incidents caused by outside forces fall below 55 percent; in most years between 1975 and 1984, it was in excess of 60 percent. Though outside forces damage is the cause of the majority of the serious gas pipeline incidents, it is not the cause of the majority of gas pipeline leaks (which will be a consequence not only of the serious incidents reportable to the U.S. DOT, but also of less serious incidents, as well). Based on the repaired leaks information contained in the annual reports submitted to the U.S. DOT by gas transmission, gathering, and distribution system operators, less than half of the total number of pipeline leaks that occur are attributable to outside forces damage.[11]

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[8] Courtney, Kalkbrenner, and Yie, p. 97.

[9] Courtney, Kalkbrenner, and Yie, pp. 93, 98.

[10] The information in Table 1 came from the individual accident reports that gas distribution system operators with more than 100,000 customers and gas transmission and gathering system operators must file with the U.S. DOT when the consequences of an incident are especially serious. Included among the consequences requiring a report to be filed are death, injury requiring hospitalization, gas ignition, and property damage of $5000 or more. For more on the incident report filing requirements, see 49 CFR Section 191.9 and Section 191.15.

[11] U.S. DOT, "Hazardous Materials Information System," computerized databases.

TABLE 1. **OUTSIDE FORCE DAMAGE TO GAS PIPELINES**

Year	Number of Reportable Incidents* Caused by Outside Forces	Total Number of Reportable Incidents	Outside Force Percent of Total
1975	981	1373	71.4
1976	878	1579	55.6
1977	1168	1996	58.5
1978	1343	2088	64.3
1979	1346	1970	68.3
1980	1361	1996	68.2
1981	1043	1623	64.3
1982	1042	1711	60.9
1983	974	1580	61.6
1984	584	1002	58.2
Average, 1975-84	1072	1692	63.4

*A reportable incident is one requiring notice to the U.S. DOT under 49 CFR Parts 191.9 or 191.15.

Sources of data: U.S. DOT, ANNUAL REPORT ON PIPELINE SAFETY for 1980, 1981, 1982, 1983, and 1984. The data for 1975-1979 were obtained from the ANNUAL REPORT for 1980.

The most important cause of outside forces damage is excavation and related earthmoving activities.[12] Other causes of outside forces damage to underground plant and equipment include natural forces, such as earthquakes and land subsidence, vandalism, and freak occurrences.[13] It is interesting to note that one of the groups causing significant unintentional excavation damage is utilities that operate underground facilities, and their contractors.[14]

Reasons for excavation damage vary. Some damage is a consequence of the excavator not determining what exists belowground at the excavation site.[15] Underground operators tend to identify this as the major reason for excavation damage.[16] An extreme example of this behavior is exhibited by contractors who use a "rip and pay" approach to excavation. These excavators appear to find it more cost effective to dig without checking first. They are not willing to wait for the local operators of underground facilities to determine what underlies the dig site, because this would idle their equipment and idle equipment costs.[17] Sometimes utilities pressure their contractors to get work done on schedules that do not take into consideration the need to locate underground facilities, and accidents result.[18] Many others who fail to find out about subsurface facilities have not considered the possibility that there might be facilities beneath them or mistakenly believe that they know what lies underground and, therefore, see no point in contacting any local subsurface facilities operators.[19]

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[12]Bartol and Nichols, p 6-18; U.S. DOT, "Hazardous Materials Information System," computerized databases; Courtney, Kalkbrenner, and Yie, pp. 7-9; Walker, p. 27.

[13]NTSB, p. 5; U.S. DOT, "Hazardous Materials Information System," computerized databases.

[14]Courtney, Kalkbrenner, and Yie, p. 9.

[15]Courtney, Kalkbrenner, and Yie, p. 145.

[16]Hendrick, p. 21.

[17]Submission to Docket No. PS-59 by Mountain Fuel Supply Company, Feb. 11, 1980, p. 2; Courtney, Kalkbrenner, and Yie, pp. 92, 164.

[18]General discussion, 10th Annual One-Call Symposium.

[19]Hendrick, p. 21.

Some problem may exist in certain cases in identifying all the possible underground operators who should be contacted. Unfortunately, when one is left out, an accident can result.

Another reason for excavation damage is inaccurate or inadequate marking or staking of underground facilities by the locators sent out to excavation sites by underground operators.[20] Often, locators have imperfect information with which to work. System maps, for instance, may not be complete. In addition, subsurface facilities may be difficult to correlate with surface landmarks. Consequently, marking or staking may be inexact and, because of this, an accident may occur. Excavation contractors believe poor locating is one of the major reasons for dig-ins.[21]

Undoubtedly, some incidents can be attributed to confusion about which underground systems have been marked or staked and which have not. As the American Public Works Association's Uniform Color Code and National Marking Standards[22] continue to gain increased acceptance among operators of underground facilities, it can be expected that this confusion will diminish, as will errors arising from it that result in excavation damage.

Some excavation damage occurs even when all underground operators have been notified and marking or staking have been both accurate and adequate. Among the reasons this happens are (1) equipment operator carelessness, (2) equipment operator incompetence, (3) equipment operator malice, (4) unavoidable problems and mistakes, (5) equipment problems, and (6) poor operating procedures.[23] Equipment operators often cite the last of these, poor operating procedures, as a major reason for dig-ins. These poor procedures appear to arise out of the contractor's need to get the excavation work being performed done as quickly as possible.[24]

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[20]NTSB, p. 6.

[21]Courtney, Kalkbrenner, and Yie, p. 162.

[22]For more on these, see Americal Public Works Association, "Uniform Marking and Staking of Underground Utilities."

[23]Courtney, Kalkbrenner, and Yie, p. 74.

[24]Courtney, Kalkbrenner, and Yie, p. 164.

3. DAMAGE PREVENTION

Because of the serious nature of outside forces damage, outside forces damage prevention has, in relatively recent years, become an important concern of gas pipeline operators (and other underground operators). The primary focus, as might be expected, has been on controlling excavation damage. Some of the impetus for damage prevention has been supplied by federal, state, and local regulations. Much, however, has been supplied by industry,[25] undoubtedly spurred, at least in part, by a desire to minimize service interruptions and repair outlays.

3.1 DAMAGE PREVENTION PROGRAMS

Throughout much of U.S. history, excavation damage was essentially treated as an unavoidable price of progress.[26] With the increase in excavation damage attending the intensive building activities of the 1950's, 1960's and 1970's (and the concurrent installation of considerable underground plant and equipment),[27] there came a change in attitude. The former view of excavation damage was no longer acceptable. Something, it was felt, needed to be done to control damage to underground facilities. Industry's answer to the problem of excavation damage was the development and institution of damage prevention programs. Efforts were underway in industry to develop these programs by the early 1960's. By the mid-1970's, many, if not most, operators of underground facilities had damage prevention programs of one sort or another in operation.[28]

There are three basic types of damage prevention program: informal, single company, and multi-company.[29] The most simple of these, as probably would be expected, is the informal program. This type of program consists,

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[25] Walker, p. 27.

[26] Courtney, Kalkbrenner, and Yie, p. 12.

[27] "One-Call Systems Directory, 1984-85," p. 3.

[28] Courtney, Kalkbrenner, and Yie, p. 153.

[29] Courtney, Kalkbrenner, and Yie, pp. 17-18.

primarily, of informal arrangements between individuals at various organizations, including utilities with underground facilities, excavation contractors, and local governmental agencies involved with the issuing of permits, who undertake to keep each other, or themselves, apprised of excavation activity. The individuals involved in these informal arrangements may include, among others, utility field supervisors and foremen, utility safety administrators, contractor staff, and local governmental officials. Informal programs have, generally, been found to have a very limited impact on excavation damage.[30]

In a single company program, a firm operating underground facilities becomes, as a whole, actively and formally involved in damage prevention. The activities and actions that a company can take are varied. One of the most important, of course, is locating its facilities upon demand. Other activities and actions that a company might undertake include participation in meetings with local contractors and advertising its locating service. Underground operators can have some success in preventing excavation damage using a single company program. However, the success will be limited, primarily, it appears, by the lack of coordination with other underground operators.[31]

In the multi-company program, the third type of damage prevention program, a number of underground operators formally band together and coordinate at least some of their damage prevention activities. One important example of a multi-company program is the one-call system. Among the activities that may be coordinated in a multi-company program are meetings with local contractors, damage control seminars, advertising, and locating. In addition, one-call systems will have a common telephone number for excavation notifications.[32]

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[30]Courtney, Kalkbrenner, and Yie, pp. 17, 143.

[31]Courtney, Kalkbrenner, and Yie, pp. 17, 143.

[32]Courtney, Kalkbrenner, and Yie, pp. 18, 143-151; NTSB, 1973, pp. 7-10; General discussion, 9th and 10th Annual One-Call Symposiums.

3.2 ONE-CALL SYSTEMS

Undoubtedly, the most important type of multi-company damage prevention program is the one-call system. The first one-call system, the UTILITY COORDINATING COMMITTEE, was founded in 1964 by a group of concerned utilities to provide one-call service in the Rochester area in the state of New York.[33] Since then, the number of one-call systems has increased considerably. As of 1984-85, in the U.S. there were 98 different one-call systems operating in a total of 44 states (there were 99 systems if the UTILITY COORDINATING COMMITTEE, which has merged many of its functions with the UNDERGROUND FACILITIES PROTECTION ORGANIZATION,[34] which also operates in New York, is included). In addition, one-call systems also operate in the Canadian province of Alberta, the Republic of China (Taiwan), and Scotland.[35]

Many one-call systems are local in nature. They, like the TO BEGIN system, which operates in Springfield, Missouri, may cover a single city or county in a state. Others, like the CALL BEFORE YOU DIG system of Connecticut, cover much or all of a state. A number of systems operate in more than one state. Some are fairly local in nature. Others provide extensive coverage. The DIG SAFE system, as an example of the latter, provides coverage for the states of Massachusetts, Rhode Island, New Hampshire, Vermont, and Maine.[36]

Considerable growth in one-call coverage has occurred in recent years in the U.S., as Figure 1 illustrates. Not only has the number of states with one-call systems been increasing, but, as can be seen in Figure 1,

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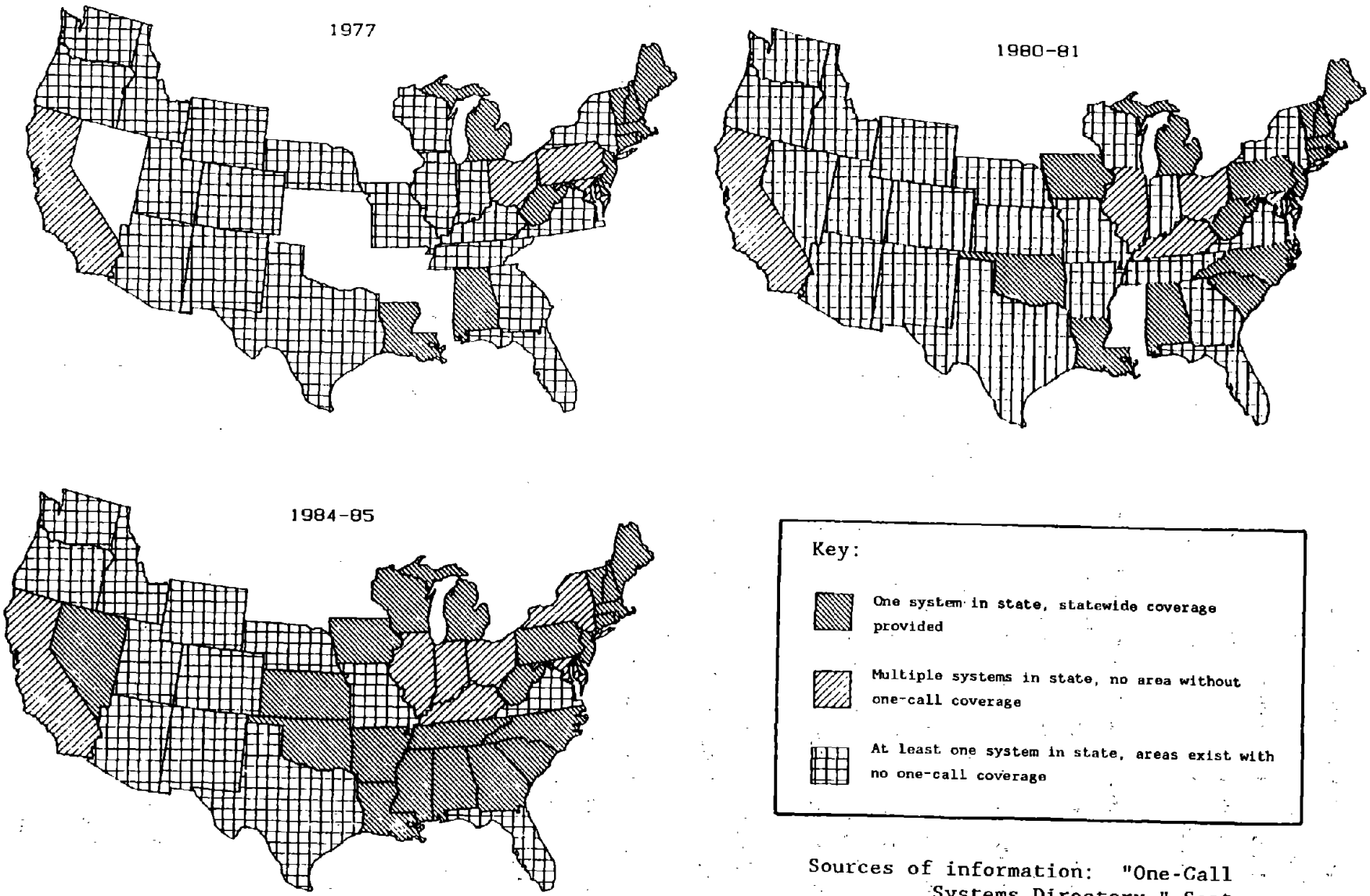
[33]Presentation by R. Taliento, Rochester Gas and Electric at Workshop #5, "Organization and Administration of Your One-Call System," at the 10th Annual One-Call Systems and Damage Prevention Symposium, April 1984; M. Hoyal, p. 2-3.

[34]Presentation by R. Taliento at the 10th Annual One-Call Symposium.

[35]One-Call Systems Directory, 1984-85." A copy of this can be found in Appendix C.

[36]See the "One-Call Directory, 1984-85."



Sources of information: "One-Call Systems Directory," Sept. 1977, 1980-81, and 1984-85; Contacts with various one-call systems.

FIGURE 1. **U.S. STATES WITH ONE-CALL SYSTEMS**

the coverage within the states has been expanding as well. In 1977, 12 states had statewide coverage provided by one one-call system, and another four had statewide coverage through multiple systems. By 1984-85, there were 23 states with statewide coverage by a single one-call system and seven states with statewide coverage through multiple systems.

U.S. one-call systems have a wide variety of participants. Included among them may be gas distribution, transmission, and gathering system operators; petroleum pipeline operators; sewer and water system operators; communications carriers (such as telephone and cable TV operators); and electric utilities. Excavators and contractors who operate in the one-call region may also be formally associated with the one-call system.[37] Participation rarely includes every potential member.[38] However, as many potential participants as possible should be brought into a system's membership in order to maximize its effectiveness.[39]

There is some indication that certain underground operators should be targeted for membership in one-call systems. Municipal water and sewer system operators are one example. Their pipe often lies below most other underground facilities and, as a consequence, accessing it can involve digging around and underneath the other facilities. Problems, of course, can result. Having these operators participating in one-call systems, it is felt, will increase the incidence of excavation notices by excavators intending to work on underground facilities connected with these systems and, as a result, decrease the likelihood that excavation damage will occur.[40]

A one-call system can be an in-house, member-owned-and-operated, or contractor operation. Member-owned-and-operated systems seem to be relatively new. Most systems appear to be either in-house or contractor

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[37]Communications with selected one-call systems.

[38]Odegaard, p. 1; Courtney, Kalkbrenner, and Yie, p. 21.

[39]Courtney, Kalkbrenner, and Yie, p. 146.

[40]Courtney, Kalkbrenner, and Yie, pp. 88, 92-93.

operations.[41] In an in-house operation, one member of the system undertakes to provide the one-call service using its own personnel and facilities. The other members of the system help fund its operation, as well as work with the operating member in managing the system. The first U.S. one-call system, the UTILITY COORDINATING COMMITTEE, began as an in-house system (with Rochester Gas and Electric as the operating utility) and remained so for many years. A problem with this type of system is that the operating utility is sometimes stuck with a disproportionate share of the system's operating costs.[42] In a contractor operation, the membership selects a management team, which, in turn, hires a contractor to handle the day-to-day operations of the system.[43] In some cases, the contractor hired is an answering service.[44] A member-owned-and-operated system differs from a contractor operated system in that, instead of hiring a contractor, the management team directly hires the people who will perform the day-to-day operations of the one-call system. In some circumstances, this can result in a cost savings.[45]

The basic one-call notification process is relatively straightforward. The process is initiated when a person calls the central office of a one-call system to report an impending excavation.[46] Problems can arise at this point if the caller cannot get through to the one-call center within a reasonable length of time, because, for example, of an insufficient number of telephone lines or operators. When this happens, the excavator

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[41] "One-Call Systems Directory, 1984-85," pp. 7-17, 20-30.

[42] Presentation for H. Burke, DOTTIE, at Workshop #6, "Your One-Call Organization...," 9th Annual One-Call Symposium; Presentation by R. Taliento, Rochester Gas and Electric Company, at Workshop #5, "Organization and Administration of Your One-Call System," 10th Annual One-Call Symposium.

[43] J. Kelly, Jr., "DIG SAFE SYSTEM, INC. -- A Not For Profit Corporation," Paper Presented at Workshop #6, "Your One-Call Organization...," 9th Annual One-Call Symposium; J. Hill, "Oklahoma One-Call System, Inc.," Paper Presented at Workshop #6, 9th Annual One-Call Symposium; various industry sources.

[44] Communications with selected one-call systems.

[45] Presentation by M. Hoyal, USA-SOUTH, at Workshop #5, "Organization and Administration of Your One-Call System," 10th Annual One-Call Symposium.

[46] Odegaard, p. 1.

may decide to forego notification altogether, and, as a consequence, excavation damage may occur. Though it must undoubtedly occur upon occasion, just how frequently this situation occurs is not clear.

When a caller reaches a one-call system operator, the operator asks the caller for pertinent information about the proposed excavation. Included among the information requested from the caller will be the exact location of the excavation and how the excavator can be contacted. The caller will often be told during the call which underground operators will be contacted by the one-call system. It will be the responsibility of the excavator to identify and call any underground operators who may have facilities at the excavation site and who are not participants in the one-call system.[47]

After obtaining the information that it needs, a one-call system contacts its members about the impending excavation by telephone or teletype.[48] In many systems, the list of contacted members is limited to those who, in some way, can be identified as possibly operating in the area of the proposed excavation. This screening can, among other ways, be by political subdivision, by street, by subdivision and street, or by special map grid reference. The information used in the screening is obtained by a one-call system from its membership.[49]

Using the information obtained by the one-call system about the impending excavation, the contacted members determine, from their own records and knowledge of their systems, if their facilities are near the excavation site. If they are, the firms will send out locators to the site to mark and stake the location of their facilities.[50] Usually, this will occur within 48 hours of the notification about the dig. In a few

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[47] Odegaard, p. 1-2; Hendrick, p. 22; Courtney, Kalkbrenner, and Yie, p. 149.

[48] Hendrick, p. 22; General discussion, 9th and 10th Annual One-Call Symposiums.

[49] Keesee, pp. 4-7; Rieben, p. 1; Chisholm, pp 2-6.

[50] Odegaard, p. 2.

areas, underground operators will have 72 hours to locate their facilities, and in a few others, they will only have 24 hours.[51] Emergencies are usually handled on a case-by-case basis. If the underground operators have no facilities at the excavation site, in some cases they will notify the excavator of this fact; in many cases they will not. Liability concerns and the extra labor that would be required and the extra costs that would be incurred if everyone giving notice of excavation were contacted are probably the most important reasons for not notifying excavators when no facilities are endangered by a proposed excavation.[52]

To help one-call systems function successfully, the American Public Works Association (APWA), which has been actively involved in the effort to reduce excavation damage for a number of years,[53] has established a set of "minimum standards" for one-call systems. These standards are

1. One telephone number should be provided for excavators to use to notify participating utilities within a predetermined area of planned excavation work.

2. The service should be provided during normal working hours, Monday through Friday.

3. Off-hours calls should reach a recording which explains emergency procedures.

4. All telephone calls should be mechanically voice-recorded.

5. The system should identify for the caller those utilities which will be notified for them.

6. The system should provide a permanent file number for each request.

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[51]"One-Call Systems Directory, 1984-85," pp. 7-17, 20-30.

[52]Courtney, Kalkbrenner, and Yie, pp. 146, 149-150; Selected industry sources.

[53]Courtney, Kalkbrenner, and Yie, p. 18.

7. The system should provide, for a statutory period, a printed copy of all location requests which can easily be retrieved through use of the file number.

8. The system should provide a timely method of notifying the affected utilities. This method is to be determined by each individual system.

9. The system should provide periodic administrative reports as required by the participating utilities.

10. The system should document contractor education programs on an ongoing basis.[54]

These recommended minimum standards are fairly basic. Most one-call systems in operation today probably meet or exceed these standards. Many, if not most, systems, for example, have extensive contacts with area excavators, and engage in very extensive advertising campaigns to let contractors and the public know about their service, as well as the dangers of digging blind.[55]

While data on their performance are relatively sparse, what exists does indicate that one-call systems are successful in reducing excavation damage. A 1978 survey of one-call systems by the American Public Works Association found that 31 percent of the survey respondents had observed a 20 to 30 percent reduction in damages since beginning operation, 19 percent of the respondents had observed a 40 percent reduction in damages, 38 percent of the respondents had observed a 60 to 70 percent reduction in damages, and 12 percent of the respondents reported that they had no data on the extent to which damages had been reduced. It is interesting to note that more than half of the respondents to the APWA survey reported that 50 percent or more of the incidents that had been observed happened to excavators who had not bothered to report their intention to excavate to the one-call center.[56]

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[54] APWA, "One-Call System Manual," p. 1. A copy of the "One-Call System Manual" can be found in Appendix B. This document, prepared as part of the APWA's ongoing effort to promote damage prevention, provides recommendations and pointers on organizing and operating a one-call system.

[55] Contacts with selected one-call systems.

[56] Odegaard, pp. 5-6.

Gas pipelines have evidently been some of the beneficiaries of the improvements that one-call participation have brought about. Gas pipeline operators who have participated in one-call systems have reported that the systems can help reduce damages by between 24 and 67 percent.[57]

3.3 LEGISLATIVE AND REGULATORY EFFORTS TO PROMOTE DAMAGE PREVENTION

Various states, as well as localities, have enacted laws and issued regulations relating to the prevention of excavation and related damage. In addition, Federal damage prevention regulations have been issued by the Occupational Safety and Health Administration and the U.S. DOT. The basic underlying purpose of these laws and regulations has been, of course, the promotion of excavation safety and damage prevention.

As of 1985, thirty-one states in the U.S., and the District of Columbia, had enacted damage prevention legislation (included in this total is North Carolina, whose law will not go into effect until sometime in 1986). In one additional state, Illinois, the Illinois Commerce Commission, a state regulatory authority, has issued regulations relating to damage prevention under the authority of its basic legislative mandate.[58] A similar situation currently exists in North Carolina.[59]

Selected aspects of the various state damage prevention laws and regulations can be found in Table 2. As can be seen in this table, there is some variation in the laws and regulations that the states (and the District of Columbia) have adopted. Some of the provisions listed in Table 2 are found in the damage prevention laws and regulations of most of the states. For example, more than 90 percent require excavators to notify utilities in advance of excavation. Similarly, over 80 percent of the states require excavators to determine the location of underground

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[57] U.S. DOT, "Damage Prevention Program: Cost/Benefit Impact Analysis," p. 7.

[58] See Illinois Commerce Commission, General Order 185, Revised.

[59] Telephone conversation with staff at the North Carolina Utilities Commission.

TABLE 2. **SELECTED ASPECTS OF STATE DAMAGE PREVENTION LAWS**[a]

	Law Requires Excavator to			Law Requires Utility to				
	Determine Location of Underground Gas Plant	Notify Utility In Advance of Excavation	Notify Utility of Damage to Underground Plant	Encourage Excavator to Give Advance Notice to Utility	Respond To All Excavation Notices	Mark Location of Underground Plant Upon Request	Belong to One-Call System[b]	Year in Which Law Became Effective
California	Yes	Yes	Yes	No	No	Yes	Yes	1983-84
Colorado	Yes	Yes	Yes	No	No	Yes	No	1981
Connecticut	Yes	Yes	Yes	Yes	No	Yes	Yes	1977
Delaware	No	No	No	No	Yes	No	No	1979
D.C.	Yes	Yes	Yes	Yes	Yes	No	Yes	1980
Florida[c]	Yes	Yes	No	No	Yes	Yes	No	1977
Georgia[c]	Yes	Yes	No	Yes	Yes	Yes	No	1975
Illinois	No	No	No	No	No	No	Yes[e]	--
Louisiana[d]	No	Yes	No	No	No	No	No	c. 1977
Maine	Yes	Yes	No	No	No	Yes	No	c. 1971
Maryland	Yes	Yes	Yes	Yes	Yes	Yes	No	1974
Massachusetts	Yes	Yes	No	No	No	No	Yes	1980
Michigan	Yes	Yes	Yes	Yes	No	Yes	Yes	1975
Missouri	Yes	Yes	Yes	Yes	No	Yes	No	1976
Montana	Yes	Yes	Yes	Yes	Yes	Yes	No	1971
New Hampshire	No	Yes	Yes	No	No	Yes	Yes	1983
New Jersey[c]	Yes	Yes	Yes	Yes	No	Yes	No	1964
New Mexico	Yes	Yes	Yes	No	No	Yes	No	c. 1973
New York	Yes	Yes	Yes	No	No	Yes	No	1975
North Carolina	Yes	Yes	Yes	Yes	No	Yes	Yes[f]	1986
North Dakota	Yes	Yes	No	No	No	Yes	No	1973
Ohio	Yes	Yes	Yes	Yes	No	Yes	No	1982
Oklahoma	No	Yes	Yes	No	Yes	Yes	No	1982
Pennsylvania	Yes	Yes	Yes	Yes	Yes	Yes	No	1975

TABLE 2. **SELECTED ASPECTS OF STATE DAMAGE PREVENTION LAWS**[a] (CONTINUED)

	Law Requires Excavator to			Law Requires Utility to				
	Determine Location of Underground Gas Plant	Notify Utility In Advance of Excavation	Notify Utility of Damage to Underground Plant	Encourage Excavator to Give Advance Notice to Utility	Respond To All Excavation Notices	Mark Location of Underground Plant Upon Request	Belong to One-Call System[b]	Year in Which Law Became Effective
Rhode Island	Yes	No	Yes	Yes	No	No	No	c. 1984
South Carolina	Yes	Yes	Yes	Yes	No	Yes	No	1978
South Dakota	Yes	Yes	Yes	Yes	No	Yes	No	1977
Tennessee	Yes	Yes	Yes	Yes	No	Yes	No	c. 1978
Utah	Yes	Yes	Yes	Yes	No	Yes	Yes	1977
Virginia	No	Yes	Yes	No	Yes	Yes	No	1980
Washington	Yes	Yes	No	Yes	No	Yes	No	c. 1984
Wisconsin	Yes	Yes	Yes	No	No	Yes	No	c. 1977
Wyoming	Yes	Yes	Yes	Yes	No	Yes	Yes	1978

Sources: National Association of Regulatory Utility Commissioners, 1982 ANNUAL REPORT ON UTILITY AND CARRIER REGULATION, Table 49, p. 584; APWA/ULCC, "One-Call Systems Directory, 1984-85," pp. 32-35; the legal codes of various of the states; telephone conversations with staff at the public service commissions of Alabama, Kentucky, Montana, and North Carolina.

[a]The states of Alabama, Alaska, Arizona, Arkansas, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Mississippi, Nebraska, Nevada, Oregon, Texas, Vermont, and West Virginia have no damage prevention laws. The Illinois Commerce Commission does have regulations relating to damage prevention.

[b]May be required only if there is a one-call system covering the utility's area of operation.

[c]Applies only to gas pipelines.

[d]Applies only to work performed for "public entities."

[e]Required by the Illinois Commerce Commission for utilities under its jurisdiction beginning in 1976.

[f]Required for gas pipelines by the North Carolina Utilities Commission beginning in 1981.

gas facilities. Likewise, over 80 percent have laws that require utilities to mark the location of underground plant and equipment upon request. Around 72 percent require excavators to notify utilities of damage to underground plant. Other damage prevention provisions are found in the laws and regulations of fewer states. Only about 54 percent of the states require utilities to encourage excavators to give advance notice of excavation, while approximately 30 percent require utilities to belong to a one-call system and only 27 percent require that utilities respond to all excavation notices.

The penalties for noncompliance with damage prevention laws vary from state to state. In general, they do not appear to be particularly onerous. In most states, the laws stipulate fines of $1000 or less per incident.[60] The extent to which the legal penalties for excavation damage are imposed is not clear, though it, like the penalties themselves, probably varies from state to state.

Enforcement of the state damage prevention laws has been somewhat spotty. The record of enforcement varies, as might be expected, from state to state.[61] Some laws, or at least provisions of the laws, are not enforced. For example, industry sources in Utah and Wyoming indicate that the provisions in the damage prevention laws of these states requiring utilities with underground plant to become members of the states' one-call systems (of which there are nine in Wyoming and one in Utah[62]) are not enforced, and, as a consequence, many utilities who should be part of a one-call system are not.

The first Federal regulations having to do with the prevention of excavation damage were issued by the Occupational Safety and Health Administration (OSHA). OSHA's regulations, which are presented in Table 3,

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[60] "One-Call Systems Directory, 1984-85," pp. 32-35; the legal codes of various states.

[61] Courtney, Kalkbrenner, and Yie, p. 119.

[62] "One-Call Systems Directory, 1984-85," pp. 25, 28-30.

TABLE 3. **OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS RELATING TO DAMAGE PREVENTION**

Excavation[a]
Prior to opening an excavation, effort shall be made to determine whether underground installations; i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.
Demolition[b]
All electric, gas, water, steam, sewer, and other service lines shall be shut off, capped, or otherwise controlled, outside the building line before demolition work is started. In each case, any utility company which is involved shall be notified in advance.
Blasting[c]
Blasting operations in the proximity of overhead power lines, communications lines, utility services, or other services and structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken.

[a] 29 CFR 1926.651(a)

[b] 29 CFR 1926.850(c)

[c] 29 CFR 1926.900(o)

require that, prior to excavation, demolition, or blasting, the utilities that may be affected must be notified of the impending action. These regulations, it should be noted, apply only to employers over which OSHA has jurisdiction. Consequently, the regulations do not apply to all who might excavate. OSHA's damage prevention regulations have not, it appears, been particularly well enforced.[63] For this reason, among others, these regulations have probably had little direct impact on the incidence of excavation damage to underground facilities.

In April 1983, new Federal regulations concerned with damage prevention went into effect. These new regulations were issued by the U.S. DOT, which has been concerned for a number of years about the prevention of excavation damage. The regulations (see Table 4) establish minimum requirements for damage prevention programs that must be set up by gas distribution, and transmission and gathering system operators for their operations in Class 4 and some Class 3 locations.[64] As part of its damage prevention, the regulations require a pipeline operator to (1) maintain an up-to-date list of the excavators who generally operate in the area of the pipeline, (2) provide the public and the excavators who generally operate in the area of the pipeline with information about the operator's damage prevention program and the procedure for notifying the operator of impending excavation, (3) receive and record excavation notices, (4) provide those notifying the operator of proposed excavation with information on whether the company has any underground facilities in the area and how the company will mark them if there are, (5) provide temporary marking of any underground facilities operated by the pipeline company at an excavation site, and (6) inspect any pipe at an excavation site that could be damaged by excavation. Pipeline operators are explicitly permitted by the regulations to use the services of a one-call system to meet any of the requirements of the regulations. Examining the list of requirements, it is obvious that many could and, in fact, would be taken care of by the one-call systems operating in the U.S. today. Of course, pipeline operators choosing to participate in

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[63]Courtney, Kalkbrenner, and Yie, pp. 119, 196.

[64]For definitions of Class 3 and 4 locations, see 49 CFR 192.5(d), (e), (f)(1), and f(2).

TABLE 4. **U.S. DOT DAMAGE PREVENTION PROGRAM REGULATIONS**

Damage Prevention Program -- 49 CFR 192.614

(a) Except for pipelines listed in paragraph (c) of this section, each operator of a buried pipeline shall carry out in accordance with this section a written program to prevent damage to that pipeline by excavation activities. For the purpose of this section, "excavation activities" include excavation, blasting, boring, tunneling, backfilling, the removal of above ground structures by either explosive or mechanical means, and other earth moving operations. An operator may perform any of the duties required by paragraph (b) of this section through participation in a public service program, such as a "one-call" system, but such participation does not relieve the operator of responsibility for compliance with this section.

(b) The damage prevention program required by paragraph (a) of this section must, at a minimum:

(1) Include the identity, on a current basis, of persons who normally engage in excavation activities in the area in which the pipeline is located.

(2) Provide for notification of the public in the vicinity of the pipeline and actual notification of the persons identified in paragraph (b)(1) of the following as often a needed to make them aware of the damage prevention program:

(i) The program's existence and purpose; and

(ii) How to learn the location of underground pipelines before excavation activities are begun.

(3) Provide a means of receiving and recording notification of planned excavation activities.

(4) Provide for actual notification of persons who give notice of their intent to excavate of whether there are buried pipelines in the area of excavation activity and, if so, the type of temporary marking to be provided and how to identify the markings.

(5) Provide for temporary marking of buried pipelines in the area of excavation activity before, as far as practical, the activity begins.

(6) Provide as follows for inspection of pipelines that an operator has reason to believe could be damaged by excavation activities:

(i) The inspection must be done as frequently as necessary during and after the activities to verify the integrity of the pipeline; and

(ii) In the case of blasting, any inspection must include leakage surveys.

(c) A damage prevention program under this section is not required for the following pipelines:

(1) Pipelines in a Class 1 or 2 location.

(2) Pipelines in a Class 3 location defined by Section 192.5 (d)(2) that are marked in accordance with Section 192.707.

(3) Pipelines to which access is physically controlled by the operator.

(4) Pipelines that are part of a petroleum gas system subject to Section 192.11 or part of a distribution system operated by a person in connection with that person's leasing of real property or by a condominium or cooperative association.

a one-call system must still take care of any requirements not met by participation in the one-call system. Gas system operators, it should be noted, are not required to use the services of a one-call system.[65]

[65]For more on these regulations, see Appendix A.

4. ANALYSIS OF GAS DISTRIBUTION SYSTEM OUTSIDE FORCES DAMAGE

The U.S. DOT's recent damage prevention program regulations emphasize what might be called the "one-call process" for gas pipeline damage prevention. That is, while they do not require participation in a one-call program, the regulations do mandate the development of a damage prevention program with many of the more important attributes and characteristics of a one-call system. Understanding more fully the one-call process, its impact on outside forces damage, and the factors affecting it can be a first step toward further improving gas pipeline damage prevention. To develop insights into the operation of the one-call process, in the section that follows, an outside forces damage model for gas distribution system operators belonging to U.S. one-call systems is developed and estimated.

4.1 MODELLING INCIDENT LEVELS

The level of outside forces incidents experienced by gas distribution system operators participating in one-call systems is influenced by a number of factors and conditions. It appears that the most important of these, given the nature of outside forces damage and given the efforts that have been made (and are being made) in the area of damage prevention, can be expected to be (1) the level of exposure to the risk of damage experienced by the underground facilities of gas systems, (2) the provisions of the various damage prevention laws and regulations extant, (3) the organizational structure and operating characteristics of the gas pipeline operators (since their behavior will help determine the success or failure of their one-call-system-based damage prevention programs), (4) the structure and operating characteristics of the one-call systems to which the gas companies belong, and (5) the general trend in incident levels over time. To meaningfully model the level of outside forces incidents, all of these factors and conditions must, in one way or another, be accounted for.

The approach used in modelling incident levels was to specify and estimate a regression equation for gas distribution system operators in one-call systems using data for the years 1980 through 1982 (the most recent years for which incident data by gas distribution system were available at the time of this study). Variables representing all of the major factors

influencing the level of outside forces incidents were included in the estimated equation.

The sample used in the estimation of the incident level equation consisted of observations on gas distribution system operators belonging to one-call systems and operating in a state for which starting year information on gas system participation could be obtained for all one-call systems in the state. The participation information employed in setting up the sample was obtained directly from various of the one-call systems in operation in the U.S. at the time of this study. The gas system participation information obtained in the course of this study can be found in Appendix D.

In the sample, a gas pipeline operator operating in more than one state (and supplying the U.S. DOT, in mandatory annual reports[66], with information on each state's operations) was treated as a separate firm for each state of operation. Similarly, a one-call system operating in more than one state was treated as a separate one-call system for each state of operation. Firms operating in two or more one-call systems within the same state were treated as belonging to a special "overlap" one-call system. No attempt was made to identify the gas distribution system operators whose service areas are only partially covered by the one-call system(s) to which they belong. A list of the one-call systems and overlaps with paticipants in the sample can be found in Table 5.

For purposes of this study, all firms reporting annually to the U.S. DOT under 49 CFR 191.11 ("Distribution system: Annual report") were defined to be operating gas distribution systems. Because the U.S. DOT's damage prevention regulations (see 49 CFR 192.614) exempts "Pipelines to which access is physically controlled by the operator"[67] and "Pipelines that are...part of a distribution system operated by a person in connection with that person's leasing of real property or by a condominium or cooperative association,"[68] firms who report to the U.S. DOT under 49 CFR 191.11 and who appear to come under these exclusions were not included in the sample

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[66] See 49 CFR 191.11.

[67] 49 CFR 192.614(c)(3).

[68] 49 CFR 192.614(c)(4).

TABLE 5. **ONE-CALL SYSTEMS WITH PARTICIPANTS IN SAMPLE**

State and System	State and System
Alabama	Indiana
MISS ALL	INDIANA UNDERGROUND PLANT PROTECTION SERVICE
	UNITED UTILITIES PROTECTION SERVICE
California	
USA NORTH	Iowa
USA SOUTH	UNDERGROUND PLANT LOCATION SERVICE
USA NORTH/USA SOUTH Overlap	
	Kansas
Colorado	KAN-U-DIG-IT
CENTRAL LOCATING UNIT	
	Kentucky
Connecticut	BUD
"CALL BEFORE YOU DIG"	UNITED UTILITIES PROTECTION SERVICE
Delaware	Michigan
"MISS UTILITY" OF DELMARVA	MISS DIG
Florida	Missouri
"CALL CANDY"	"TO BEGIN"
CONSTRUCTION CONTROL CENTER	
"CALL CANDY"/CALL U.N.C.L.E./	Nebraska
UNDERGROUND UTILITIES	ONE CALL COVERS ALL
NOTIFICATION CENTER Overlap	
	Nevada
Georgia	USA NORTH
UTILITIES PROTECTION CENTER	
	New Jersey
Illinois	GARDEN STATE UNDERGROUND PLANT LOCATION SERVICE
JULIE	
DIGGER	

TABLE 5. **ONE-CALL SYSTEMS WITH PARTICIPANTS IN SAMPLE** (CONTINUED)

State and System	State and System
North Carolina	Texas
UTILITIES LOCATION CO.	TEXAS ONE CALL SYSTEM
	AUSTIN AREA ONE CALL SYSTEM
Ohio	
OHIO UTILITIES PROTECTION	Utah
SERVICE	BLUE STAKE
UNITED UTILITIES PROTECTION	
SERVICE	West Virginia
	MISS UTILITY OF WEST VIRGINIA
Oklahoma	
OKLAHOMA ONE-CALL SYSTEM	Wyoming
	CALL-IN-DIG-IN SAFETY COMMISSION
Pennsylvania	SOUTHEASTERN WYOMING UCC
PENNSYLVANIA ONE CALL SYSTEM	CONVERSE COUNTY CC
	WEST PARK UCC
South Carolina	SWEETWATER COUNTY UCC/CARBON COUNTY UCC Overlap
PALMETTO UTILITY LOCATION	CARBON COUNTY UCC/ALBANY COUNTY UCC Overlap
SERVICE	FREEMONT COUNTY UCC/CENTRAL WYOMING UCC Overlap

used in the estimation of the incident level equation. Though the U.S. DOT's damage prevention program regulations also exempt gas pipelines operating in Class 1 and 2, and certain Class 3 locations, and LP-gas systems[69] no attempt was made to identify and remove pipelines meeting these conditions from the sample because of the difficulty involved in doing so.

4.1.1 The Variables

The specific variables in the incident level model can be found in Table 6. A primary consideration in the selection of the variables for the model was the availability of data.

4.1.1.1 The Dependent Variable - As Table 6 indicates, the dependent variable of the incident level model (OFIS) is the number of outside forces incidents occurring to a firm during a year. The data for this variable were obtained from the U.S. DOT's computerized gas distribution system annual report databases for 1980-81 and 1982.[70] These databases contain

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[69] 49 CFR 192.614(c)(1), (c)(2), and (c)(4). For definitions of Class 1, 2, and 3 locations, see 49 CFR 192.5(a), (b), (c), (d), (f)(2), and (f)(3).

[70] U.S. DOT, Hazardous Materials Information System computerized databases. The databases from which these data were taken needed considerable "cleaning up" before the data could be used. The first step in the process was to add usable gas distribution system operator names and identification numbers to records containing no name (or an obscure name) and no operator identification number (or a completely unique number). Records that could not be matched with a gas system operator were dropped from the sample. Records with a usable operator name but no operator identification number were augmented with a usable identification number. The next step in the process was the removal of (1) all but one record in sets of duplicates, (2) obviously incorrect records for which obvious corrections were not readily apparent (where obvious corrections were apparent, they were made), and (3) all records in sets in which the records appeared to be for the same operator and the same operating region (and, of course, the same year), but did not agree in their reported number of dig-ins. Sometimes, multiple records for the same operating system, operating region, and year agreed on dig-ins, but not on reported pipeline mileage and/or number of services. In many, if not most, cases, a comparison of pipeline mileage or number of services over time indicated that one particular record was more likely than the others to be correct. In these cases, this record was kept in the sample and the others were dropped. When a comparison over time did not indicate a most-likely-correct record, all records in the set were dropped from the sample. The final step of the "clean up" was to make certain that the records for operators operating in multiple states were associated with the appropriate state of operation, not the headquarters (or some other) state. To accomplish this, the dataset was examined, and records linked with inappropriate states were identified and changed, while records for multiple or unidentifiable states were removed from the sample set.

TABLE 6. **VARIABLES USED IN THE MODEL**

Category and Variable	Description	Measure
	DEPENDENT VARIABLE	
OFIS	Outside forces incidents	incidents per year
	INDEPENDENT VARIABLES	
Exposure Measure Variables		
CONSTN	Construction contracts let in state during year	billions of 1982 dollars
PIPE	Gas distribution pipeline mileage plus estimated service pipe mileage in service region	miles of pipe
POP	Estimated population of one-call system service region	number in thousands
State Damage Prevention Law Variables		
DLAW1	Dummy variable indicating whether state of operation has damage prevention law	1(= law exists) or 0(= no law)
DLAW2	Dummy variable indicating whether state has legal requirement that utilities must respond to all excavation notices	1(= required by law) or 0(= no requirement)
DLAW3	Dummy variable indicating whether state law mandates participation in a one-call system	1(= mandated) or 0(= not mandated)
Gas Company Variables		
DSIZE1	Dummy variable for gas companies reporting less than 101 services	1(if true) or 0
DSIZE2	Dummy variable for gas companies reporting from 101 to 1,000 services	1 or 0

TABLE 6. **VARIABLES USED IN THE MODEL** (CONTINUED)

Category and Variable	Description	Measure
Gas Company Variables (Cont.)		
DSIZE3	Dummy variable for gas companies reporting from 1,001 to 10,000 services	1 or 0
DSIZE4	Dummy variable for gas companies reporting from 10,001 to 100,000 services	1 or 0
DSIZE5	Dummy variable for gas companies reporting from 100,001 to 1,000,000 services	1 or 0
DSIZE6[a]	Dummy variable for gas companies reporting more than 1,000,000 services	1 or 0
DGOVT	Dummy variable indicating if the gas company is government owned/ operated	1(if govt) or 0
One-Call System Variables		
PAR	Number of underground operators participating in one-call systems	number of firms
RTIME	Time requested by one-call system between notification of system and start of excavation	hours
INCALLS	Calls made to one-call system	number of calls
ADBUD	One-call system advertising budget for year	1982 dollars
CALLPOP	Calls made to one-call system per system telephone operator per year	number of calls per operator
DOPTYPE	Dummy variable indicating whether system is a contract or in-house operation	1(= contract) or 0(= in-house)

TABLE 6. **VARIABLES USED IN THE MODEL** (CONTINUED)

Category and Variable	Description	Measure
One-Call System Variables (Cont.)		
DSCOVER1[a]	Dummy variable indicating system is statewide	1(= statewide) or 0(= not statewide)
DSCOVER2	Dummy variable indicating system is not statewide but state is completely covered by one-call systems	1(= is the case) or 0(= not the case)
DSCOVER3	Dummy variable indicating system is not statewide and areas of state are not covered by a one-call system	1(= is the case) or 0(= not the case)
DNEWSYS	Dummy variable for new one-call systems	1(if new system) or 0
Year Variables		
D1980[a]	Dummy variable for 1980	1(for 1980) or 0
D1981	Dummy variable for 1981	1(for 1981) or 0
D1982	Dummy variable for 1982	1(for 1982) or 0

[a]Dummy variable implicit in constant term of equation.

the information submitted to the U.S. DOT by gas distribution system operators as required by 49 CFR 191.11. This report must be submitted annually by all gas distribution system operators, including all petroleum gas system operators except those serving "less than 100 customers from a single source."[71]

One-call systems, and the one-call process, are designed to assist in the prevention of excavation damage. One-call systems can be expected to have little or no impact on outside forces damage resulting from non-excavation-related causes, such as earthquakes, land subsidence, the weather, or vandalism, which appear to account for somewhere around 50 percent of all outside forces incidents.[72] As a consequence, it might be expected, given the impetus for this study, that the number of excavation incidents occurring might be a more appropriate dependent variable for the incident level model than the total number of outside forces incidents. Unfortunately, there was no data source that could supply reliable figures on the level of excavation damage at the firm level (or even at the one-call system level), nor was there any data source that could be used to generate reliable estimates.

4.1.1.2 The Independent Variables: Overview - The independent (or explanatory) variables of the incident level model, as can be seen in Table 6, include three exposure measure variables, three state damage prevention law variables, seven gas company variables, ten one-call system variables, and three year variables.

4.1.1.3 The Independent Variables: Exposure Variables - The three exposure measure variables included in the model are CONSTN, the value of construction contracts let during the year in the state in which the gas distribution system operates, PIPE, the estimated mileage of gas system pipe, and POP, the population in the service region of the one-call system in which the gas distribution system participates. All three of these exposure measures

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[71] 49 CFR 191.11(b).

[72] Based on information obtained from the U.S. DOT's computerized gas pipeline leak report databases, which are part of the U.S. DOT's Hazardous Materials Information System.

are expected, a priori, to vary directly with the level of incidents. That is, an increase in any one of these variables is expected to result in an increase in the number of incidents that occur, since the more exposure to the risk of an accident, the more accidents, all other things equal.

The exposure variable, CONSTN, was derived from data taken from the STATISTICAL ABSTRACT OF THE UNITED STATES (see Table 7 for the value of construction contracts let by state and year from 1980 through 1982). The deflator used to put the construction figures into 1982 constant dollars was the Department of Commerce composite construction cost index,[73] with the base year changed from 1977 (the base year of the reported data) to 1982.

PIPE, the second exposure variable, was derived by adding the total mileage of mains of a system to the number of services of the system times 50 feet, the estimated average length of a service,[74] divided by 5280 feet. Mileage of mains and number of services were obtained from the U.S. DOT's computerized gas distribution system annual reports.

The third exposure variable, POP, was estimated by multiplying the total population of the state of operation of the gas system of interest by the percentage of the total state population in a year residing in the one-call system's service region. The state population data used were taken from the STATISTICAL ABSTRACT OF THE UNITED STATES, 1984. The percentage figures used in the derivation of POP were obtained primarily from the "One-Call Systems Directory."[75] For the one-call systems in the sample for which no percentage figures were given, estimates were calculated using the coverage information contained in the "One-Call Systems Directory" and the population data taken from the 1980 U.S. Census.[76]

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[73]See the STATISTICAL ABSTRACT OF THE UNITED STATES, 1984, p. 739.

[74]Courtney, Kalkbrenner, and Yie, p. 31.

[75]"One-Call Systems Directory," for 1981-92 and 1983-84.

[76]U.S. Census, 1980 CENSUS.

TABLE 7. **VALUE OF CONSTRUCTION CONTRACTS BY STATE**
1979 THROUGH 1982
(In Billions of Constant 1982 Dollars;
States Are Those In Which Work Was Performed)

State	Year		
	1980	1981	1982
Alabama	2.1	1.9	2.0
Alaska	0.8	1.2	1.5
Arizona	3.4	3.2	3.8
Arkansas	1.4	1.3	1.6
California	19.0	17.5	15.4
Colorado	3.0	4.5	4.1
Connecticut	1.6	1.9	1.6
Delaware	0.3	0.6	0.4
D. C.	0.5	1.0	0.8
Florida	13.8	12.3	10.8
Georgia	4.2	3.9	5.0
Hawaii	1.3	0.9	0.9
Idaho	0.7	0.7	0.5
Illinois	5.7	4.8	4.7
Indiana	3.0	3.0	2.9
Iowa	1.7	1.3	1.3
Kansas	2.0	1.3	1.4
Kentucky	2.4	3.5	2.7
Louisiana	3.5	3.9	5.7
Maine	0.6	0.4	0.5
Maryland	3.3	2.5	3.0
Massachusetts	2.9	3.3	2.9
Michigan	4.5	3.3	2.5
Minnesota	3.0	2.7	2.9
Mississippi	1.7	1.4	1.1
Missouri	2.8	2.5	2.4
Montana	0.4	2.1	0.6

TABLE 7. **VALUE OF CONSTRUCTION CONTRACTS BY STATE 1979 THROUGH 1982** (CONTINUED)

State	Year		
	1980	1981	1982
Nebraska	0.9	0.8	1.0
Nevada	1.3	1.3	1.1
New Hampshire	0.5	0.6	0.5
New Jersey	4.1	3.6	3.7
New Mexico	1.5	1.4	1.3
New York	6.3	6.5	7.1
North Carolina	3.7	3.4	3.4
North Dakota	0.5	0.5	3.1
Ohio	5.6	4.9	4.8
Oklahoma	2.5	2.8	3.1
Oregon	2.1	2.1	1.4
Pennsylvania	5.6	5.0	4.5
Rhode Island	0.3	0.4	0.3
South Carolina	2.7	2.2	2.2
South Dakota	0.5	0.4	0.8
Tennessee	3.0	2.6	2.6
Texas	14.7	17.9	16.9
Utah	1.2	1.8	3.3
Vermont	0.3	0.3	0.4
Virginia	3.7	3.5	3.6
Washington	5.2	3.6	3.4
West Virginia	0.9	0.7	0.8
Wisconsin	2.4	2.1	1.8
Wyoming	0.7	0.6	0.7

Source of construction contracts data: STATISTICAL ABSTRACT OF THE UNITED STATES, various issues; original source of data: F. W. Dodge, DODGE CONSTRUCTION POTENTIALS.

4.1.1.4 The Independent Variables: State Damage Prevention Law Variables - As can be seen in Table 6, the three state damage prevention law variables included among the explanatory variables of the incident level model are DLAW1, DLAW2, and DLAW3. The three, all dummy variables, indicate respectively the existence of a state damage prevention law, the existence of a legal requirement to respond to all excavation notices, and the existence of mandatory one-call participation. Since the purpose of the damage preventions laws is, of course, the reduction of excavation incidents, the estimated regression coefficients of all three variables are expected to be negative. No Federal regulatory variables were included in the model because OSHA's regulations, the only Federal damage prevention regulations in existence prior to the 1984 effective date of the U.S. DOT's damage prevention program regulations, have not been considered very effective.[77] Local regulatory variables were not included in the model because it appears that the main legislative and regulatory thrust toward damage prevention has been historically at the state level.[78]

A number of possible law variables could have been included in the incident level model (see Table 2). The three selected for the model were chosen to cover the state efforts at damage prevention while minimizing the adverse effects of multicollinearity, a statistical estimation problem caused by highly correlated independent variables that was detected during preliminary work with the model.[79] The information used to create the three state damage prevention law dummy variables (which can be found in Table 2) was obtained primarily from the legal codes of the various states in the sample.

4.1.1.5 The Independent Variables: Gas Company Variables - The gas company variables included in the incident level model consist of a set of company size dummy variables, DSIZE1, DSIZE2, DSIZE3, DSIZE4, DSIZE5 and DSIZE6, and a government owned/operated dummy variable, DGOVT. The size dummy

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[77] Courtney, Kalkbrenner, and Yie, p. 119.

[78] NTSB, pp. 22-23; Courtney, Kalkbrenner, and Yie, pp. 119-142.

[79] For more on multicollinearity and its effects, see a standard econometrics text, such as Judge, et al.

for gas systems with greater than 1,000,000 services, DSIZE6, is not explicitly included in the estimated incident level regression equation (in order, of course, to avoid the "dummy variable trap"[80]), but rather is implicit in its constant term. The expected relationship between size and incident levels is that the gas systems with the fewest services would have the fewest incidents and the gas systems with the most services would have the most incidents. No prior hypothesis was posited for the estimated regression coefficient of the government dummy.

The data used to create the size dummy variables was obtained from the computerized gas distribution system annual report databases maintained by the U.S. DOT. The main information used to identify government owned/operated gas systems was the name field in the U.S. DOT's annual report databases. Where a question existed after the name field had been checked, BROWN'S DIRECTORY[81] was consulted.

4.1.1.6 The Independent Variables: One-Call System Variables - The one-call system variables included in the model are PAR, the number of participants in the one-call systems to which the gas distribution system operators in the sample belong, RTIME, the request time desired by the one-call systems, INCALLS, the number of notification calls received by the systems, ADBUD, the advertising budget of the systems, CALLPOP, the number of notification calls per one-call system telephone operator, DOPTYPE, a dummy variable indicating whether the system is a contract or an in-house operation, DSCOVER1, DSCOVER2, and DSCOVER3, a set of dummies indicating the level of coverage offered by the one-call systems, and DNEWSYS, a dummy variable indicating if a one-call system is new. No prior expectations were attached to PAR, DOPTYPE, DSCOVER1, DSCOVER2, or DSCOVER3. In order that the "dummy variable trap" might be avoided, the coverage dummy variable, DSCOVER1, was left out of the estimated regression equation.

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[80] Regression estimation will fail if a categorical variable is represented in a regression equation by a set of dummy variables equal in number to the number of categories present in the variable. This situation is known as the "dummy variable trap." To get around the trap, one dummy variable in the set must be excluded from the equation to be estimated.

[81] BROWN'S DIRECTORY OF NORTH AMERICAN AND INTERNATIONAL GAS COMPANIES for 1980.

It might be considered somewhat surprising that no prior hypothesis is proposed for the variable PAR. PAR, it might be thought, should be expected to vary inversely with the level of gas system incidents. After all, as membership in a one-call system expands, coordination among underground operators should improve and, since underground operators are directly or indirectly the source of much, if not most, of the excavation damage that occurs,[82] this should mean fewer incidents for participating operators, including member gas distribution systems. A countervailing process, however, may also be at work. Underground operators with a serious excavation damage problem are probably more likely to join a one-call system than are those for whom the problem is not serious (or not as serious). Consequently, one-call systems may have a disproportionate number of members with significant excavation damage problems. Systems with large memberships may be servicing areas where the problem of excavation damage is pervasive. The larger the membership, the more pervasive the problem of excavation damage may be. Of course, the more pervasive the problem, the higher the incident levels of underground operators, such as those operating gas systems, can be expected to be. Thus, PAR will be influenced by this to vary directly, not inversely, with the number of gas system incidents. Whether this effect or that resulting from improved coordination will dominate is unclear. For this reason, no prior hypothesis was specified for PAR.

The one-call variables INCALLS and ADBUD are both expected to vary inversely with gas system incident levels. INCALLS is expected to vary inversely because the more calls received by a one-call system, all other things equal, the more the public is taking advantage of and using the one-call program, and the more one-call systems are used, the more the primary benefit of the systems, reduced levels of excavation incidents, can be expected to be realized.

ADBUD is hypothesized to vary inversely with OFIS, gas system incident levels, because advertising and promotion are the primary ways in which contractors and the general public learn about and are reminded of the service offered by the one-call systems. In general, it is expected that as one-call advertising and promotion increase, so does the use of one-call systems.

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[82] Courtney, Kalkbrenner, and Yie, p. 9.

The variables RTIME, CALLPOP, and NEWSYS are all expected, a priori, to vary directly with OFIS. RTIME is hypothesized to vary directly because, as the requested time between notification of impending excavation and start of work increases, it is expected that the proclivity to dig without waiting the full time also increases. This, of course, can lead to increased excavation damage. Cost considerations would undoubtedly be the primary motivation for choosing not to wait. It should be noted that request time is only partially under the control of the one-call systems. Laws in 30 states and the District of Columbia mandate the minimum length of time that must be allowed to elapse between notification of intent to dig and the beginning of excavation.[83] In some cases, the maximum allowed is mandated as well.

CALLPOP is expected to vary directly with the level of gas system incidents since the fewer calls an operator has to handle, the more quickly and expeditiously they can be handled, and the more quickly and expeditiously incoming calls are answered, the less likely it will be that callers will give up trying to contact the system and just go ahead and dig, perhaps with unfortunate consequences. Conversely, the more calls a telephone operator has to handle, the more likely it is that callers will become frustrated with the notification process and begin excavation without notifying anyone.

The estimated regression coefficient on the dummy variable NEWSYS is expected to have a positive sign because new one-call systems are not expected to be able to realize the full benefits of the one-call process during their startup period (here defined to be the first year of operation). Thus, the incident levels of participants in new systems will be expected to be higher than those of participants in established systems, all other things equal.

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[83]The states are Arizona, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Maine, Maryland, Massachusetts, Michigan, Missouri, Montana, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Virginia, Washington, Wisconsin, and Wyoming.

The participation data used for PAR (see Table 8) was obtained primarily from the "One-Call Systems Directory." Unfortunately, since a "One-Call Systems Directory" for 1982-83 was not published, the number of system participants for 1982 was unavailable from this source and had to be estimated. This was accomplished by averaging the values for 1981 and 1983 where they both were available and using the available value as the estimate for 1982 where one was missing. Missing data for 1980 and 1981 were assigned the same value as that used for 1982.

The information used to create the contract/in-house dummy, DOPTYPE (see Table 9), was also obtained from the "One-Call Systems Directory." To develop a "best guess" for the type of operation in 1982, the type of operation in the surrounding years was used. Where 1981 and 1983 were both in-house operations, the operation in 1982 was assumed to have been in-house; likewise, where the two years were contract, 1982 was assumed to have been contract. Where information for 1981 or 1983 was unavailable, information for the next available year (1980 or 1984) was used. Where the 1981 and 1983 operations were different, the observation was dropped from the sample. Other gaps in the data were handled in a similar fashion. In a few cases, information supplied by certain of the one-call systems was used to supplement the "One-Call Systems Directory" information.

The primary source of the information used in the generation of the coverage dummies and the new system dummy, DNEWSYS, was the APWA's "One-Call Systems Directory" for various years. Supplemental information was obtained from certain of the one-call systems.

The request time data used for the model were taken from the "One-Call Systems Directory" (see Table 10 for the reported request times for the U.S. one-call systems in operation during the 1980 to 1982 period). Since no variation over time was found, the lack of 1982 data presented no problems. For the variable RTIME, all request times were converted to an hourly basis, with each "working day" being assigned 24 hours. No attempt was made to add a factor to a "working day" for weekends or holidays.

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP**

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Alabama					
Miss All	18	24	NA	26	26
Arizona					
Blue Stake (Phoenix)	10	16	NA	20	20
Blue Stake (Sierra Vista)	4	6	NA	6	6
Blue Stake (Cottonwood)	8	8	NA	4	4
Blue Stake (Prescott)	5	7	NA	6	6
Blue Stake (Tucson)	4	6	NA	10	10
Blue Stake (Flagstaff)	--	--	NA	6	6
Arkansas					
Arkansas One Call System	8	45	NA	45	45
California					
USA South	33	43	NA	85	253
USA North	44	56	NA	80	212
Colorado					
Mesa County Buried Utilities Location Service	6	6	NA	NA	NA
Blue Stake	3	3	NA	10	12
Central Locating Unit	NA	NA	NA	4	4
Fort Collins - Loveland One Call	--	--	--	--	6
Connecticut					
Call Before You Dig	241	296	NA	296	296

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Delaware					
"Miss Utility" of Delmarva	16	17	NA	20	22
Florida					
"Call Candy"	17	20	NA	25	25
Call U.N.C.L.E	23	23	NA	23	28
Underground Utilities Notification Center	12	12	NA	14	14
Construction Control Center	4	4	NA	4	5
Georgia					
Utilities Protection Center	7	9	NA	11	62
Idaho					
Palouse Empire UCC	3	3	NA	3	7
Lewis Clark UCC	5	--	--	--	--
Utilities Underground Location Center	--	7	NA	7	13
Dig-Line	8	8	NA	8	6
Panhandle UCC	--	--	--	--	17
Illinois					
J.U.L.I.E.	45	120	NA	118	150
Digger	6	6	NA	6	6
Indiana					
Utility Locations	7	7	--	--	--
Had-Help	10	10	--	--	--
Be-A-Ware	NA	NA	--	--	--

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
United Utilities Protection Service -- SEE OHIO					
Ruff Dig-In-Service	NA	NA	--	--	--
Kokomo Utilities UPS	NA	NA	--	--	--
Knox County One-Call	NA	NA	--	--	--
90-90 Dig In of Wayne County	NA	NA	--	--	--
Indiana Underground Plant Protection Service	--	23	56	62	84
Iowa					
Underground Plant Location Services	2	25	NA	20	26
Kansas					
Kansas One Call Center	NA	NA	NA	6	82
Kentucky					
BUD	12	14	NA	16	25
Louisiana					
DOTTIE	40	50	NA	60	80
Maine					
Dig-Safe -- SEE MASSACHUSETTS					
Maryland					
Miss Utility	23	28	NA	25	29
"Miss Utility" of Delamarva -- SEE DELAWARE					

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Massachusetts					
Dig-Safe	16	22	NA	22	80
Michigan					
Miss Dig	386	407	NA	440	483
Mississippi					
Mississippi One-Call Center	--	--	--	--	55
Missouri					
To Begin	6	6	NA	5	4
Nebraska					
One Call Covers All	7	8	NA	8	9
Lincoln UCC	4	4	NA	5	5
Nevada					
Can You Dig It	10	10	NA	--	--
USA North -- SEE CALIFORNIA					
New Hampshire					
Dig-Safe -- SEE MASSACHUSETTS					
New Jersey					
Garden State UPLS	22	26	NA	32	32
New Mexico					
Blue Stake (Farmington)	5	9	NA	9	9
Blue Stake (Grants)	7	6	NA	6	6
Blue Stake (Albuquerque)	6	6	NA	5	5

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Blue Stake (Gallup)	4	6	NA	6	6
Blue Stake (Las Cruces)	11	5	NA	--	--
Blue Stake (Santa Fe)	6	5	NA	5	5
Blue Stake (Las Vegas)	5	NA	NA	3	3
Blue Stake (Zuni)	5	5	NA	5	5
Blue Stake (Roswell)	--	5	NA	5	5
New York					
UCC of Rochester	4	6	NA	6	6
UFPO	40	47	NA	50	50
Underground ULS	5	5	NA	5	5
Underground UCC	12	15	NA	13	17
UCC (Long Island)	2	2	NA	2	2
North Carolina					
"ULOCO"	37	41	NA	41	50
Ohio					
Ohio Utilities Protection Service	30	38	NA	40	62
United UPS	4	4	4	4	4
Oklahoma					
Oklahoma One-Call System	29	45	NA	113	130
Oregon					
Utilities Underground Location Center	--	12	NA	12	14
Umatilla County UCC	NA	--	--	--	--
Wasco County UCC	NA	NA	NA	NA	12

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Linn Benton UCC	10	NA	NA	NA	9
Lane UCC	23	NA	NA	25	40
Douglas UCC	NA	NA	NA	NA	21
Josephine UCC	NA	NA	NA	NA	7
Rouge Basin UCC	30	NA	NA	NA	NA
Central Oregon CC	NA	23	NA	23	8
Curry CC	NA	--	--	--	--
Hoodriver UCC	NA	12	NA	12	20
East Linn CC	10	NA	NA	NA	12
City of Dallas UCC	6	6	NA	6	6
West Lane UCC	NA	--	--	--	--
Malheur UCC	--	4	NA	4	8
Klamath UCC	NA	20	NA	21	6
North Lincoln County UCC	--	--	--	--	10
South Lincoln County UCC	--	--	--	--	NA
Pennsylvania					
Pennsylvania One Call System	28	32	NA	36	52
Rhode Island					
Dig-Safe -- SEE MASSACHUSETTS					
South Carolina					
Palmetto ULS	47	52	NA	53	67
Tennessee					
Miss Locate	1	3	NA	3	--
"Dare Dig"	--	6	NA	6	--
One Call System of Tennessee	--	29	NA	34	92

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Texas					
Texas One Call System	4	10	NA	10	22
One Call (Austin)	8	8	NA	9	9
Utah					
Blue Stakes Center	8	8	NA	8	10
Vermont					
Dig-Safe -- SEE MASSACHUSETTS					
Virginia					
Roanoke Valley ULS	7	7	NA	7	7
Miss Utility of Virginia	20	29	NA	29	51
Miss Utility -- SEE MARYLAND					
"Miss Utility" of Delmarva -- SEE DELAWARE					
Miss Utility of Lynchburg	4	4	NA	4	--
Washington					
Utilities ULC	53	116	NA	116	154
Grays Harbor & Pacific County UCC	15	15	NA	15	22
Cowlitz County UCC	9	9	NA	9	9
Clark County ULS	12	12	NA	12	8
Chelan-Douglas UCC	12	12	NA	12	12
Upper Yakima County UUC	15	15	NA	15	16
Klickitat-Skamania CC	18	18	NA	18	18
Walla Walla Area UCC	9	9	NA	9	9
Inland Empire UCC	15	15	NA	15	16
Palouse Empire UCC -- SEE IDAHO					

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Benton & Franklin Counties UCC	23	--	--	--	--
Skagit UCC	12	12	NA	--	--
Island County UCC	10	10	NA	--	--
Lower Yakima Valley UCC	NA	NA	NA	--	--
Challen-West Jefferson	10	--	--	--	--
Grant County UCC	10	--	--	--	--
Kitsap County UCC	20	--	--	--	--
West Virginia					
Miss Utility of West Virginia	11	11	NA	21	22
Cable Protection Bureau	1	--	--	--	--
Wisconsin					
Dane County One Call System	8	10	NA	12	--
Diggers Hotline	11	10	NA	12	30
Wyoming					
West Park UCC	3	3	NA	5	5
Call-In-Dig-In Safety Commission	NA	NA	NA	10	10
Freemont County UCC	11	11	NA	11	11
Central Wyoming UCC	5	5	8	8	8
Sweetwater County UCC	15	15	NA	15	15
Carbon County UCC	NA	NA	NA	6	6
Albany County UCC	15	15	NA	15	15
Southeastern Wyoming UCC	7	7	NA	7	7
Converse County UCC	--	5	NA	5	5

TABLE 8. **SIZE OF ONE-CALL SYSTEM MEMBERSHIP** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
D.C.					
Miss Utility -- SEE MARYLAND					

Sources: ONE-CALL SYSTEMS DIRECTORY, issues for 1980-81, 1981-82, 1983-84, and 1984-85; certain one-call systems.

*No ONE-CALL SYSTEMS DIRECTORY was published for 1982-83.

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM**

(I = In-house C = Contract)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Alabama					
Miss All	I	I	NA	I	I
Arizona					
Blue Stake (Phoenix)	C	C	NA	C	C
Blue Stake (Sierra Vista)	C	C	NA	C	C
Blue Stake (Cottonwood)	I	C	NA	I	I
Blue Stake (Prescott)	I	C	NA	I	I
Blue Stake (Tucson)	I	C	NA	I	C
Blue Stake (Flagstaff)	--	--	NA	C	C
Arkansas					
Arkansas One Call System	C	C	NA	C	C
California					
USA South	C	C	NA	C	I
USA North	C	C	NA	C	C
Colorado					
Mesa County Buried Utilities Location Service	C	C	NA	C	C
Blue Stake	I	I	NA	I	I
Central Locating Unit	--	--	NA	I	I
Fort Collins-Loveland One Call	--	--	--	--	I
Connecticut					
Call Before You Dig	C	C	NA	C	C

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Delaware					
"Miss Utility" of Delmarva	I	I	NA	I	I
Florida					
"Call Candy"	I	I	NA	I	I
Call U.N.C.L.E.	I	I	NA	I	I
Underground Utilities Notification Center	I	I	NA	I	I
Call Before You Dig	I	I	NA	I	I
Georgia					
Utilities Protection Center	I	I	NA	I	I
Idaho					
Palouse Empire UCC	I	I	NA	I	I
Lewis Clark UCC	C	--	--	--	--
Utilities Underground Location Center	--	C	NA	C	C
Dig-Line	C	C	NA	C	C
Panhandle UCC	--	--	--	--	C
Illinois					
J.U.L.I.E.	C	C	NA	C	C
Digger	I	I	NA	I	I
Indiana					
Utility Locations	C	C	--	--	--
Had-Help	C	C	--	--	--
Be-A-Ware	C	C	--	--	--
United Utilities Protection Service -- SEE OHIO					
Ruff Dig-In-Service	NA	NA	--	--	--

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Kokomo Utilities UPS	NA	NA	--	--	--
Knox County One-Call	NA	NA	--	--	--
90-90 Dig In of Wayne County	NA	NA	--	--	--
Indiana Underground Plant Protection Service	--	C	NA	C	C
Iowa					
Underground Plant Location Services	C	C	NA	C	C
Kansas					
Kansas One Call Center	C	C	NA	I	C
Kentucky					
BUD	I	I	NA	I	I
Louisiana					
DOTTIE	I	I	NA	I	C
Maine					
Dig-Safe -- SEE MASSACHUSETTS					
Maryland					
Miss Utility	I	I	NA	C	C
"Miss Utility" of Delmarva -- SEE DELAWARE					
Massachusetts					
Dig-Safe	I	I	NA	C	C
Michigan					
Miss Dig	I	I	NA	I	C

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Mississippi					
Mississippi One Call Center	--	--	--	--	C
Missouri					
To Begin	I	I	NA	I	I
Nebraska					
One Call Covers All	I	I	NA	I	I
Lincoln UCC	I	I	NA	I	I
Nevada					
Can You Dig It	C	C	--	--	--
USA North	--	--	NA	C	C
New Hampshire					
Dig-Safe -- SEE MASSACHUSETTS					
New Jersey					
Garden State UPLS	C	C	NA	C	C
New Mexico					
Blue Stake (Farmington)	I	I	NA	I	I
Blue Stake (Grants)	I	I	NA	I	I
Blue Stake (Albuquerque)	I	I	NA	I	I
Blue Stake (Gallup)	I	I	NA	I	I
Blue Stake (Las Cruces)	I	I	NA	--	--
Blue Stake (Santa Fe)	I	I	NA	I	I
Blue Stake (Las Vegas)	I	I	NA	I	I
Blue Stake (Zuni)	I	I	NA	I	I
Blue Stake (Roswell)	--	I	NA	I	I

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
New York					
UCC of Rochester	I	I	NA	I	C
UFPO	C	C	NA	C	C
Underground ULS	C	C	NA	C	C
Underground UCC	I	NA	NA	C	C
UCC (Long Island)	C	C	NA	C	C
North Carolina					
"ULOCO"	C	C	NA	C	C
Ohio					
Ohio Utilities Protection Service	I	NA	NA	C	I
United UPS	I	I	NA	I	I
Oklahoma					
Oklahoma One-Call System	C	C	NA	C	C
Oregon					
Utilities Underground Location Center	--	C	NA	C	C
Umatilla County UCC	NA	--	--	--	--
Wasco County UCC	NA	C	NA	C	C
Linn Benton UCC	C	C	NA	C	C
Lane UGC	I	C	NA	C	C
Douglas UCC	NA	C	NA	I	C
Josephine UCC	NA	C	NA	C	C
Rouge Basin UCC	C	C	NA	C	C
Central Oregon CC	NA	C	NA	C	C
Curry CC	I	--	--	--	--
Hoodriver UCC	NA	C	NA	C	C
East Linn CC	C	C	NA	C	C
City of Dallas UCC	I	I	NA	I	I

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
West Lane UCC	NA	--	--	--	--
Malheur UCC	--	C	NA	C	C
Klamath UCC	NA	C	NA	I	C
North Lincoln County UCC	--	--	--	--	C
South Lincoln County UCC	--	--	--	--	C
Pennsylvania					
Pennsylvania One Call System	C	C	NA	C	C
Rhode Island					
Dig-Safe -- SEE MASSACHUSETTS					
South Carolina					
Palmetto ULS	C	C	NA	C	C
Tennessee					
Miss Locate	I	I	NA	I	--
"Dare Dig"	--	I	NA	I	--
One Call System of Tennessee	--	C	NA	C	C
Texas					
Texas One Call System	I	C	NA	C	C
One Call (Austin)	I	I	NA	I	I
Utah					
Blue Stakes Center	I	C	NA	C	C
Vermont					
Dig-Safe -- SEE MASSACHUSETTS					

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Virginia					
Roanoke Valley ULS	C	C	NA	C	C
Miss Utility of Virginia	I	I	NA	I	I
Miss Utility -- SEE MARYLAND					
"Miss Utility" of Delmarva -- SEE DELAWARE					
Miss Utility of Lynchburg	C	C	NA	C	--
Washington					
Utilities ULC	C	C	NA	C	C
Grays Harbor & Pacific County UCC	NA	C	NA	C	C
Cowlitz County UCC	C	C	NA	C	C
Clark County ULS	NA	C	NA	C	C
Chelan-Douglas UCC	NA	C	NA	C	C
Upper Yakima County UUC	C	C	NA	C	C
Klickitat-Skamania CC	C	C	NA	C	C
Walla Walla Area UCC	I	I	NA	I	C
Inland Empire UCC	C	C	NA	C	C
Palouse Empire UCC -- SEE IDAHO					
Benton & Franklin Counties UCC	C	--	--	--	--
Skagit UCC	C	C	NA	--	--
Island County UCC	I	I	NA	--	--
Lower Yakima Valley UCC	NA	C	NA	--	--
Challen-West Jefferson	C	--	--	--	--
Grant County UCC	NA	--	--	--	--
Kitsap County UCC	C	--	--	--	--
West Virginia					
Miss Utility of West Virginia	C	C	NA	C	C
Cable Protection Bureau	I	--	--	--	--

TABLE 9. **TYPE OF OPERATION OF ONE-CALL SYSTEM** (CONTINUED)

State and One-Call System	Year				
	1980	1981	1982*	1983	1984
Wisconsin					
Dane County One Call System	I	I	NA	I	--
Diggers Hotline	C	C	NA	C	C
Wyoming					
West Park UCC	C	C	NA	I	I
Call-In-Dig-In Safety Commission	NA	NA	NA	C	C
Freemont County UCC	C	C	NA	C	C
Central Wyoming UCC	C	C	NA	C	C
Sweetwater County UCC	C	C	NA	C	C
Carbon County UCC	C	C	NA	C	C
Albany County UCC	C	C	NA	C	C
Southeastern Wyoming UCC	C	C	NA	C	C
Converse County UCC	--	I	NA	I	I
D.C.					
Miss Utility -- SEE MARYLAND					

Source: ONE-CALL SYSTEMS DIRECTORY, issues for 1980-81, 1981-82, 1983-84, and 1984-85.

*No ONE-CALL SYSTEMS DIRECTORY was published for 1982-83.

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION**

State and One-Call System	Request Time
Alabama	
Miss All	48 hours
Arizona (state law: 2 days)	
Blue Stake (Phoenix)	2 working days
Blue Stake (Sierra Vista)	2 working days
Blue Stake (Cottonwood)	2 working days
Blue Stake (Prescott)	2 working days
Blue Stake (Tucson)	2 working days
Blue Stake (Flagstaff)	2 working days
Arkansas	
Arkansas One Call System	48 hours
California (state law: 48 hours)	
USA South	2 working days
USA North	2 working days
Colorado (state law: 2 days)	
Mesa County Buried Utilities Location Service	2 working days
Blue Stake	2 working days
Central Locating Unit	2 working days
Fort Collins-Loveland One Call	2 working days
Connecticut (state law: 2 days)	
Call Before You Dig	2 working days
Delaware (state law: 2-10 days)	
"Miss Utility" of Delmarva	2 working days

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION** (CONTINUED)

State and One-Call System	Request Time
Florida (state law: 2 days min.)	
"Call Candy"	2 working days
Call U.N.C.L.E.	2 working days
Underground Utilities Notification Center	2 working days
Call Before You Dig	24 hours
Georgia (state law: 3-10 days)	
Utilities Protection Center	3 working days
Idaho	
Palouse Empire UCC	24 hours
Utilities Underground Location Center	2 working days
Dig-Line	48 hours
Panhandle UCC	24 hours
Illinois (state law: 48 hours)	
J.U.L.I.E.	2 working days
Digger	2 working days
Indiana	
Indiana Underground Plant Protection Service	48 hours
Iowa	
Underground Plant Location Services	2 working days
Kansas	
Kansas One Call Center	48 hours
Kentucky	
BUD	48 hours

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION** (CONTINUED)

State and One-Call System	Request Time
Louisiana	
DOTTIE	48 hours
Maine (state law: 48 hours)	
Dig-Safe	48 hours
Maryland (state law: 48 hours)	
Miss Utility	2 working days
"Miss Utility" of Delmarva	2 working days
Massachusetts (state law: 72 hours)	
Dig-Safe	72 hours
Michigan (state law: 2 days)	
Miss Dig	2 working days
Mississippi	
Mississippi One Call Center	48 hours
Missouri (state law: 2 days)	
To Begin	48 hours
Montana (state law: 48 hours)	
No one-call systems currently operating in state	
Nebraska	
One Call Covers All	2 working days
Lincoln UCC	24 hours
Nevada	
USA North	2 working days

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION** (CONTINUED)

State and One-Call System	Request Time
New Hampshire (state law: 72 hours)	
Dig-Safe	72 hours
New Jersey (state law: 3-30 days)	
Garden State UPLS	3 days
New Mexico (state law: 48 hours)	
Blue Stake (Farmington)	24 hours
Blue Stake (Grants)	2 working days
Blue Stake (Albuquerque)	2 working days
Blue Stake (Gallup)	2 working days
Blue Stake (Santa Fe)	24 hours
Blue Stake (Las Vegas)	24 hours
Blue Stake (Zuni)	24 hours
Blue Stake (Roswell)	2 working days
New York (state law: 2-10 days)	
UCC of Rochester	2 working days
UFPO	2 working days
Underground ULS	2 working days
Underground UCC	2 working days
UCC (Long Island)	2 working days
North Carolina	
"ULOCO"	48 hours
North Dakota (state law: 3 days)	
No one-call systems currently operating in state	
Ohio (state law: 48 hours)	
Ohio Utilities Protection Service	2 working days
United UPS	NA

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION** (CONTINUED)

State and One-Call System	Request Time
Oklahoma (state law: 2-10 days)	
Oklahoma One-Call System	48 hours
Oregon	
Utilities Underground Location Center	2 working days
Wasco County UCC	24 hours
Linn Benton UCC	24 hours
Lane UCC	24 hours
Douglas UCC	24 hours
Josephine UCC	24 hours
Rouge Basin UCC	24 hours
Central Oregon CC	24 hours
Hoodriver UCC	24 hours
East Linn CC	24 hours
City of Dallas UCC	24 hours
Malheur UCC	24 hours
Klamath UCC	24 hours
North Lincoln County UCC	48 hours
South Lincoln County UCC	48 hours
Pennsylvania (state law: not less than 3 days)	
Pennsylvania One Call System	3 working days
Rhode Island (state law: 48 hours)	
Dig-Safe	48 hours
South Carolina (state law: 3-10 days)	
Palmetto ULS	3 working days
South Dakota (state law: 2 days)	
No one-call systems currently operating in state	

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION** (CONTINUED)

State and One-Call System	Request Time
Tennessee (state law: 3-10 days)	
One Call System of Tennessee	72 hours
Texas	
Texas One Call System	2 working days
One Call (Austin)	48 hours
Utah (state law: 2 days)	
Blue Stakes Center	48 hours
Vermont	
Dig-Safe	48 hours
Virginia (state law: 48 hours)	
Roanoke Valley ULS	2 working days
Miss Utility of Virginia	2 working days
Miss Utility	48 hours
"Miss Utility" of Delmarva	2 working days
Washington (state law: 2 days)	
Utilities ULC	2 working days
Grays Harbor & Pacific County UCC	2 working days
Cowlitz County UCC	2 working days
Clark County UCC	2 working days
Chelan-Douglas UCC	24 hours
Upper Yakima County UUC	2 working days
Klickitat-Skamania CC	2 working days
Walla Walla Area UCC	2 working days
Inland Empire UCC	2 working days
Palouse Empire UCC	24 hours

TABLE 10. **TIME DESIRED BETWEEN NOTIFICATION AND START OF EXCAVATION** (CONTINUED)

State and One-Call System	Request Time
West Virginia	
Miss Utility of West Virginia	3 working days
Wisconsin (state law: 3 days)	
Diggers Hotline	72 hours
Wyoming (state law: 2 days)	
West Park UCC	48 hours
Call-In-Dig-In Safety Commission	48 hours
Freemont County UCC	48 hours
Central Wyoming UCC	48 hours
Sweetwater County UCC	48 hours
Carbon County UCC	48 hours
Albany County UCC	48 hours
Southeastern Wyoming UCC	48 hours
Converse County UCC	48 hours
D.C. (district law: 2-10 days)	
Miss Utility	2 working days

Source: ONE-CALL SYSTEMS DIRECTORY, 1984-85.

The data for the variables INCALLS and ADBUD, and the information used to create the variable CALLPOP were obtained from the various one-call systems. Where the data for these variables were not available, the average over the available observations was used. CALLPOP was created by dividing INCALLS by the number of telephone operators employed by the one-call systems. ADBUD was put into 1982 constant dollars using the Producer Price Index for all commodities.

4.1.1.7 The Independent Variables: Year Variables - Completing the variables included in the incident level model are D1980, D1981, and D1982, dummy variables for the years 1980, 1981, and 1982 (the sample period), respectively. These three dummy variables are included in the model to capture the effect that the passage of time has had on the level of outside forces incidents. To avoid the "dummy variable trap," the variable, D1980, is not included in the estimated regression equation. The expectation for these variables is that the estimated coefficients of D1981 and D1982 will be both be negative and that of D1982 will be smaller than that of D1981. The rationale for this expectation is that over time the action of one-call systems and other forms of damage prevention engaged in by the gas distribution system operators in the sample (all of which, it should be remembered, are participants in one-call systems) should tend to generate a secular reduction in the level of excavation incidents, all other things equal.

4.1.2 The Regression Model

The regression model specified and estimated for this study was of the general form

$$OFIS(\lambda) = a + b_1X_1(\lambda) + \ldots + b_rX_r(\lambda) + c_1D_1 + \ldots + c_sD_s + e \qquad (1)$$

where $OFIS(\lambda)$, a transformation of the variable OFIS, is the dependent variable, $X_1(\lambda), \ldots, X_r(\lambda)$ are transformations of the non-dummy independent variables of the incident level model, $D_1, \ldots, D_s$ are the dummy variables, a, $b_1, \ldots, b_r$ and $c_1, \ldots, c_s$ are the regression coefficients, and e is error term of the regression model. The error term of the model is assumed to be normally distributed with mean zero and variance σ^2. The transformation used on the dependent and non-dummy independent variables was the Box-Cox Transformation.

This transformation takes the form

$$Z(\lambda) = \begin{cases} \dfrac{Z^{\lambda} - 1}{\lambda} & \text{if } \lambda \neq 0 \\ \ln Z & \text{if } \lambda = 0 \end{cases} \qquad (2)$$

where Z is the variable transformed and λ (lambda) is the transformation coefficient.[84] Changing the value of λ will, it should be noted, change the functional form of equation (1). When λ equals zero, for example, equation (1) will be log-linear; when it equals one, equation (1) will be linear. The value λ takes can be specified prior to estimation, if theory indicates what is appropriate, or determined during the estimation process.

The Box-Cox Transformation was used in the statistical modelling of incident levels for two reasons. First, preliminary estimation work indicated that the residuals of a standard linear regression model of incident levels estimated using ordinary least squares would be non-normal. Since the normality of the residuals is one of the basic underlying assumptions of classical linear regression, an alternative approach needed to be found. The use of the Box-Cox Transformation is one way in which the distribution of the residuals may be brought closer to normality.[85] The second reason for using the Box-Cox Transformation is that its use allows a model with a more flexible, less restrictive functional form to be estimated.

To obtain maximum likelihood estimates of the coefficients of the regression model, the following procedure was used. First, untransformed variables were transformed using a value for lambda chosen from a range of reasonable values. Then, a regression equation that includes the transformed variables was estimated with ordinary least squares and the log-likelihood function of the estimated equation was evaluated.[86] This process was

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[84] For more on the Box-Cox Transformation, see Box and Cox, or Zarembka, 1968.

[85] Zarembka, 1974, p. 87.

[86] For the log-likelihood function to be calculated, it is necessary that OFIS be strictly greater than zero (since ln(OFIS) must be evaluated for every observation in the sample). Consequently, where OFIS equalled zero in the sample, an arbitrarily small number, .00001, was added to it.

repeated with new values of lambda until a global maximum for the log-likelihood function was found.[87] The estimated coefficients of the equation where the log-likelihood function is maximized are the maximum likelihood estimates of the coefficients of the regression model.

4.2 ESTIMATION RESULTS

The estimated coefficients of the incident level regression model, their t-ratios, and selected summary regression statistics are presented in Table 11. Overall, the model appears to have performed well. The R^2 for the regression model was found to be .723, indicating a fairly good fit. The values of the adjusted R^2 (=.705) and the Barten's R^2 (=.706) indicate that the fit can still be considered to be good even after the degrees of freedom of the model and much of the statistical bias inherent in the R^2 and the adjusted R^2 are taken into account.[88] The F-statistic for the model, 38.522, is statistically significant at the 90 percent level, indicating that the joint hypothesis that all of the coefficients in the regression equation are equal to zero must be rejected.

The value of lambda at which the log-likelihood function achieved a maximum was .19. Using likelihood ratio tests,[89] this value was found to be significantly different from both zero (log-linear functional form)[90] and one (linear functional form) at the 90 percent level of confidence. Thus, the hypothesis that the appropriate functional form of the model is either log-linear or linear can be rejected.

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[87] The computer program used for this procedure was written in the matrix-oriented programming language, GAUSS™. The estimation was carried out on an IBM PC-AT.

[88] For more on Barten's R^2, see Barten.

[89] Zarembka, 1974, p. 86.

[90] To evaluate the log-likelihood function for $\lambda=0$ for use in the likelihood ratio test, all untransformed variables must be strictly positive (because a natural logarithmic transformation will be used). This requirement necessitated the addition of an arbitrarily small number, .00001, to ADBUD in the eight observations in the sample where this variable was equal to zero. No other independent variables required any modification. Prior modification of the untransformed dependent variable made modification for the calculation of the log-likelihood function for $\lambda=0$ unnecessary (see Footnote 86).

TABLE 11. ONE-CALL ESTIMATION RESULTS

(t-Statistics Given in Parenthesis)

Note: $VARIABLE(\lambda) = (VARIABLE^{\lambda} - 1)/\lambda$
λ = LAMBDA

Variable Category and Independent Variable	Dependent Variable: OFIS(λ)
CONSTANT	-1.309 (-.181)
Exposure Variables	
CONSTN(λ)	.642[a] (1.786)
PIPE(λ)	.595[a] (7.629)
POP(λ)	-.129 (-1.119)
State Damage Prevention Law Variables	
DLAW1	-1.899[a] (-2.131)
DLAW2	.502 (.564)
DLAW3	.946 (1.329)
Gas Company Variables	
DSIZE1	-1.488 (-.446)
DSIZE2	-.693 (-.262)
DSIZE3	-.974 (-.411)

TABLE 11. ONE-CALL ESTIMATION RESULTS (CONTINUED)

Variable Category and Independent Variable	Dependent Variable: OFIS(λ)
Gas Company Variables (Cont.)	
DSIZE4	.473 (.234)
DSIZE5	.534 (.333)
DGOVT	-.171 (-.272)
One-Call System Variables	
PAR(λ)	.421[b] (2.242)
RTIME(λ)	.305 (.309)
INCALLS(λ)	-.074[a] (-1.464)
ADBUD(λ)	-.110[a] (-2.606)
CALLPOP(λ)	.102 (.846)
DOPTYPE	.263 (.472)
DSCOVER2	-2.564[b] (-3.616)
DSCOVER3	2.043[b] (2.071)
DNEWSYS	-1.031 (-.768)
Year Variables	
D1981	-1.490[a] (-2.860)

TABLE 11. **ONE-CALL ESTIMATION RESULTS** (CONTINUED)

Variable Category and Independent Variable	Dependent Variable: OFIS(λ)
Year Variables (Cont.)	
D1982	-.342 (-.612)
Transformation Coefficient	
LAMBDA	.19[c]
Summary Statistics	
F-Statistic	38.522[d]
R^2	.723
Adjusted R^2	.705
Barten's R^2	.706
Number of Observations	363
Degrees of Freedom	339

[a]Significantly different from zero at the 90% level of confidence (using one-tailed t-test).

[b]Significantly different from zero at the 90% level of confidence (using two-tailed t-test).

[c]Significantly different from zero (log-log model specification) and from one (linear model specification) at 90% level of confidence (using likelihood ratio test).

[d]Significant at the 90% level of confidence (using F-test).

4.2.1 The Coefficients of the Model

As can be seen in Table 11, nine of the variable coefficients proved to be significant at the 90 percent level of confidence. The others, including the intercept term, proved not to be statistically significant.

4.2.1.1 The Exposure Coefficients -- The coefficients of the exposure variables, CONSTN(λ) and PIPE(λ), were found to be statistically significant at the 90 percent confidence level using a one-tail t-test. The signs of both coefficients, as expected, were positive, indicating that, as construction or gas system pipeline mileage increases, the number of outside forces incidents experienced by the gas distribution system members of one-call systems increases. The coefficient of the exposure variable, POP(λ), did not prove to be statistically different from zero, implying that population by itself does not impact gas distribution system outside forces incident levels.

4.2.1.2 The State Damage Prevention Law Coefficients -- The coefficient of only one state law variable, DLAW1, proved to be significant at the 90 percent level of confidence. The coefficients on DLAW2 and DLAW3, the other two state law dummy variables in the model, were not found to be significant. The sign on the DLAW1 coefficient, as expected, was negative, confirming the prior hypothesis about the impact of the variable, DLAW1, on the level of gas distribution system outside forces incidents.

The statistical significance and negative sign of the estimated coefficient of the state law dummy, DLAW1, would seem to indicate that the promulgation of state damage prevention laws might be one way to bring about a decrease in the level of excavation damage occurring to gas distribution systems participating in one-call systems, and probably in that occurring to other system participants and many, if not most, non-participants, as well. This, of course would only lead to an improvement of the situation in states that do not already have damage prevention laws. As of 1985, there were eighteen states without underground damage prevention laws or regulations.[91]

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[91] These states are Alabama, Alaska, Arizona, Arkansas, Hawaii, Idaho, Indiana, Iowa, Kansas, Kentucky, Minnesota, Mississippi, Nebraska, Nevada, Oregon, Texas, Vermont, and West Virginia. Three of these (Alaska, Hawaii, and Minnesota) do not have any one-call systems in operation within the state.

The total decrease in outside forces incidents that might result if all of these states enacted damage prevention laws could be fairly substantial.

The lack of statistical significance of the coefficients of DLAW2 and DLAW3 is of considerable import since it indicates that these variables have little impact on the level of outside forces incidents occurring to gas distribution systems participating in one-call systems. This finding would seem to imply that there is low incremental value to state legal requirements that underground operators must respond to all excavation notices or must participate in one-call systems. It should be noted that mandatory one-call participation may be a good way to get one-call coverage for areas or firms whose facilities are not presently covered by a system.

4.2.1.3 The Gas Company Coefficients -- As can be seen in Table 11, none of the coefficients of the gas company variables in the model proved to be statistically significant at the 90 percent level of confidence. This means that gas system size does not appear to impact the level of gas system incidents in a way not already accounted for by the exposure variables in the model. It also means that government ownership/operation of a gas system will, all other things equal, have neither an adverse nor a propitious effect on incident levels.

4.2.1.4 The One-Call System Coefficients -- The estimated coefficients of five of the one-call system variables included in the model proved to be statistically significant at the 90 percent level of confidence. These were the coefficients of the variables, PAR(λ), INCALLS(λ), ADBUD(λ), DSCOVER2, and DSCOVER3. The estimated coefficients of RTIME(λ), CALLPOP(λ), DOPTYPE, and DNEWSYS, the other four one-call variables in the model, were not found to be statistically significant. The signs on the regression coefficients of INCALLS(λ) and ADBUD(λ) were negative, as expected. There were no prior hypotheses, it should be recalled, for the coefficients of PAR(λ), DSCOVER2, and DSCOVER3, the other three one-call variables with statistically significant coefficients.

The sign of the estimated coefficient of PAR(λ) proved to be positive. This seems to indicate that, of the two processes influencing the relationship

between the number of one-call participants and gas distribution system incident levels, which might be referred to as the "improved coordination" and the "pervasive problem" processes, the "pervasive problem" process dominates, at least in the sample under consideration in this study.

Given the estimation results for the coefficients of the one-call variables, ADBUD(λ), DSCOVER2, and DSCOVER3, it appears that one-call systems can use their level of advertising and promotion, and type of coverage to actively improve the outside forces damage situation within their service regions.

The negative sign on the coefficient of the variable ADBUD(λ) means, of course, that increasing the amount spent on advertising and promotion by one-call systems can be expected to decrease the level of incidents experienced by their member gas distribution systems, and probably by their other member operators, as well. Thus, by expanding their advertising and promotion (and thereby getting their message about their service and its benefits to a wider audience) one-call systems can generate an improved safety environment for their members. Of course, at some point the incremental decrease in incidents will cease to justify additional advertising expenditures. Where this point is reached will depend on a number of conditions and will probably vary from one-call system to one-call system.

The signs on the coefficient estimates obtained for DSCOVER2 and DSCOVER3 indicate that, all other things equal, the gas distribution system operators with the best performance (i.e., the lowest levels of outside forces incidents) belong to non-statewide one-call systems operating in states with complete one-call coverage. The next best are those belonging to systems providing statewide coverage. The worst are those participating in systems operating in states with incomplete one-call coverage. The reason that these gas system operators have the worst performance may result from operating inefficiencies inherent in the operation of the often quite small one-call systems in which they participate. In comparing the performance of gas distribution system operators participating in non-statewide one-call systems operating in states where all areas have one-call service with that of operators participating in statewide one-call systems, the better performance of the former can probably be attributed,

at least in part, to the fact that the non-statewide systems will generally be providing service more attuned to local conditions and needs (because they are, after all, more local in nature) than statewide systems can be expected to provide. The non-statewide systems operating in states with complete one-call coverage seem to be larger and more organized than the systems in states with incomplete coverage, and as a consequence, they are probably able to avoid most of the operating inefficiencies the smaller, less organized systems experience.

The trend in recent years has been the formation of statewide one-call systems. It is expected that this trend will continue in the future.[92] While non-statewide systems in states with statewide coverage, it appears, have lower incident levels, it is possible that structures could be set up and procedures established that would give statewide systems more local input and thereby bring them closer to the situation existing in non-statewide systems operating in states that have no areas not serviced by a one-call system. In particular, systems might set up local underground coordinating committees throughout their service regions (or formally incorporate those that already exist into the one-call process) to better enable them to keep an eye on local conditions and needs, and to facilitate contact and coordination between and among local excavation contractors, underground operators, and the system. The result should be improved participant performance.

The estimated coefficients of the variables RTIME(λ), CALLPOP(λ), and DOPTYPE, as mentioned before, were not found to be statistically different from zero. This means, of course, that the three variables, which are, in the main, under the control of the one-call systems, do not impact the level of gas distribution system outside forces incidents. This finding is quite significant, since it implies that one-call systems have flexibility in their choice of request time (constrained, of course, by the requirments of state law), telephone operator staff size, and type of system operation (in-house or contract).

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[92]General Discussion, Session #9, "Imaginuity: Solving Your One-Call Problems," 9th Annual One-Call Symposium, Chicago, 1984.

4.2.1.5 The Year Coefficients -- Of the two year variables included in the model, only one, D1981, was found to have a statistically significant coefficient; the other, D1982, was not. The negative sign on the estimated coefficient of D1981 was in accord with prior expectations. However, since the coefficient on D1982 was not statistically different from zero, the hypothesized downward secular trend in gas system outside forces incidents was not demonstrated by the model.

4.2.2 Elasticity Estimates

Table 12 contains estimated gas distribution system incident elasticities for the non-dummy variables in the incident level model. To facilitate interpretation, these elasticities have been calculated in terms of the untransformed form of the variables. An elasticity is defined to be the percentage change in the dependent variable that could be expected to result from a one percent change in an explanatory variable. From a policy point of view, given the impetus for this study, undoubtedly the most important elasticity reported in Table 12 is that of ADBUD. The elasticity estimate, -.23, indicates that one-call systems can expect a decrease in gas distribution system incidents of a little over .2 percent for every one percent increase (in real terms) in advertising and promotional expenditures. Conversely, a one percent decrease in advertising can be expected to result in around a .2 percent increase in incidents. Thus, system operators should consider very carefully when contemplating a decrease in their advertising budget.

TABLE 12. **ESTIMATED GAS DISTRIBUTION INCIDENT ELASTICITIES**
(Evaluated at Variable Means)

Variable Category and Independent Variable	Dependent Variable: OFIS
Exposure Variables	
CONSTN	0.29
PIPE	0.96
POP	0.00
One-Call System Variables	
PAR	0.33
RTIME	0.00
INCALLS	-0.23
ADBUD	-0.23
CALLPOP	0.00

Note: (1) An elasticity is the percentage change in the dependent variable resulting from a one percent change in an independent variable.

(2) The elasticities presented in this table have been evaluated for the untransformed variables.

(3) Elasticities are presented in this table only for the non-dummy variables in the estimated incident level equation. Dummy variable elasticities are not reported because they have no meaning.

5. SUMMARY AND CONCLUSIONS

This report has examined both the nature of outside forces damage, the most important cause of U.S. gas pipeline incidents, and the efforts that have been made by government and industry to control it. To help develop a fuller understanding of outside forces damage and the impact of damage programs, such as one-call systems, on it, a statistical model of the level of outside forces incidents faced by gas distribution system operators participating in one-call systems was specified and statistically estimated.

The statistical model developed for this study was estimated using gas system and one-call data for the years 1980 through 1982. The sample used in the estimation consisted of 363 observations on gas distribution system operators operating in 26 states and participating in 41 one-call systems and system "overlaps." The model used in the estimation included variables representing all of the major factors that influence outside forces incidents. In addition to regression coefficients, elasticity estimates were developed in the analysis for the non-dummy variables of the model. These estimates indicate the percentage change in the dependent variable of the regression model (or a transformation thereof) that would be expected to result from a one percent change in an independent variable.

A number of findings came out of the statistical modelling of the incident levels of gas distribution system operators belonging to one-call systems. Principal among these findings are (1) the level of gas distribution system incidents is affected by the level of construction and by gas system pipeline mileage, as would be expected, (2) the presence of a state damage prevention law affects the level of incidents, but state requirements that operators respond to all excavation notices and participate in one-call systems do not, (3) government owned/operated gas distribution systems do not differ in performance from non-government systems, (4) neither in-house one-call operations nor contract one-call operations are superior to the other in controlling incidents, (5) the level of advertising engaged in by a one-call system affects the level of its gas system participants' outside forces incidents (a one percent increase in advertising expenditures

can be expected to yield around a .2 percent decrease in gas system incident levels), (6) neither a system operator's request time nor its average number of incoming calls per telephone operator affect the level of gas distribution system incidents, and (7) the type of coverage provided by a one-call system affects the level of gas system incidents.

APPENDIX A

FINAL RULE, "TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: DAMAGE PREVENTION PROGRAM," 49 CFR 192, DOCKET NO. PS-59

49 CFR Part 192

[Amdt. No. 192-40; Docket No. PS-89]

Transportation of Natural and Other Gas by Pipeline; Damage Prevention Program

AGENCY: Materials Transportation Bureau (MTB), Research and Special Programs Administration, DOT.

ACTION: Final rule.

SUMMARY: This final rule implements section 3(a)(2) of the Natural Gas Pipeline Safety Act of 1968 (49 U.S.C. 1672(a)(2)) by requiring gas pipeline operators to have or participate in a damage prevention program to reduce the risk of excavation damage to buried pipelines in populated areas. Excavation damage is the leading cause of gas pipeline accidents.

DATE: This final rule becomes effective April 1, 1983. The delayed effective date will permit operators time to prepare for compliance by participating in programs

already in existence or to begin their own programs.

FOR FURTHER INFORMATION CONTACT: Ralph T. Simmons, 202-426-2392. Copies of the final rule and documents related thereto may be obtained from the Dockets Branch, Room 8426, Materials Transportation Bureau, U.S. Department of Transportation, 400 7th Street, SW., Washington, D.C. 20590.

SUPPLEMENTARY INFORMATION:

Background

To reduce the risk of excavation damage to underground gas pipelines, the leading cause of pipeline accidents, MTB issued a Notice of Proposed Rulemaking (NPRM) (44 FR 65792; November 15, 1979) proposing to amend Part 192 by adding a new § 192.614 to require each operator of a buried gas pipeline in populated areas to establish and carry out, or otherwise participate in, a damage prevention program. Modeled after successful "one-call" programs, the NPRM set forth criteria that an operator's program would have to meet, including public notice, receipt of calls about pending excavation, and prompt response in locating and marking pipelines. The proposed rule was the initial step in complying with section 3(a)(2) of the NGPSA (49 U.S.C. 1672(a)(2)) that requires the issuance of this final rule.

Interested persons were given until February 15, 1980, to comment on the proposed amendment. One hundred and one different persons submitted comments. The comments were from gas utilities and gas transmission companies, their trade associations, State and Federal agencies, industry standard-making bodies, and consultant firms to the gas industry. Also, several comments were received from one-call systems.

In accordance with Section 4 of the NGPSA (49 U.S.C. 1673), the Technical Pipeline Safety Standards Committee (TPSSC) met in Washington, D.C., on April 15-17, 1980, to review the technical feasibility, reasonableness, and practicability of the amendment proposed in the NPRM. In general, the TPSSC favored the proposed rule, but suggested a number of modifications. A copy of the Committee's report is available in the docket. A discussion of any rejection of the views of the TPSSC is given below in the discussion of the sections of the final rule involved.

Cost Impact

The final rule is non-major under Executive Order 12291. The Order defines a major rule as one which has an annual effect on the economy of $100 million, a major increase in costs, or a significant adverse effect on the economy. As shown by the cost benefit analysis for this proceeding, this final rule will have no such impact. The final rule is also not a significant rule as defined by the Department of Transportation Policies and Procedures (DOT Order 2100.5).

The Regulatory Flexibility Act (94 Stat. 1164, 5 U.S.C. 601) requires a review of a proposed regulation issued after January 1, 1981, for its effect on small businesses, organizations, and governmental bodies. Although in this case a notice of proposed rulemaking was issued prior to January 1, 1981, the effect on the segments of the public covered by the Regulatory Flexibility Act has been assessed. These regulations will not have a significant economic impact on such small businesses or organizations because they have been excepted from the final rule. While small government bodies who operate pipelines are not excepted from the final rule, it will not have a significant impact on them because a large number of them are already covered by one-call systems. Also the cost to small municipalities will not be great because the charge for participating in one-call systems is based upon the miles of pipelines owned by the operator or the number of services; plus many of the small operators are often given a cost discount as an inducement to join to prevent any gaps from occurring in the system. Furthermore, a municipality which requires a permit for excavation activities may use its permit procedures with little additional modification to meet the requirements of § 192.614.

It is therefore certified, pursuant to section 605(b) of the Regulatory Flexibility Act, that this regulation will not have a significant economic impact on a substantial number of small entities.

Effect on State Laws

In accordance with section 3(a) of the NGPSA (49 U.S.C. 1672(a)(1)), any State may adopt additional or more stringent safety standards for damage prevention programs and linemarkers with respect to intrastate pipeline transportation as are not incompatible with the standards being established by this amendment to Part 192. However, States may not adopt or continue in force any such standards applicable to interstate transmission facilities. Therefore, any State standards governing damage prevention programs or linemarkers for intrastate pipeline transportation that meet the compatibility test of section 3(a) will not be preempted by the new Federal standards.

Under section 5 of the NGPSA (49 U.S.C. 1674), the safety standards issued under the NGPSA generally may not be enforced by MTB against intrastate pipeline transportation in a State in which a State agency submits an annual certification stating, among other things, that it has adopted and is enforcing such standards under State law. Newly issued Federal standards that apply to intrastate pipeline transportation are enforceable by MTB under the NGPSA until a State agency adopts those standards under State law and submits another annual certification. In the case of the new damage prevention program standards, however, section 101(c) of the Pipeline Safety Act of 1979 (49 U.S.C. 1672 note) provides that the new standards "shall not apply with respect to annual certifications under section 5 during the 2-year period which begins on the effective date of such requirements." This provision allows State agencies that do not have compatible damage prevention program standards additional time they may need to adopt and enforce the new Federal standards, while continuing to participate in the certification and grant-in-aid program under section 5 with respect to the other Federal gas pipeline safety standards. In States that take advantage of this provision, the result will be to extend for up to 2 years the period within which the new Federal damage prevention program standards are enforceable by MTB with respect to intrastate pipeline transportation that is subject to the jurisdiction of those certified State agencies.

General Comments on Proposed § 192.614

1. Eighty commenters stated that to burden pipeline operators instead of excavators with regulations designed to prevent excavation damage is inequitable and results in increased cost of transportation at a questionable increase in public safety. Although it is true that by this rule MTB is requiring pipeline companies to shoulder the costs of damage prevention, while perpetrators of damage pay nothing above their liability for damages, society does expect these pipeline companies, as transporters of hazardous commodities, to take every reasonable precaution against harm to the public, regardless of the cause. This societal objective is expressed in section 3(a)(2) of the NGPSA, which requires any operator of gas pipeline facilities to participate in a damage prevention program which the Secretary determines

is being carried out in a manner adequate to assure protection; or to take steps as the Secretary shall prescribe to provide services which are comparable. Furthermore, this policy is supported by studies cited in the NPRM showing that damage prevention programs are the best way to minimize harm from excavation damage. For example, the National Transportation Safety Board has, on the basis of accident investigation and special studies, identified a direct relationship between effective excavation damage prevention programs and low excavation damage rates. In addition, as set forth in the cost/benefit study for this final rule, the program benefits to the industry as a whole outweigh the costs. For example, a reduction in excavation damage to an operator's pipeline would result in benefits to the operator by reducing the cost of repairing the damage, loss of service to his customers, and by savings in the gas which would be lost if a rupture occurs as a result of the damage. Moreover, there are societal benefits that result from fewer injuries and deaths. Because of the duty operators must meet to prevent harm to the public and because these "one-call" programs have proven themselves cost effective, MTB does not agree that the operator responsibility imposed by this rulemaking is inequitable.

2. Thirty commenters recommended that MTB continue to encourage States to enact legislation placing the burden of conducting a damage prevention program on both utility operators and excavators. MTB's efforts to encourage States to enact legislation were discussed fully in the NPRM, and the results of those efforts were shown to have been mixed and inconsistent. Furthermore, because participation in an acceptable State-sanctioned or State-operated program can satisfy the requirements of the new rule, there should be a sufficient incentive for operators to lobby the States to enact appropriate legislation.

3. Four transmission companies and two trade associations argued that unlike distribution companies, transmission systems and gas gathering lines should not be required to have damage prevention programs, because they have relatively small amounts of pipeline in Class 3 or 4 areas. Moreover, they noted that the bulk of their Class 3 piping occurs where transmission lines pass an inhabited building or recreation center located in an otherwise rural area, as defined by § 192.5(d)(2), and it would be impractical to run separate programs for these segments. Similarly, the TPSSC objected to applying the proposed damage prevention program to segments of transmission pipelines in a Class 3 location solely by application of § 192.5(d)(2).

MTB recognizes the unique situation of operators who have short segments of their pipelines placed in Class 3 locations by application of the requirements of § 192.5(d)(2). In addition to transmission lines and gathering lines, there may also be distribution mains that fall into this situation. It would be impractical for an operator to develop and run or participate in a damage prevention program specifically for each short segment of its pipeline in rural areas which is in a Class 3 location as defined by § 192.5(d)(2). In addition, a program run just for these Class 3 areas would be of little benefit because of low population and excavation activity. Therefore, the final rule excepts segments of pipelines placed in Class 3 locations solely by application of the requirements of § 192.5(d)(2), provided the pipeline is marked in that Class 3 area in accordance with § 192.707.

Except as just discussed, MTB is of the opinion that it is just as necessary for transmission and gathering line systems in populated Class 3 and 4 areas to have a damage prevention program as it is for a distribution system. While the fewer number of transmission and gathering lines in these areas compared to distribution lines obviously has resulted in fewer accidents, excavation damage to these lines in populated areas would result in the public being placed at just as great a risk as it would be if the same damage occurred to a distribution pipeline. In fact, for transmission lines, the risk could be greater because they are normally larger pipelines and operate at much higher pressures than distribution pipelines. Also, it does not appear logical to require that a distribution main, which may traverse the same area as a transmission or gathering pipeline, meet the requirements of the damage prevention regulation and not require a transmission or gathering line in the same area and carrying the same product to meet the same requirement.

4. Thirty-seven commenters argued that the proposed rule was too specific and that any final rule should be written in performance language. The final rule has been written in performance language.

Operator controlled rights-of-way

In the preamble to the NPRM, MTB invited comments on the extent to which the proposed requirements should apply to systems whose operators own or have control over the property traversed by the pipelines. These operators generally are municipalities and persons who transport gas in conjunction with renting property, such as managers of mobile home parks or public housing projects and operators whose pipeline facilities are enclosed by physical barriers restricting public access to such facilities.

There were eleven comments received on this topic. Five of the commenters stated that all operators should be covered by the proposed rule, unless they have absolute control of access to the rights-of-way and can prevent any excavation on the property without their knowledge. They reasoned that mobile home parks are often small cities with uncontrolled public rights-of-way, and that since municipally-owned systems utilize the same methods as private companies for the location of their facilities (e.g., easements or streets and rights-of-way dedicated to public use), it would not be any more appropriate to except them than privately-owned systems. These commenters also argued that managers of mobile home parks and municipalities generally have minimal damage prevention programs; therefore, it would lessen the effectiveness of the final rules to except them from coverage.

Another commenter reiterated support for "control of access" being a basis for exception by stating that a mobile home park owner or housing project manager who can control access to his property should also be able to control excavation activities.

Several other commenters stated that all municipally-owned systems exceeding a minimum threshold of customers should be required to have a damage prevention program, while those under the minimum should be excepted from coverage. The commenters did not give the number of customers for the threshold or a rationale for the comment.

Additionally, one trade association commented that all liquefied petroleum gas (LP-Gas) operators should be excepted from coverage because it is inconceivable that any excavation work could take place without the knowledge of the LP-Gas dealer and/or the property owner. Additionally, the association said that LP-Gas systems are regularly serviced by LP-Gas truck drivers/delivery men, providing an opportunity for detection of excavation activity, and that above ground tanks or underground tank domes are visible remainders of the presence of gas lines.

MTB is aware that many segments of all types of gas pipelines and pipeline facilities in Class 3 or 4 locations are contained within physical barriers which restrict public access to the

pipelines or facilities. Such restricted access lessens the chance of excavation damage because the operator would know of any excavation activity within the barriers and would take steps to protect the gas pipeline and facilities. The final rule, therefore, excepts pipelines to which access is physically controlled by the operator.

MTB is not persuaded that an operator's control over its right-of-way short of physical control of access is sufficient reason to except pipeline facilities from the damage prevention program. Without physical control of entry, mere ownership of a right-of-way is not a sufficient deterrent to excavation damage since it is too easy for excavation to occur without the operator's knowledge, making it even less likely that an operator would voluntarily mark the pipelines near a planned excavation. Thus, no further exceptions than physical control of right-of-way, as discussed above, are adopted in this final rule.

Similarly, even though a municipality may control excavation activity on its rights-of-way within its jurisdiction through permits or licensing procedures, MTB does not have any information which shows that this exercise of control by the municipalities has resulted in a lessening of damage to pipelines by excavation activities. As proposed in the NPRM, MTB has made municipally-owned facilities subject to the final rule.

Although a strong argument can be made in support of including LP-Gas and master meter systems in the final rule, MTB does not now have sufficient statistical data to clearly demonstrate that a certain number of incidents caused by outside force damage will be prevented by applying the final rule to LP-Gas and master meter systems.

In the future, if adequate statistical data is available to clearly demonstrate the value of the benefits of requiring LP-Gas and master meter systems to have a damage prevention program, MTB will reconsider requiring them to have a damage prevention program at that time. In the meantime, MTB chooses not to impose on LP-Gas and master meter systems, a requirement which is of unproven value, and these systems are excepted from compliance as set forth in § 192.614(c)(4).

The following portion of this preamble discusses specific sections of the proposed rule that received significant comment.

Section 192.614(a)—Definition of "Excavation Activity"

One commenter recommended expanding the definition of "excavation activity" to mean: "Any operation in which any structure, earth, rock, or other mass of material in or on ground is moved, including without limitation, wrecking, razing, grading, trenching, digging, ditching, drilling, augering, tunneling, scraping, cable plowing, rock plowing, and pile driving activity."

MTB believes the definition of "excavation activity," as given in less detail in the NPRM, is broad enough to cover all the earth-moving activities that can reasonably be expected to cause damage to a pipeline. Therefore, MTB has not adopted the commenter's recommendation for the final rule. However, for emphasis, the final rule does include in the definition the removal of above ground structures.

Section 192.614(b)(1)—Identification of Excavators

Fifty-one commenters thought that the term "semiannually" should be changed to "annually" with respect to how often an operator must determine who in an area is engaging in excavation activities. The reasons given were: Impossible to do semiannually because of the numerous number of contractors involved; the requirement is excessive; most one-call systems and operators' programs now do it once a year; there would not be any greater benefit from doing it semiannually, but it would increase the cost; and the mobility of the contractors make it impossible to keep track of them.

Six commenters asked that the proposed determination requirement be deleted.

MTB agrees that to require semiannual determination of the names of persons who are normally engaged in excavation or demolition would be excessive. The mobility of the people engaged in such operations would make compiling and keeping up-to-date such a list a monumental and expensive task in larger metropolitan areas. Furthermore, MTB believes that if an operator has or participates in a program which includes the features of notifying the excavation and demolition industry and the general public in the operator's Class 3 and 4 areas of operations of the program's existence, advising them how to get information from the program, and encouraging them to participate, that the large majority of persons engaged in excavation or demolition activities will become aware of the program and participate.

MTB does not agree with the commenters who recommended that the proposed § 192.614(b)(1) be deleted. If a program of informing a certain segment of the public is to be successful, the informer must be able to identify those who are to be informed. For this reason, MTB believes that it is necessary for each operator to determine who is most likely to engage in activities that may cause damage to pipelines so that information concerning the damage prevention program may be sent to them directly.

Also, the Gas Research Institute study, "Prevention of Third Party Damage to Gas Pipelines Final Report for 1980", on page 41 states: The five major utilities, their employees and their subcontractors account for well over 50 percent of the damage incidents. * * * When the associated road construction and general construction damage incidents are included * * * well over three-fourths of the damages are caused by personnel who are professionally and regularly involved in excavation activities on or near * * * the utility trenches." Given the above, it follows that the majority of the outside force damage to gas pipelines is done by a well defined group of professionals which is readily identifiable and once identified should remain fairly constant. Thus, after the initial identification process, it should be relatively simple to keep a current list of excavators for any given area.

Therefore, MTB has amended the proposal in the final rule (§ 192.614(b)(1)) to permit the operator more flexibility of action in determining those persons who are normally engaged in excavation activities in his Class 3 and 4 area of operation. In the final rule, a period for updating lists of excavators is not prescribed. Rather, an operator will have to make an initial determination, and then keep the findings current.

Section 192.614(b)(2)—Notification of damage prevention program

Fifty-two commenters opposed the proposed requirement that excavators be notified of the damage prevention program by newspaper ads and direct mailings. Their reasons were that the proposal was restrictive in that it would not allow the operator to pick the best method for his operation; that most notices would be lost in large city newspapers and newspaper ads are expensive; that most of the damage is done by fly-by-night contractors, and newspaper ads would not reach them; and that the ads would probably be ineffective because of the mobility of excavators and much of the work being done by out-of-towners.

Two commenters stated that the proposal was vague, inasmuch as the required content of the notice was not furnished. They also said a required

program is unnecessary since posted signs and public records provide notice to the excavators of the location of the pipeline.

In addition, commenters objected to the proposed semiannual notification of excavators and the public as too inflexible.

MTB agrees with the commenters' statement that the proposal as written may have been too restrictive and would not have allowed the flexibility necessary for operators to develop information programs that would promote the desired response. MTB also concurs that newspaper ads could be expensive, and might not produce the desired response from the public or would not provide the reinforcement of the message that other, more permanent types of notification might. MTB also agrees that the transient nature of the excavation industry makes it unlikely that some members would be aware of notices or ads placed in local newspapers. In consideration of these factors, MTB has modified the proposal in the final rule (§ 192.614(b)(2)) to require that the public be notified of the program functions and that known excavators be given actual notice of the program. Operators may use any methods of notification that are designed to achieve the desired results in their Class 3 and 4 areas of operation. The frequency of notification would be based on the extent to which excavators and the public are aware of the program. As awareness increases, as judged by participation, fewer notices could be given.

MTB does not agree with the commenters who stated that the proposal was vague because it did not contain the required content of the notice. If MTB were to spell out the specific wording a notice must contain, the final rule would be too rigid, inasmuch as different wording may be desirable in different locations and sections of the country because of the types of operations being performed and methods of informing the public which may be available to the operator. Furthermore, to specify the wording the notice must contain would not be in keeping with MTB's objective of writing this final rule in performance language.

MTB does not agree with the statement that posted signs and public records provide sufficient notice to the excavator of the location of the pipeline. This has not proven true in the past, and MTB does not have any indications to the effect that posted signs and public records will prove to be any more effective in the future. While a sign may alert an excavator to the presence of a pipeline, it normally does not mark the location as precisely as temporary marking in a "one-call" program. Also, public records such as permits, licenses, and right-of-way information will not provide the precise location with the necessary reliability for an excavator's use to prevent accidental damage to a pipeline. For these reasons, the commenters' recommendations were not adopted for the final rule.

Section 192.614(b)(4) (i), and (ii) (A) and (B)—Providing information

There were thirty-six commenters who opposed the proposed requirements of § 192.614(b)(4)(i) that callers be told immediately if there are pipelines in the area of plannned excavation. The reasons for their opposition were that most one-call systems do not have the capability of furnishing the required information, and to impose such requirements would destroy the one-call systems as they are presently constituted; that it is not feasible to expect that the one-call systems could maintain current records of the utility location in their area; and that no responsible operator would accept the responsibility of permitting third parties to give out facility locations because of the possible liability involved.

Seventy-two commenters were opposed to the proposed requirements of § 192.614(b)(4)(ii)(A) regarding the details about a pipeline to be given to callers. Their arguments were that most of the details would not be available to the person receiving the call; that providing the required information at the first call would encourage excavators to begin work without waiting for field marking; and that giving the pressure in the pipeline could mislead excavators to believe that damage to a low pressure line is not as hazardous as damage to a high pressure line.

Thirteen commenters opposed § 192.614(b)(4)(ii)(B), as proposed, regarding telling callers the type and time of marking to be provided. Their reason was that the surface at the work site determines the markings to be used, and the surface(s) involved could not be determined by telephone.

After review of the comments received and further investigation of the issues in § 192.614(b)(4) (i) through (ii)(B), MTB agrees with the commenters that it would not be appropriate to require that detailed information about pipeline location, characteristics, and type or time of marking be given out upon receipt of notice of planned excavation. Indeed, giving details about pipelines upon receipt of notice could be counterproductive for public safety. However, since comments on this section opposed basically the time at which information is given to excavators and not the giving of information, MTB still believes that persons planning to engage in excavation activities should be told before such activities begin whether there are pipelines in the area and if so, the type of temporary marking that is to be provided and when the marking will be completed. Giving out this information early in the process should deter excavators from forging ahead with the work should they feel a "one-call" system has not been responsive to their calls. Therefore, MTB has incorporated in the new § 192.614(b)(4) these notification provisions of paragraph (b)(4) of the NPRM, but revised them to permit the information to be given at some time after notice of excavation is received.

Section 192.614(b)(5)(i)—Temporarily Marking Pipelines

Two commenters stated that strict compliance with the proposed requirement to mark pipelines before excavation begins would be impossible as the operator has no control over when work commences.

MTB does not wholly agree with the commenters' statement. True, the operator has no control over when work commences, but a main purpose of the damage prevention program is to facilitate preconstruction cooperation and planning between the operator and excavators. MTB believes that a well planned and operated damage prevention program will facilitate preconstruction communication between parties, thereby reducing the chance that excavation activities will commence before the pipelines in the area of the proposed activities are properly located and marked or that marking of pipelines would be too far in advance of excavation.

The proposal in subparagraph (b)(5)(i) of the NPRM has been modified in the final rule, however, by qualifying the intent that marking be done before excavation begins with the words "as far as practical." This change recognizes that operators may not in every instance be able to complete marketing prior to the beginning of excavation activities because of the vagaries of persons doing the excavation.

Section 192.614(b)(5)(ii)—Inspection requirements

1. Sixty-one commenters were opposed to the proposal to inspect pipelines during and after excavation activities. Their reasons were that field inspections of all pipeline excavations during and after excavation is unnecessary, unrealistic, and

economically unfeasible; the operator should be allowed to determine which excavation should be inspected based upon his experience as to the probability of damage occurring; the support of the pipeline is a factor in only a small number of cases; it is the excavator's responsibility to notify the operator of any damage caused by his activities; and the proposal would place the burden of liability on the operator and not on the excavator where it belongs.

Many said that inspection would be excessively expensive. One commenter estimated it would cost his company over 4 million dollars a year to comply; another estimated cost at three million dollars a year, and several estimated their cost would be from two million to three million dollars a year.

Five commenters were opposed on the basis that inspection of the pipeline should continue to be the responsibility of the excavator as currently required by the Occupational Safety and Health Administration under 29 CFR Part 1926, Subpart P, section 651(a).

After reviewing the comments made on the proposed requirements of subparagraph (b)(5)(ii), MTB believes that most of the commenters interpreted the proposal to mean that an inspector must be on the job site at all times that excavation activities are taking place. This was not MTB's intent. MTB's intent was to require inspection during and after excavation activities to the extent that is necessary to verify the integrity of the pipeline.

MTB recognizes the responsibility of the excavator to notify the operator of any damage he may cause to the pipeline. MTB's concern is that the pipeline may have its coating damaged and its cathodic protection interfered with in such a manner that it would negate the protection afforded the pipeline. Also small dents, scratches, or gouges could occur or its support be undermined so that excessive stress could be set up in the pipeline that could cause failure at a later date. These causes of failure may not be recognized and reported by even the most conscientious excavator as being significant enough to be reported to the operator; therefore, inspection of the pipeline is necessary. This is shown in the following examples. The National Transportation Safety Board's special study, "Prevention of Damage to Pipelines" Report Number: NTSB–PSS–73–1) states that a 2-inch high-pressure gas main, which was apparently damaged during sewer construction several months before the accident, leaked gas and caused an explosion completely destroying a house, killing a mother and two children, and injuring seven other children.

The study further quotes a Prince Georges County, Maryland, ad hoc committee as stating that "* * * statistics show that hits still seem to occur at an alarming rate after lines have been located and marked prior to digging. This would indicate that contractors and subcontractors must assume a lion's share of the blame since their workmen not only damage the lines, but according to County Fire Department and gas company records, fail to exercise good judgment to safeguard the public in many cases. Such workmen often conceal their damages and proceed with 'work as normal.' " Another NTSB report (Number P–78–44) on an accident which occurred at Cherokee, Alabama, states that the support of a cast-iron gas main broke due to the erosion of its soil support where a sewer line had been installed perpendicular to the gas main resulting in an explosion which destroyed a house and killed one occupant.

Also, when blasting is being performed that could harm pipelines in surrounding areas, it is necessary that the pipelines in such areas be leak surveyed immediately after the blasting has occurred to ensure their integrity, since the effect of blasting on pipelines is largely unpredictable. This unpredictability results from the many variables associated with blasting, such as soil condition, type of soil, size of charges used, type of charges used, skill of the personnel doing the blasting, the proximity of the blasting to the pipeline, and the delay sequence of the blasting charges.

In Coopersburg, Pennsylvania, five persons died and sixteen were injured when a weld on an 8-inch steel high-pressure gas main was cracked by blasting.

MTB recognizes that an operator, through experience in dealing with excavators in his area, should know those who are conscientious in avoiding damaging pipelines and in reporting any significant damage. Also, operators should be able to determine from the type of excavation activities being conducted at a particular site, the possibility of damage occurring to the pipeline, and the degree and type of inspection necessary to verify the integrity of the pipeline.

For the above reasons, the final rule in subparagraph (b)(6) has been modified to make MTB's intent clear. The final rule permits the operator to determine which excavation activities should be inspected and the extent of inspection necessary except, that for blasting activities which could be harmful to nearby pipelines, leakage surveys are mandatory.

The commenters' concern over excessive cost due to performing the proposed inspections appears to stem from their belief that full-time inspection of all excavation activities would be required. This conclusion is supported by the fact that the cost estimates submitted by the commenters were based on the cost of construction inspection presently being conducted by their respective companies. This cost was projected to show the anticipated cost of full-time inspection of all excavation activities. Also, the potential benefits shown by the commenters to be derived from these expenditures were based on major damage being done to the pipeline, such as a puncture of the pipeline or a break in the pipeline. They did not consider the benefits which would be derived from preventing less immediate failures by discovering and correcting less serious damage to the pipeline as expressed in the above discussion of MTB's reasons for requiring inspection.

Since the final rule does not require full-time inspection of all excavation activities and permits the operator to use reasonable judgment in determining which excavation activities to inspect and the extent of inspection required, MTB does not believe that unreasonable additional cost will result from the final rule.

Section 192.614(c)—Program Criteria

MTB proposed that operators would not have to run their own damage prevention programs if they voluntarily or by State or local law participate in a public service program that "essentially" meets the criteria proposed under § 192.614(b) for an operator-run program. Four commenters requested clarification of the meaning of "essentially meets the requirements of paragraph (b)." They asked, are they minimum provisions which must be met or can they be met if State law encompasses many of the items enumerated? The intent of this proposal was to permit operators to provide damage prevention programs by participation in State, local, or voluntary public service programs which have the same fundamental characteristics as a damage prevention program defined in paragraph (b) of the notice. The word "essential" was included in the notice so that fundamentally sound programs might qualify though they did not provide every detail that was given in paragraph (b). In the final rule, however, the clarifying changes discussed above

regarding program criteria remove any uncertainty as to which public service programs meet these criteria so that the word "essentially" is not needed.

The final rule adopts the proposal regarding participation in public service programs by providing in paragraph (a) that an operator may perform any of the duties of a damage prevention program by participating in a qualified public service program. Where such a program only partially satisfies program criteria, as by providing a telephone answering service, the operator would have to supplement the public service program with activities of his own to assure full compliance with all criteria. Even where a public service program purports to meet all criteria, participation alone would not relieve an operator of the duty to assure that the criteria are met. In other words, an operator would be subject to penalty for the failure of a public service program in which the operator participates to correctly carry out any aspect of the program criteria that it is performing. If a function is being performed incorrectly, it is the operator's duty to correct the situation at the public service program or otherwise take the necessary steps to perform the function to assure that his compliance responsibility is met.

Section 192.614(d)—Determining Program Effectiveness

1. Fourteen commenters concurred with the proposal that the program should be monitored, but they did not believe that the number of reported incidents, by itself, is a fair measure of program effectiveness. These commenters argued that the proposal did not take into account the increase in incidents that would occur due to an increase in excavation activities, that the effectiveness of programs should be measured by something other than past experience, and that the data would be so unreliable that it could not be used for statistical analysis.

One commenter stated that a measurement based on Part 191 incident reports would be meaningless because of the small number of reports that are filed.

Seven commenters stated that operators should not be subjected to further regulatory burdens of improving programs where the fault lies with excavators' failure to respond to the operator's efforts or to take the necessary precautions to protect a facility that has been properly marked.

After reviewing the comments and consideration of use of the incident and annual reports filed under Part 191, it was determined that Part 191 reports would not be a reliable basis for measuring program effectiveness because excavation activities may increase or decrease from one year to the next. In a year of low excavation activity, a lesser amount of pipeline would be exposed to risk, and less damage would probably occur, thus making the damage prevention program appear to be very effective. In a year of high excavation activity, the reverse could be true. Also, the number of calls requesting the location and marking of pipelines is not a reliable measure, because many of the calls could be originated by excavators whose activities take place in areas where there are few, if any, pipelines, resulting in a large number of calls but with a small amount of pipeline being placed at risk. In contrast, a small number of calls could be from excavators whose activities are in areas of a high density of pipelines, thereby placing a large amount of pipeline at risk. Another consideration was the miles of pipeline in an operator's area. But, the same problem exists with the use of miles of pipeline as does with the use of number of calls received.

MTB believes that there are insufficient reliable data available at this time to allow operators to make a reliable annual determination of the effectiveness of their damage prevention programs and to take remedial action based on that determination. For the above reason, the proposed requirement that operators determine annually the effectiveness of their damage prevention programs and take action on that determination has not been incorporated in the final rule.

MTB believes that a method for monitoring the effectiveness of a damage prevention program is necessary, and will continue its efforts to develop a reliable method of doing so. MTB would welcome assistance from interested persons in developing such a method.

Section 192.707—Line Markers

Eight commenters opposed the proposed exemption of pipelines covered by a damage prevention program from the permanent line marking requirement of § 192.707. The reason most often given was that line marking serves many other useful purposes, such as aid to firefighting units.

The purpose of the line marking requirement under § 192.707 is to alert potential excavators of the existence of underground pipelines and their general location. While there may be other benefits, they did not form a basis for the rule when adopted, and thus cannot be used to justify its retention. MTB believes that where damage prevention programs exist, there is no need for line markers, because the damage prevention program is a more effective means of protecting underground pipelines against excavation damage. Although line markers may serve a secondary purpose of aiding other public bodies, this is not sufficient justification to impose costly duplicate requirements on the operators. For these reasons, the commenters' recommendation was not adopted for the final rule.

PART 192—TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: MINIMUM FEDERAL SAFETY STANDARDS

For the reasons set out in the preamble, 49 CFR Part 192 is amended as follows:

1. A new § 192.614 is added to read as follows:

§ 192.614 Damage prevention program.

(a) Except for pipelines listed in paragraph (c) of this section, each operator of a buried pipeline shall carry out in accordance with this section a written program to prevent damage to that pipeline by excavation activities. For the purpose of this section, "excavation activities" include excavation, blasting, boring, tunneling, backfilling, the removal of above ground structures by either explosive or mechanical means, and other earth moving operations. An operator may perform any of the duties required by paragraph (b) of this section through participation in a public service program, such as a "one-call" system, but such participation does not relieve the operator of responsibility for compliance with this section.

(b) The damage prevention program required by paragraph (a) of this section must, at a minimum—

(1) Include the identity, on a current basis, of persons who normally engage in excavation activities in the area in which the pipeline is located.

(2) Provide for notification of the public in the vicinity of the pipeline and actual notification of the persons identified in paragraph (b)(1) of the following as often as needed to make them aware of the damage prevention program:

(i) The program's existence and purpose; and

(ii) How to learn the location of underground pipelines before excavation activities are begun.

(3) Provide a means of receiving and recording notification of planned excavation activities.

(4) Provide for actual notification of persons who give notice of their intent to excavate of whether there are buried pipelines in the area of excavation activity and, if so, the type of temporary marking to be provided and how to identify the markings.

(5) Provide for temporary marking of buried pipelines in the area of excavation activity before, as far as practical, the activity begins.

(6) Provide as follows for inspection of pipelines that an operator has reason to believe could be damaged by excavation activities:

(i) The inspection must be done as frequently as necessary during and after the activities to verify the integrity of the pipeline; and

(ii) In the case of blasting, any inspection must include leakage surveys.

(c) A damage prevention program under this section is not required for the following pipelines:

(1) Pipelines in a Class 1 or 2 location.

(2) Pipelines in a Class 3 location defined by § 192.5(d)(2) that are marked in accordance with § 192.707.

(3) Pipelines to which access is physically controlled by the operator.

(4) Pipelines that are part of a petroleum gas system subject to § 192.11 or part of a distribution system operated by a person in connection with that person's leasing of real property or by a condominium or cooperative association.

2. Section 192.707(b)(2)(ii) is revised to read as follows:

§ 192.707 Line markers for mains and transmission lines.

* * * * *

(b) * * *

(2) * * *

(ii) Where a damage prevention program is in effect under § 192.614; or

* * * * *

3. The table of sections is amended by adding a new § 192.614 titled "Damage prevention program."

(49 U.S.C. 1672; 49 CFR 1.53, Appendix A of Part 1)

Issued in Washington, D.C., on March 25, 1982.

L. D. Santman,

Director, Materials Transportation Bureau.

[FR Doc. 82-8824 Filed 3-31-82; 8:45 am]

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APPENDIX B

ONE-CALL SYSTEM MANUAL

ONE-CALL SYSTEM MANUAL

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$5.00

ONE-CALL
SYSTEM
MANUAL

1984 Revised Edition

Utility Location and Coordination Council

of the
American Public Works Association
1313 East 60th Street
Chicago, Illinois 60637
312-667-2200

CONTENTS

PREFACE

This publication is intended to serve as a guide in the development of one-call systems. Compiled by members of the ULCC One-Call Systems International Executive Committee, it is meant to assist in the effective development and extension of the one-call notification concept.

The information provided here represents the combined efforts of many one-call system operators. It is hoped that other communities will find this information valuable and will benefit from the collective experience of those who have preceded them in setting up one-call notification programs.

As community needs differ, so do the requirements of one-call systems. No "cookbook" approach can be developed due to these varying requirements. This guide attempts to examine the concepts behind one-call programs and identifies those steps taken to meet overall system needs.

The Utility Location and Coordination Council of the American Public Works Association, of which the One-Call Systems International Executive Committee is a part, is indebted to many individuals and their employers for their valuable and enthusiastic cooperation. Without it, this publication could not have been produced.

This publication may be amended and refined as more experience and new technologies are developed. Comments about future changes are invited as you become involved in this most effective phase of underground facility damage prevention.

One-Call Systems International Executive Committee
Utility Location and Coordination Council
American Public Works Association

INTRODUCTION

We all know that subsurface facilities are not new. The ancient Romans built underground waterways and sewers thousands of years ago and even back then it was safe to assume that whatever one man buried, another would accidently dig up.

Today, the problems associated with buried plant are exacerbated not only by the number of facilities placed below ground but by the constant growth, renewal and redevelopment of our communities. The result is an ever-increasing need to coordinate all excavation and blasting activities with those who share the ground beneath us.

Without coordination and communication the web of subsurface facilities can be a very dangerous one to circumvent. Studies by the National Transportation Safety Board show that better than 40% of pipeline damages and the resultant deaths, injuries and property damages are caused by someone digging into the pipelines accidently. Countless lives and expense could have been spared if only these excavators knew what lay beneath their job sites.

Coordination and communication are what one-call systems are all about. A one-call system is a tool to use in the prevention of facility dig-ups. It is a communication link between excavators and buried-plant owners and operators. A one-call system is a safety program designed to cut the cost of pipe and cable repairs and even more important, it is meant to diminish the hazard posed to workmen and the general public whenever excavation is undertaken.

The ancient Romans may have invented buried facilities. Perhaps their empire would have lasted longer had they invented one-call systems as well.

MINUMUM REQUIREMENTS OF A ONE-CALL NOTIFICATION SYSTEM

The American Public Works Association strongly encourages all owners and/or operators of underground facilities to participate in one-call notification systems. While it is recognized that some areas may require or desire a great deal of sophistication, it is APWA's intent to provide these minimum requirements, in order to assist all parties in establishing cost efficient, as well as effective, one-call notification systems.

1. One telephone number should be provided for excavators to use to notify participating utilities within a predetermined area of planned excavation work.

2. The service should be provided during normal working hours, Monday through Friday.

3. Off-hours calls should reach a recording which explains emergency procedures.

4. All telephone calls should be mechanically voice-recorded.

5. The system should identify for the caller those utilities which will be notified for them.

6. The system should provide a permanent file number for each request.

7. The system should provide, for a statutory period, a printed copy of all location requests which can easily be retrieved through use of the file number.

8. The system should provide a timely method of notifying the affected utilities. This method is to be determined by each individual system.

9. The system should provide periodic administrative reports as required by the participating utilities.

10. The system should document contractor education programs on an ongoing basis.

DEFINITION

A one-call notification system is a communication system established by two or more underground network owners or operators to provide one telephone number for excavating contractors and the general public to call for notification of their intent to use equipment for excavating, tunnelling, demolition, or otherwise disturbing the subsurface of the earth. This below ground protection system provides participating members an opportunity to identify and mark their lines in the vicinity of proposed activity. The notification also allows the owners of underground facilities to provide any necessary information about the facilities and to post a construction watch, if desired.

This definition covers a wide variety of one-call operating possibilities ranging from a simple answering service arrangement to an in-house system run by a participating member to a separate incorporated organization of member firms which awards the operation of the one-call center to a contractor. Information contained in this manual should be applicable to most types of one-call systems.

GOALS

Beyond the obvious goal of increasing excavation notices, the one-call system is a multi-purpose endeavor which benefits every element of a community. A brief listing of one-call objectives includes:

1. Prevention of underground damages which reduces monies spent on repairs and customer service outages.

2. Protection from loss of or damage to life, property, and equipment.

3. Reduction of excavator downtime.

4. Protection of the environment and natural resources.

5. Establishment of a watch over unauthorized excavation.

6. Assistance for excavators in complying with federal OSHA regulations - and, where in effect, state laws.

7. Promotion of coordination among utilities, governmental agencies, and other operators of underground lines for placement and preservation of below ground facilities.

BACKGROUND

For years owners and operators of underground lines have attempted to persuade excavators to provide notification of their proposed digging activities. With more and more facilities going underground, the need to notify each owner of lines became a staggering and often frustrating task. Who has facilities on C Street? Where on B Street? Suddenly it became inconvenient for many excavators to notify anyone. Soon a trend became evident - the most common way to locate an underground facility was to dig it up with a backhoe.

In the early 1960's a group of underground service operators decided to take steps to alleviate this worsening situation. They started with the basic premise that if the red tape and inconvenience of making multiple calls could be eliminated, then more excavators would notify owners of facilities and services would be protected. From that premise, those operators established the first one-call notification system, a central calling point with a single telephone number.

Since that time the one-call concept has been successfully implemented throughout the United States, Canada, Taiwan, and the United Kingdom. Significant progress has been made in one-call systems since the early beginnings. Many systems have expanded their coverage area from one or two counties to the entire state or multi-states; other systems have developed from small manual operations to sophisticated, automated programs which process several hundred thousand notifications yearly.

In order to promote the one-call concept, several one-call centers banded together in 1976 as a committee of the Utility Location and Coordination Council of the American Public Works Association. The advances made in the one-call arena under the guidance of this committee have been quite significant. One of the major accomplishments has been the staging of an annual symposium to provide assistance for those interested in establishing centers. A yearly directory and an annual newsletter are published by the committee to report on the state of the art in one-call. Recently a standard logo was adopted by the committee to formalize its identity. The One-Call Systems International Committee has also been instrumental in developing and promoting standardization of staking and color codes for temporary marking and in defining the need for advanced underground locating equipment.

IDENTIFICATION OF ONE-CALL SYSTEM USERS

One-call system users include firms, joint ventures, partnerships, corporations, associations; municipalities, political subdivisions; governmental units, departments, and agencies; utility companies with underground faci-

lities; and any persons who need to excavate or work with the soil in such a manner as to contact or cause possible damage to subsurface structures.

System users include two divisions. The first is operators of underground facilities such as:

1. communication carriers - telephone, telegraph, cable TV, fire, police, traffic control, military, airport, and other signal system operators
2. electricity providers - transmission and distribution, private, cooperatives, municipal, traffic control, street lighting, and others
3. gas and petroleum product carriers (gaseous and liquid) - transmission, distribution, municipal, cooperative, private, and others
4. water and sewer suppliers (private and public) - transmission, distribution, sanitary, storm, flood control, and others
5. transportation - railroad, rapid transit, shuttles, roadways, and similar facilities
6. All others who own or maintain substructures

The second division includes but is not limited to excavators such as:

1. operators' contractors
2. general contractors and subcontractors
3. highway, street, and road builders
4. plumbers and steamfitters
5. landscapers, forestry groups, lawn services, fencing companies, and similar groups
6. welldrillers and miners
7. recreational builders
8. real estate developers and home builders
9. engineers and project originators
10. home owners (including farmers)
11. blasting contractors
12. all others who excavate the earth's surface

One-call system users include all groups listed above and others as well. One-call systems accept calls from anyone needing to determine the location of underground facilities.

ESSENTIALS IN ORGANIZING A ONE-CALL SYSTEM

GOVERNING BODY

Even before a decision is made to initiate a one-call system, a governing body should be assembled. This group, whether it is called a steering committee or operating committee, should be large enough to cover all aspects of the organization but small enough to function with a minimum of red tape. The committee should encourage as many varied service organizations as possible to be represented, including members from municipalities. Input from smaller underground service organizations such as cable television groups can prove beneficial to the committee as well.

A primary concern of the committee should be to develop the overall concepts. It may wish to appoint subcommittees to deal with specific tasks such as drawing up contracts, establishing public relations, purchasing equipment, obtaining office space, and similar tasks. The theme must be to compromise

for the good of the center since not everyone's desires can be fully accommodated.

The most common frequency for meetings of the members or governing groups is monthly. Some meet twice a month and others, once every two months. Types of meetings vary, but most are of the decision-making or coordinating type. As a system grows in membership, this kind of meeting becomes more difficult to arrange due to the large number of people and amount of related discussion. One method being used successfully is to hold monthly meetings for a small governing group (board of directors) plus a semi-annual or an annual membership meeting to discuss past performance, future plans, and to elect officers.

AGREEMENTS

Operating procedures and bylaws should be established. Procedures for the operation of a one-call center should be simple. The concept is for service, not paperwork. Topics for procedures can be classified as: general, communications, center operations, reports, expenses, and publicity. These topics could be expanded to include guidelines and whatever else is needed for a particular system.

Bylaws vary, depending on the type of organization. In some instances they may prove unnecessary. If bylaws are adopted, simplicity should be the keyword. Items that could be incorporated include sections on membership (including rights), financial matters, meetings, elections and duties of officers.

Any other agreements required should be kept as simple as possible to facilitate understanding by all participants. Consideration should be given to including "hold harmless" clauses, amounts of liability insurance, errors and omissions insurance, retention of records, cost allocations, reimbursements, area served (with options to expand as planned), and any special arrangements necessary. If an agreement to contract the service to an outside concern is made, it should contain controls, checks, and balances.

Certain states have municipal home-rule charter requirements which may raise questions concerning municipal participation in a one-call system. Does a municipality, in effect, relinquish a portion of its regulatory authority by such participation? Can a municipality with the right of soverign immunity enter into an agreement containing a "hold harmless clause?" An attorney experienced in the field of municipal law should be consulted.

The size of the area a one-call system serves should be carefully chosen. In establishing boundaries, it is wise to use prominent existing ones such as county, city, or state lines. A system should not use boundaries set by a utility (e.g., district, division) because most excavators neither know nor care about such "invisible" boundaries. However, this does not answer the utilities need to protect their entire system. If at all possible a statewide system should be considered.

Advantages of a statewide system far outweigh the disadvantages. For instance, a contractor need only remember one number to call anywhere in the state to give notification. Only one staff is required to process calls. There are no questions in the excavator's mind as to whether he has called the right center. Center credibility is more viable and general funding is considerably more evenly distributed due to a larger number of participants.

PROMOTION

Other than receipt and dispatch of notices, probably the most vital function

of a one-call system is the promotion of the one-call notification concept in the area served. Promotion is carried out at the national level by APWA and others, but it is essential to inform all excavators at the local level. Methods used are many and varied, with some centers using direct mail systems to contractors while others employ on-site visits, contractor association meetings and conventions, rallies, and similar means.

Many systems submit public service announcements and articles to newspapers, TV, and radio stations with success. The public information, communication, and public relations departments of members can often advise how to develop such information to increase the possibility of its being used. Employment of an advertising or public relations consultant is an option which can be productive.

Specialty advertising is also effective. Examples include key chains, tape measures, calendars, pens, and other items that will be used. The key is to create something of value which recipients are likely to keep with them and use often.

In some areas, local television talk shows are available. Many show hosts are willing to discuss the one-call concept because it is in the interest of the viewing public to reduce service interruptions.

In any case, promotion of and education about one-call systems is an on-going process. Civic and other public-service organizations are always searching for good speakers on topical subjects. Managers and committee members should contact them and volunteer their services.

ONE-CALL CENTER POINTERS

The call-receiving center is the nerve center of a one-call system. Here, calls are received, processed, and dispatched. Several things are of primary concern when establishing criteria for the operation of the receiving center.

THE MANAGER

First is the selection of center manager. The success of many a one-call system has been achieved on the basis of the manager's leadership alone. Most problems not involving expenditures can be solved by the manager of the system. This constitutes one good reason for selecting a strong individual for this position. In the selection, emphasis should be placed on ability, drive, and flexibility. The manager, coupled with an enthusiastic committee, can overcome many of the problems and objections that are inherent in one-call organizations. Although specific qualifications may vary, the manager should be proficient in organization, public speaking, and administration. Besides their involvement in promoting both use of and participation in the program, managers are responsible for the efficient and professional operation of the one-call center.

Incoming calls should be handled proficiently and courteously. Excavators should be encouraged to call again about future excavations. Callers should be given the names of all participants in the one-call system and be advised that any others which are not a part of the one-call system will need to be notified by the caller.

Several items of information are needed to complete the dig notice including the caller's name and company, a telephone number for use in contacting the person in the field, location of excavation, type of work, and starting date. Other information may also be required depending on local needs.

SCREENING INFORMATION

There are several ways of screening information once it has been received. "Screening" is the term applied to how the center determines which members need to know about a particular dig. The most widely used methods of screening are the following:

1. Mass dispatch - this is probably the least desirable of notification methods. All organizations participating in the program receive each and every message regardless of how few or how scattered their facilities may be. Extra time and effort is needed to sort the information at each receiving location by the members' clerks.

2. County or township identification - this system uses political boundaries to help determine which members receive the dig-site notification. If your facilities are not in the particular town, then you do not receive the message. This is more selective and cuts down on the number of needless notifications generated by a mass dispatch system.

3. Grid system identification - this most selective of screening methods uses a geometric boundary to determine who receives notifications. Members register their plant according to predetermined grids. These can be local grids or grids prepared by various mapping companies. Generally, the grids range in size from 1/4 mile to 1 full-mile square. Everyone must necessarily use the same grids within a system. The grid an excavator is working in is identified by the address information he gives the center. Then, only those members who have a plant in that single grid are given the notification.

Each of these screening systems may be used manually or they may be incorporated into a computer-automated system.

APWA COLOR CODE

Once the dig notice is sent to the field, it will be the members' responsibility to locate and mark their facilities or to advise the excavator if they have no facilities in the area. Each member must contact the excavator even when he has no facilities in the area to be excavated.

Although some variance in color coding exists, most operators now employ APWA's recommended color codes for temporary markings:

1. Safety Red - Electricity
2. High Visibility Yellow - Gas
3. Safety Alert Orange - Communication
4. Safety Precaution Blue - Water
5. Safety Green - Sewer

Center personnel should be familiar with the color coding system used by its members in case excavators have questions about markings along their dig routes.

ADMINISTRATION CONSIDERATIONS

There are three widely used modes of one-call system operation. Though there are several other ways in which a program can be administered they are primarily combinations or permutations of the following:

1. Operation by a system member (in-house). In this instance, the member that operates the system is any utility or agency participating in the program. Usually the member operator will provide personnel,

office space, clerical help, and equipment. This type of system is often used at a program's start-up when funding the initial requirements may create a problem. In time, the operating costs are prorated among all members and the in-house operator is reimbursed.

2. Contract with non-member (contractor/vendor operation). This arrangement can be with an answering service, a contractor, or any organization equipped to take dig site notices, provide essential information to the caller, and pass proposed excavation site information on to the involved utilities. The cost is borne by all the members. Usually, as much responsibility as possible is placed on the contract operator, leaving the members free to monitor the system's overall progress. Care must be taken to ensure that in any contractual agreement, control of the system's direction and operating policies are maintained by the members.

3. Member-owned & operated. This mode of operation generally requires incorporation of the governing board. It must hire its own manager and staff as well as be prepared to handle liability and other insurance coverages. Though this arrangement allows a great amount of flexibility, the amount of work it entails is considerable as all the responsibilties of running an actual business are involved.

OPERATION OF A ONE-CALL CENTER

BASIC REQUIREMENTS

The determination of space, equipment, and personnel requirements at start-up time must be planned and budgeted as with any business venture. The plan must be flexible without being hit or miss. For instance, a figure for space rental might be budgeted based on average rentals in a given area. Telephone communication needs however, may dictate that the center office be located in a Telephone Company Central Office area where rents are higher. Growth of the service must also be taken into consideration. This requires that short and long term planning be accomplished before a center site is chosen. It is very expensive to move once the center is set up.

Some of the basic considerations for center location are:

1. Telephone Company. Central Office Capability. Consult with telephone company sales and network personnel to insure that the C.O. will have the long term trunking capabilities for your center.

2. Adequate Space. Be sure that not only can you expand your floor area if necessary, but that the power, air conditioning, and space arrangements are such that planned equipment can be installed without major building modifications.

3. Location. Locate in an area with a large labor pool or where public transportation is available to provide for easy commuting.

4. Work Environment. Plan to create a pleasant work environment which will appeal both to the employees and prospective members/visitors. A pleasant, well-planned work environment generally aids in operator productivity and work force stability.

It is generally accepted that the telephone is the best and most effective means for receiving dig notices. There are, however, several types of communication arrangements that should be considered before settling on a specific system.

If the one-call concept is expected to grow from a local operation to one that covers a larger area, consideration should be given to securing a telephone rotary system with spare numbers for future growth. If possible, the key number should be easy to remember, either because of the numbers, or the corresponding letters on the dial.

Careful consideration should be given to selection of a telephone number since advertising and promotion items bear this number. A number change after the system is operating can be expensive because of the need for additional advertising campaigns to re-familiarize users with a new number.

Consideration should be given to using IN-WATS. Although the cost is fixed for a prescribed amount of usage, it is not inexpensive. It may or may not be the best solution, depending on local conditions.

Several systems use a "call collect" arrangement. This system gives true billing, but is slower than In-Wats. As volume grows, it may become more expensive than In-Wats.

No matter which communication system is selected, it should have enough capacity to prevent an excessive number of busy signals. If lines are always busy or not answered quickly, many busy excavators will not use the service. Infrequently used phone lines, however, are an unnecessary cost.

Several firms manufacture call-recording equipment to record conversations on the center's incoming lines. These recorders should be tamper-proof and be equipped with a date and time generator to assist in confirming message accuracy and receipt verification. They can also be helpful in legal proceedings. These units are available in reel-to-reel or cassette form and are multi-track machines which contain anywhere from 2, 8, 10, 20, to 40 channels. Careful consideration should be given to the size of these recorders. Long-term requirements should be the major consideration in selection criteria.

The reason for considering long-term growth is that an 8 channel recorder can accommodate 7 lines and one time channel on its one-fourth-inch tape, a 10-channel unit can accommodate 9 lines and one time channel on its one-half-inch tape, but can be expanded to 20 channels. Purchase of an 8-channel machine limits the use of the recorder tape.

As telephone companies convert to Electronic Switching Systems (ESS), new services are becoming available. ESS offices can provide call director systems, monitor and keep track of the number of busy signals, dropped calls, etc. A number of commercial companies also provide equipment which can be purchased to perform those same tasks. A number of those enhancements can provide very cost effective additions to the total center operation. It is very worth-while to investigate these options when planning a new center or, for that matter, in upgrading the operation of an existing center.

DEFINING START-UP AND ON-GOING OPERATING COSTS

There are three basic areas to be considered in determining and defining the start-up and on-going costs of a one-call center.

1. Office and Equipment. The key element in this category is accurate projection of the status of your center three to five years from now. The daily work volume will determine your square footage needs and how sophisticated your telecommunications equipment must be. Under-projection of your needs will lead to overcrowding and inefficiency. Over-projections will result in needless expenditures of

capital.

2. Personnel. Determining the costs of a one-call center also calls for careful growth projections. How many operators and how much of a layering of management is needed are important questions to be answered for a stable working environment. Otherwise the costly ingredients of turnover and training will have to be added to your overhead. Once staffing needs have been determined salary scales can be designed to be competitive with the job market in your particular area.

3. Advertising and Promotion. This category of expense is the hardest to measure in terms of effectiveness, thus, this program must be flexible in terms of planning and implementation. The outlay can be minimal or huge in the amount of dollars expended, but as in all other facets of running a successful center, planning is essential. "Getting the word out" best describes the intended bottom line result. Whether this can be done with newsletters, bumper stickers, brochures, slide shows, tricky give-a-ways, or a combination of all the aforementioned, it must be planned carefully. But as mentioned before, creating an advertising/promotion plan can enable you to get the best possible results for each dollar expended.

FUNDING

There are a number of methods currently being used to fund the center. Early in the planning phase, the principal members should define a method for "start-up" funding in order to share the initial set-up cost equitably. Generally, a percentage arrangement has been considered equitable. This can be accomplished in several ways, the most popular being equal proration of center costs among primary participants. An alternative is for larger companies to share a major portion and smaller companies a minor portion of the total billing. This percentage can be determined by miles of facilities, number of customers, or other equitable distribution for each participant.

Some systems fund on a "per-call" basis which is usually on a "message-sent" formula. This means that each participant is charged for the messages sent to that firm or agency. The cost of each message is determined by dividing the cost of the center by the number of outgoing messages. Message costs may also be set as a flat rate per call.

Some systems employ a grid-system rate. They divide their coverage area into grids, and participants pay according to the number of grids in which they have facilities. These grids are further separated into urban and rural grids. Charges for facilities in urban grids are usually higher than those in rural areas.

One-call systems may also include secondary or associate participation. In determining the cost to a new associate member, several methods may be utilized which include most of those already discussed. A popular plan is the "miles of facilities" plan. This gives the new member, basically, a flat rate bill. Annual adjustments are made plus adjustments for placing additional facilities into service or removing them from service.

These rates are on a graduated basis with a customary minimum figure. The divisions are spaced such that in most cases, a significant amount of service would have to be placed or removed before rates would change. Along with this method, some centers have adopted a "cost per trench mile" or "per right-of-way mile" schedule for transmission companies. This allows these companies

a reduced price because of securing right-of-way and depth of facilities. Other centers provide a rate break for water systems, giving them discounts for depth of facilities and for the absence of volatile fluids. However, there is a possibility of inundation from water main breaks which could cause a significant amount of damage.

Another consideration in funding includes providing membership to contractor organizations and insurance companies. In such cases, these companies pay a small fee to be members and do not normally receive any services except access to records as a reference source in damage cases.

Additional methods that are being used by centers for determining charges of active participants are:

1. "Per meter (customer) basis." This should be used only for distribution-type organizations. The prorated cost is derived by dividing the cost of the center's operations by the total entities involved with separate billing to each participant.

2. Flat rate billing, each participant pays a flat rate for center participation. The center should be on a definite budget for this type. However, this allows little margin for unforeseen expenditures.

3. Value of plant, in this arrangement each participant estimates the value of his plant and is billed according to its pro-rata share of the total plant.

4. Calls in/calls out, under this plan, the cost of the center is divided by the total incoming call volume, and the percentage of calls sent to each participant is multiplied by this factor to arrive at the cost.

5. Price structure by entity. With this method, each type of service is evaluated and a pricing structure is established for each. Pricing structures may be according to mile, meter, population, or other equitable measure with each participant's fee being determined by the scale for the service which it provides.

All of these systems have merit. None is recommended over another. The rate base should be the one which best fits the economy of the geographic area involved and the needs of the participants. Some centers are, as previously mentioned, now operating with one or a combination of these methods of funding. Regardless of the approach used, a one-call system needs to be adequately funded to produce the desired results.

EQUIPMENT

In the past, the selection of message forwarding equipment for member notification in a one-call system was very simple. The associated call-volume record keeping was manually produced and there were few problems in maintaining member contact.

As the use of one-call gained in popularity, call volumes increased and so did membership. Centers using only voice contact methodologies were forced into teletype systems and teletype operations began to experience the need for faster means of forwarding notices to members. At the same time, increased call volumes began to exceed the manual record-keeping capabilities of many centers. Compounding the problem, teletype equipment is becoming extremely scarce in some areas, and is inhibiting the growth of one-call association

membership.

Solutions to one-call communications problems were waiting in the wings. Electronic devices such as computers, as well as various types of stand-alone equipment and time-sharing systems, have begun to provide cost-efficient, effective answers to one-call communication and record-keeping needs.

The first computer system configured for a one-call operation was installed in the "Miss Dig" center in Michigan. Since that time a variety of semi-automated, fully automated, and time-sharing systems have been installed in a number of centers.

It would seem that the selection of communication equipment should be relatively simple and straight forward. The market, however, contains a bewildering range of communication devices, incoherent regulations and few, if any, standards for equipment operation or compatability. Compounding the problem is the fast pace of technological changes in hardware which tends to inhibit equipment selection criteria because of the possibilities of early obsolescence. If we keep in mind that the range of applications for a one-call center is rather narrow, (i.e., store and forward message switching, either direct dial or network), with some statistical reporting for monitoring the systems, the problem becomes less complicated. This definition holds true even if the current concept of one-call operation evolves into other areas. The system will remain basically a communication center even if the clientele is broadened. The key item to keep in mind is that any number of hardware vendors can provide an efficient workable hardware configuration for a center. The most important factor is the software required to run the system and produce the reports necessary to keep track of the operation. Most ven-dors can supply applications programming or communications programming, few can adequately supply both. The choice for a vendor then would be predicated on a combination of cost and the vendors' in-house capability in the areas of application and communication programming. The voice telephone, however, remains the basic communication tool for light volume centers.

At the present time the most widely used receivers are Dataspeed 43 RO's and KSR's. These devices are readily available in most parts of the country. Whichever type of device is used, a very efficient maintenance service is a must and should be considered prior to making any equipment agreements. Fascimile devices are becoming more flexible and much faster. Equipment is now available whch can be used both as a one-call receiver and a standard facsimile. If testing proves that those new facsimilies are reliable, efficient, and cost effective, it may be that many one-call members might opt for a device that can be used for other purposes as well as for a receiver. It is too early to tell at this time. Finally, most centers will have voice contact requirements to certain members. This is best accomplished with a touch-a-matic telephone wired through the recording device.

The communication channels for sending messages to association members are numerous. Much depends on the call volume and the type of equipment in use. As mentioned above, small call-volume centers can work with voice telephone or when available, teletype networks.

If we assume that some form of automation is being used, there is a choice between full private line network, direct dial, foreign exchange, WATS or business lines, or any combination of the above. Most time-sharing services will require a private-line network. Stand-alone systems may need some combination of line service depending on local conditions and costs. As a rule of thumb, if a single member is

receiving over ninety minutes worth of messages a day, it is more cost effective to use a direct private line. If most or all members receive a random number of messages per day amounting to less than ninety minutes hook-up time, a direct dial system is generally more cost effective. The business area covered, the availability of trunking, etc., would determine if some mix of foreign exchange connections would provide additional efficiency and/or savings.

Because costs, conditions, and call volumes vary so greatly, it is impossible to set down a system which could be used by all centers. Center management should thoroughly explore the options both with equipment suppliers and the telephone company before reaching any final decisions.

RECORD KEEPING

There are three over-riding considerations demanding accurate and organized record keeping in a one-call center:

1. Legal ramifications

2. Measurement of activity and growth

3. Financial accountability

Some of the records used to handle these requirements are:

Daily logs of calls received, including time received, caller's company, length of notice given, ticket number, and members notified. Retention of the logs listed above, hard copies of actual tickets transmitted, and tapes of recorded location requests should be of sufficient duration to meet legal requirements.

DOCUMENTATION USEFUL AS TRAINING TOOL

Documentation may be best defined as having written procedures on hand for all facets of operation of the one-call center. The documentation enables the center to have a working plan. Thus, from the newest employee to the most experienced, from the lowest level to upper management, all have an idea of what's expected of them and the basic procedures with which to carry out their job.

MARKETING A ONE-CALL SYSTEM

DEFINING THE PRODUCT

For over ten years, one-call systems have been lauded as damage preventers. The prevention of damage to underground facilities is a culmination of many actions - beginning with the desire of the excavator for certain information and ending with the careful use of that information by the excavator who requested it in the first place. The one-call system is a small but certainly central element in the completion of a series of actions by many individual organizations. Each must do its part to ensure a quality plant protection program. The one thing that a one-call system does is deliver a product. That product is information, information in the form of an accurate, rapidly delivered, locate request. Although many ancillary functions are performed, the one thing that every one-call system, manual or automated, contractor or in-house, has in common, is the delivery of its primary product, the locate request. Overall, then a successful one-call system must be characterized by the consistent, methodical, and meticulous processing of information.

WHERE IS THE MARKET

Potential members of one-call systems historically have been the obvious users,(i.e., the telephone, gas, and electric companies). Secondarily, public works (water and sewer) organizations were involved along with minimal users of the information disseminated, the pipeline and interstate communications operators.

and other local closely developed systems, have begun to be actively involved members. Assuming that there is in existence a core of companies, either actively operating a one-call system or about to form one, the following ideas will be useful in recruiting additional membership.

The technique of asking the right questions is essential, from the outset, in order to gain and maintain control of a situation. You should initially attempt to focus on broad areas of interest, which may not necessarily be yours, but are exclusively those of your potential member. Remember, they are not convinced that they need what you are offering. So, you must gear your thinking to the fact that potential members have their minds set on two things: they have survived thus far without your service and they can probably continue to survive without it. Your task will be to change this type of thinking.

In order to maintain the interest you have generated by asking the right questions, you will need to develop a rapport with your potential members. This is not an easy task, but if you keep in mind the goal at hand (more members) you will be successful. It is absolutely essential that proper business practices are followed and, most important, document your meetings and discussions in a follow-up letter within five days.

If your questioning technique was good and your follow-up was done in a timely manner, you will have created a need for your services. It is at this point that your potential member is ready to be sold on the services your one-call center has to offer. If you have prepared properly, communicated effectively, and offered the services required to fulfill the need, which you have created, you are ready to "close the deal." Always remember that every rejection is just another opportunity to broaden your sense of humor.

Everyone in your area of service should be viewed as a potential user of your service. However, just being aware of the potential as defined by population, is hardly the same as a concerted effort to determine the base of users who would, as a matter of course, actually place calls to the one-call system. Many services are available to the operators of one-call systems to help in this area, especially direct mail companies, that can provide lists of potential users by type and volume of business and geographic location. In order to create awareness of your service, you must have a written plan of contact for your market. The necessity of follow-through after your plan has been determined cannot be underestimated. Professionally implemented advertising is the single most effective method of encouraging potential excavators to use the service and tie-down necessary to complete your marketing plan of membership and usage.

The time involved in attaining the goals just discussed is considerable. You must plan your work and work your plan. The membership goal should be 100% of all persons excavating. Just because you haven't attained this level within a certain period of operation is no excuse for a marketing plan that is anything less than 100%-determined to reach those goals.

SERVICING THE MARKET

The one-call center actually has two markets for which it provides service. The primary market is the member company that receives the information. The other is the callers' need for the service of the member companies. Many times these are one and the same.

Delivery of the locate request is the primary service to the member company. The method selected to deliver the locate requests to the member companies should incorporate considerations for the size of the individual member,

the expected call volume, and the mode of delivery. A completely effective one-call system, in most instances, will have provisions for voice only, direct dial, and private line services. This will enable the operator to tailor the delivery of the locate request to the individual member's requirements.

The rapid and efficiently completed locate request is the primary service to the user (caller). Properly educated operators are of invaluable assistance to the members. By their courteous and quick handling of calls, use of the system will be encouraged and more calls will result. To this end, much thought needs to be given to the mechanics of the system itself. Proper hardware, software, and transmission systems must be utilized to avoid user stagnation due to long hold-times and the delayed transmission of requests.

The efficiency of the call completion will directly impact all aspects of the call center and will directly assist or hinder the overall marketing efforts. Efficiency of call completion is not merely getting the caller off the line. It is the quick and efficient handling of the call at its inception, the rapid delivery of the locate request to the appropriate companies, and the timely response to the requesting party by the member companies. When each of these items are incorporated correctly, your system will be properly servicing its market, which will make marketing its service much easier.

ADVERTISING

One point to keep in mind is this; advertising is a MUST, regardless of the size of the one-call system or its age.

The effectiveness of advertising is only as effective as the level of reinforcement.

The education of member companies on the use of the one-call system is a combination of internal reinforcement (the company) and external reinforcement (the one-call center). Firm guidelines, understood by all, should be agreed upon, documented in writing, and circulated among the member companies to provide everyone with the knowledge of how the system operates. This serves to build uniformity into the system. Operators must be trained to the point of understanding how the system operates, not just the mechanical functions involved in taking and completing a locate request. User education is accomplished by the application of the guidelines agreed upon by the member companies and the one-call center. The consistent application of predetermined guidelines will do more to educate users of the system than any other method of explanation. Of course, personal appearances, speaking opportunities, and participation in trade fairs, seminars, and similar forums should be actively pursued.

The general public will become aware of the one-call system through time and consistent advertising efforts. One essential item for the highest level of success for the one-call center is for member companies not to take locate requests. All calls should be directed to the one-call center. This will reinforce in all callers the awareness of the center and the need for its use.

USE OF MEDIA

There are all types of media available for use by the one-call system. Print media, broadcast media, and other methods contribute a great deal to educating the public to the existence of a one-call center. One of the most effective means of information dissemination is by member companies. By combining the

efforts of several members, everyone, public and private, could be reached. This is a method, used annually or semi-annually by many one-call systems.

The availability of public service assistance is easily obtained by knowledgeable operators. Radio, television, and print, time and space, can be created to carry the message to the public, if properly approached.

The use of professional public relation firms (as subcontractors, essentially) should not be overlooked. They are more knowledgeable than the center management or member companies in this regard, and can obtain the desired advertising at no increase in cost while providing a more consistently managed effort.

COST EFFECTIVENESS

In order to sell something, it has to be of benefit to the buyer (or at least he must be persuaded it is of benefit). Since there is no charge to the user, normally, the cost effectiveness of a one-call system is generally directed toward the member companies.

If several criteria are met, a cost effective opportunity for membership usually exists.

The creation of a cost-effective method of communicating with the member companies should be top priority for the operator of the one-call system, whether it is in-house or vendor-operated.

Every effort should be made to provide a level of service which is suitable to the needs of the entire base of potential members.

Trying to sell the system on the basis of "fewer cuts or breaks" is too abstract to be effective for all but the most continually affected members. Those are generally telephone, electric, and gas distribution companies whose plant is close to the surface.

Relating the locate request to various permit requirements and the reduction of repair costs or the recapturing of an individual member's personnel are a few of the many ideas used to sell the "cost effectiveness" of one-call membership.

ATTAINING GOALS

In order to accomplish your goals, you must know what they are! Every successful company or individual has a written plan to achieve predetermined goals. The person or group challenged with the responsibilities of creating growth for a one-call system must have a clear idea of what it is that they need to do.

Remember, if it's not in writing and it's not specific, it's not a goal, it's a wish!

Goals must be believeable. Anyone can say they'll generate 100% membership. You must be realistic and determined to be successful. Marketing the one-call concept is not unique, one-call is unique. Anyone who is determined to be successful in increasing both membership and usage of their system can be if they are prepared, professional, and persistent.

ONE-CALL INDUSTRY TRENDS

The current state of one-call can best be described by a single word: growth. Nationwide, the majority of one-call centers are reporting expansion in several key areas. The increasing reliance on and continuing growth of one-call systems help prove the effectiveness and value of the one-call concept.

The first area of growth is in the geographic area protected by one-call centers. Due to consolidation or expansion, more of the country is now serviced by an underground notification system.

Second, many one-call centers have reported an increase in the number of

members. Facility-owners/operators in many areas have realized the benefits of belonging to a system and are eager to add another safeguard to their established plant protection program.

Another area of growth is indicated by an increase in the overall call volume experienced by one-call centers. While some have not had as large a jump in number of calls taken as other centers, almost all report at least a modest increase in traffic. It is important to note that, generally speaking, statistics show increased calls mean decreased damages.

Legislation is gaining in popularity as well. Several states have laws requiring mandatory notification from excavators to underground facility owner/operators. Often, the excavator must provide such notification a required number of days in advance. This gives the utility locator time to schedule the markout and ensures that the excavator has planned his work well ahead of time. Due to penalty clauses, excavators may find themselves involved in legal complications if a damage arises due to their failure to notify, or their failure to give the proper advance notification.

The other side of the legislative coin is that all owners/operators of underground facilities may be required to belong to one-call systems as well. Recent federal regulations recommend that all natural gas and petroleum transmissions companies participate in one-call systems, where they exist. One-Call centers welcome new members for whatever the reason.

Another highly visible trend is for the use of contractor as opposed to in-house management of one-call centers. In contract management, a particular firm or individual is engaged to operate the one-call center. This eliminates the need for one member to provide housing and employees for the center and in most cases, eases the burden of insurance as the contractor may assume the liability for errors and omissions and the like.

The need to handle and process more and more location requests is being met by computer/automation equipment. The number of one-call centers converting from manual to automated office systems is on the rise and along with it is the need for office managers to be kept up to date on the types and sorts of goods available to them. This is true outside the center as well, extending to the communications/delivery networking system used to link the center with remote utility stations.

Looking further into the future, one of the innovations which may be seen is the use of contractors to mark-out facilities. This has been tried on a limited experimental basis in some areas. A contractor is selected and can be provided with the necessary maps and plans of a particular member. The contractor then handles the field locating for this member. The potential in such a program is great as it opens the door to the possibility of a joint utility marking program. A true "single dispatch" system is envisioned where one individual locates all the buried facilities at an excavation site. The time, equipment, and expense which could be saved by utilities subscribing to such a program would be vast indeed.

It must be emphasized, however, that these locating procedures are being used only on a limited basis with further study being required.

One-call technology is changing rapidly. To obtain the latest information on what's new in one-call, please contact any region representative of the ULCC One-Call Systems International Committee.

CONCLUSION

The American Public Works Association is a non-profit, professional organization of people involved in the field of public works. The Association is organized around state and regional chapters, with a board of directors and seven institutes which address specialized issues in public works. In addition to these institutes, APWA offers the Utility Location & Coordination Council (ULCC).

ULCC was formed to foster cooperation among public agencies and utilities and to promote policies which would reduce related accidents and damages. A committee of ULCC is the One-Call Systems International (OCSI) Executive Committee

The OCSI Executive Committee is composed of approximately twenty United States representatives, with international representatives from Canada, the Republic of China, the United Kingdom, and Denmark. The purpose of this committee is to promote the establishment of one-call notification systems and to provide guidance and assistance to such operations.

It is recognized that this manual may not answer all the questions persons new to one-call systems may have. If you have questions or need further guidance please contact your regional representative. The regional representative will be able to provide samples of legislation, operating procedures, bylaws, and contracts. The regions and the representatives serving those areas are listed in the One-Call Systems Directory available through the APWA headquarters, 1313 East 60th Street, Chicago, Illinois 60637.

APPENDIX I
SUPPORT INDUSTRIES

The following list of companies is provided strictly as a courtesy and is meant to supply contacts in one-call related fields. These firms support the goals and objectives of the One-Call Systems International Committee and have participated as vendors in past symposia on "One-Call Systems and Damage Prevention." Their listing here should not be construed to be an endorsement or recommendation of their products or services.

A. One-Call System Vendor Operators

Academy Computing Corporation
2601 N.W. Expressway, Suite 110E
Oklahoma City, OK 73112

Asplundh Underground Location Communication Division
Blair Mill Road
Willow Grove, PA 19090

Hood Corporation
8201 South Sorensen Ave., P.O. Box 4368
Whittier, CA 90607

One Call Concepts, Inc.
P.O. Box 196
Clarksville, MD 21029

Shelton Enterprises, Inc.
3501 Newland Road
Baltimore, MD 21218

Tesinc
1305 North Central Avenue
Phoenix, AZ 85004

United Information Services
3 Allegheny Center
Pittsburgh, PA 15212

Utility Systems Inc.
P.O. Box 369
Royal Oak, MI 48068

B. Office Equipment Vendors

Dictaphone Corp.
120 Old Post Road
Rye, NY 10580

Lanier Business Products
1700 Chantilly Drive
Atlanta, GA 30324

C. Computer/Automated Equipment Vendors

American Bell Inc.
3 Bala Plaza, West, 6th Flr.
Bala Cynwyd, PA 19004-3515

BetaCom Corporation
245 East Sixth Street
St. Paul, MN 55101

Collier-Jackson & Assoc.
1805 North Westshore Blvd.
Tampa, FL 33607

Com-Squared Systems, Inc.
278 Chester St.
St. Paul, MN 55107

TRT Data Products/Norfield Communications Division
3 Depot Pl./P.O. Box 549
East Norwalk, CT 06855

Teletype Corporation
5555 Touhy Ave.
Skokie, IL 60076

D. Graphics/Mapping Vendors

Graphco
1815 St. Clair Ave.
Cleveland, OH 44114

Information Design, Inc.
1300 Charleston Road
Mountain View, CA 94043

E. Field Equipment (Paint, Sign, Stakes, etc.)
Aervoe Pacific Company, Inc.
P.O. Box 1238
Indian Rocks Beach, FL 33535

Berntsen Cast Products, Inc.
P.O. Box 8666
Madison, WI 53708

Carsonite International Corp.
2900 Lockheeh Way
Carson City, NV 89701

Eastern Metal of Elmira, Inc.
1430 Sullivan Street
Elmirs, NY 14901

Muir Omni-Graphics
716 West Main Street
Peoria, IL 61606

Seymour of Sycamore, Inc.
917 Crosby Avenue
Sycamore, IL 60178

W.H. Brady Co., Signmark (TM) Division
727 West Glendale Ave.
Milwaukee, WI 53201

F. Locating Equipment

Automation Products Co.
11705 Research Blvd., P.O. Box 9429
Austin, TX 78766

Dynatel Department/3M
380 North Pastoria Avenue
P.O. Box 60549
Sunnydale, CA 60549

Fisher Research Laboratory
1005 I Street
Los Banos, CA 93635

Goldak Company
626 Sonora Avenue
Glendale, CA 91207

Heath Consultant
P.O. Box 456, 100 Tosca Drive
Stoughton, MA 02072

Metrotech Corporation
670 National Avenue
Mountain View, CA 94043

Progressive Electronics
432 South Extension Road
Mesa, AZ 85202

Radar Engineers
4654 North East Columbia Blvd.
Portland, OR 97218

Radiodetection Corporation
32 South Broad Street
Ridgewood, NY 07450

Schonstedt Instrument Company
1775 Wiehle Avenue
Reston, VA 22090

Triple D Marketing Corporation
8201 West 14th Avenue
Lakewood, CO 80215

Utility Tool Company
2900 Commerce Blvd.
Birmingham, AL 36210

G. Specialty Advertising Vendors

Barger Advertising Specialties, Inc.
123 C Leisure La., Rte #6
Gainsville, GA 30506

Premiums & Promotions, Inc.
211 North 5th Street
Columbus, OH 43215

National Specialties
4350 South Washington Avenue
Tacoma, WA 98409

Von Senden Company
1844 Ardmore Blvd.
Pittsburgh, PA 15221

APPENDIX II

AUDIO VISUAL AIDS AVAILABLE

Almost every one-call system has some sort of visual aid to promote and explain use of the plant protection service they provide. It may be in the form of a slide show, a 16 mm or 8 mm movie, a video tape or even a 60 second taped jingle used during radio spots. Much can be learned about the workings of other one-call systems and many ideas can be generated for your own system by viewing these materials. Three highly recommended films are:

1. "What's it going to cost you?" - This film looks at what happens when excavators neglect to notify buried plant owners prior to digging. It sets up a situation ripe for the implementation of a one-call system. (Price: $350).

2. "Did I make the call?"-This film examines how a one-call system, once established, works. It takes you from the placement of the call right through to the field markings provided on the work site. It also explains what a one-call system can do for you. (Price: $500).

3. "Who's Responsible?" - This film is a motivational film to be shown to homeowners, excavators, utility personnel or whomever else may do any digging. The consequences of <u>not</u> calling are depicted. (Price: $250).

New media programs are constantly being created and the old ones are continually being updated. Therefore, rather than attempting to compile a complete list of presentations available, it is suggested that you contact the One-Call Systems International Committee person who represents your region. He or she will do their best to help ascertain what is currently available and then help you obtain it.

APPENDIX III

SUPPLEMENTARY READING MATERIAL

1. <u>One-Call Systems Directory</u> - Published and updated on an annual basis, this book contains pertinent information on one-call systems world wide. System contact names and numbers, information on legislation, and a listing of region representatives for the OCSI Committee are also included.

2. <u>Subsurface Utility Facilities Location Techniques and Detection Devices</u> - Produced by APWA's Utility Location and Coordination Council, this book examines the how to's of underground facility locating. It includes a detection device directory which lists equipment available, approximate costs, and helpful remarks about the devices.

Both these booklets are available from the American Public Works Association

APPENDIX C

ONE-CALL SYSTEMS DIRECTORY, 1984-1985

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ONE-CALL SYSTEMS

$1.00

1984-85 DIRECTORY

AMERICAN PUBLIC WORKS ASSOCIATION
UTILITY LOCATION & COORDINATION COUNCIL
1313 EAST 60TH STREET CHICAGO, ILL. 60637 (312) 667-2200

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American Public Works Association
UTILITY LOCATION AND COORDINATION COUNCIL

Cooperative Members are organizations affiliated with the Council which have appointed an official representative to serve as a member of the ULCC Advisory Panel. Presently represented are:

Alliance of American Insurers
American Association of State Highway and Transportation Officials
American Congress on Surveying and Mapping
American Gas Association
American Insurance Association
American Petroleum Institute
American Public Gas Association
American Public Power Association
American Road and Transportation Builders Association
American Society of Civil Engineers
American Society of Mechanical Engineers
American Society of Photogrammetry
American Society of Safety Engineers
American Water Works Association
Associated General Contractors of America
Distribution Contractors Association
Edition Electric Institute
International Right of Way Association
International Union of Operating Engineers
Interstate Natural Gas Association of America
National Association of Home Builders
National Association of Regulatory Utility Commissioners
National Utility Contractors Association
Pipe Line Contractors Association
Power and Communication Contractors Association
Roads and Transportation Association of Canada
Water Pollution Control Association

Contents

The APWA Uniform Color Code

Utility and Type of Product with Specific Group Identifying Color

Safety Red
Electric power, distribution, and transmission
Municipal electric systems

High Visibility Safety Yellow
Gas distribution and transmission
Oil distribution and transmission
Dangerous materials, product lines, steam lines

Safety Alert Orange
Telephone and telegraph systems
Police and fire communications
Cable television

Safety Precaution Blue
Water systems
Slurry pipe lines

Safety Green
Sewer systems

One-Call System Definition

What Is It?

It is a communication system established by two or more utilities, governmental agencies or other operators of underground facilities to provide one telephone number for excavating contractors and the general public to call for notification of their intent to use equipment for excavating, tunnelling, demolition or any other similar work. This one-call system provides the participating members an opportunity to identify and locate their underground facilities.

Why Is It Needed?

Damage to underground facilities increased considerably following the building boom of the '50s, '60s and early '70s when the trend was to go underground with utilities. Thousands of miles of underground facilities were volnerable to excavating machines such as backhoes and the resulting damage interrupted utility service and threatened life, health and property.

How To Get It

Write or call the member of ULCC One-Call Systems International Committee representing the area within your APWA region shown on the map. He will be pleased to assist you. For further information on ULCC programs, write APWA headquarters.

Disclaimer

The purpose of this Directory is to illustrate the extent of one-call service available. The accuracy of information is not guaranteed by APWA or the one-call systems. Users must verify information including the extent and limit of service from local sources.

ULCC One-Call Systems International Committee

CHAIRMAN: Tom Odegaard — Utilities Underground Location Center; 12951 Bel-Red Road, Bellevue, WA 98005, (206) 454-6888.

VICE-CHAIRMAN: Jeff L. Hogner — Panhandle Eastern Pipeline Company; P.O. Box 68780, Indianapolis, IN 46268, (317)293-1452.

SECRETARY: Claudette Campbell — Utilities Protection Center; 276-100 Perimeter Center Place, Atlanta, GA 30346, (404) 391-5780.

LEGAL ADVISOR: William P. Boswell — The Peoples Natural Gas Company; 14th Floor - Two Gateway Center, Pittsburgh, PA 15222, (412) 471-5100, ext. 318.

United States Representatives

Tennessee
Leamon Andrews — Tennessee One Call System, Inc.; 293 Plus Park Blvd., Suite E, Nashville, TN 37217, (615) 367-0625

Georgia, North Carolina, South Carolina
Claudette Campbell — Utilities Protection Center; 276-100 Perimeter Center Place, Atlanta, GA 30346, (404) 391-5780.

New York
Robert Foster — Underground Facilities Protection Org.; 3650 James Street, Syracuse, NY 13206, (315) 696-5355.

Ohio, Michigan
Richard Fremion — Panhandle Eastern Pipeline; 25419 Paulding, Monroeville, IN 46773, (219) 623-6118.

New Mexico, Arizona, Texas
Richard Heller — DMJM/Adam, Hamlyn, Anderson; 4055 Montgomery Blvd. NE, Suita A, Albuquerque, NM 87109, (505) 881-1808.

Northern California, Nevada
John Heyer — USA North; 2190 Meridian Park Blvd., Concord, CA 94520, (415) 798-9504.

Missouri, Indiana, Illinois, Kentucky
Jeff L. Hogner — Panhandle Eastern Pipeline Company; P.O. Box 68780, Indianapolis, IN 46268, (317) 293-1452.

Wisconsin
Susan Horejs — Diggers Hotline; 2040 West Wisconsin Avenue, Suite 380, Milwaukee, WI 53233, (414) 344-7398.

Southern California, Hawaii
Mark Hoyal — USA South; 320 North Wilshire, Anaheim, CA 92801, (714) 956-5230.

Maine, Vermont, New Hampshire, Massachusetts, Rhode Island
John G. Kelley, Jr.; 501-245 State Street, Boston, MA 02109, (617) 574-1793.

Pennsylvania, New Jersey, West Virginia
Bill Kiger — Pennsylvania One Call System, Inc.; Three Allegheny Center, Pittsburgh, PA 15212, (412) 323-7111.

Florida, Puerto Rico
Jan Klatt — Call Candy; 610 Morgan Street, MC-1795, Tampa, FL 33602, (813) 224-7750.

Colorado, Wyoming
Jay M. Kole — City of Fort Collins; P.O. Box 580, Fort Collins, CO 80522, (303) 221-6605.

North Dakota, South Dakota, Nebraska, Minnesota, Iowa
Clarence Leikam — Northwestern Bell; 200 South Fifth Street, Minneapolis, MN 55402, (612) 344-4451.

Oklahoma, Kansas
Lee Marrs — Academy Computing Corporation; 2601 NW Expressway,Suite 110E, Oklahoma City, OK 73112, (405) 840-2791.

Alabama, Mississippi, Louisiana, Arkansas
Joy Moore — Alabama Line Location Center; 205-55 Bagby Drive, Birmingham, AL 35209, (205) 972-3986.

Oregon, Washington, Idaho, Alaska
Tom Odegaard — Utilities Underground Location Center; 12951 Bel-Red Road, Bellevue, WA 98005, (206) 454-6888.

Connecticut
Steve Rieben — Call Before You Dig; 105 Sanford Street, Hamden, CN 06514, (203) 281-3702.

Utah, Montana
Roger Swenson — Blue Stake Center; 2880 South Main, Central Park Plaza, Suite 117, Salt Lake City, UT 84115, (801) 487-6861.

Deleware, Maryland, District of Columbia, Virginia
Melvin R. Wyatt — Miss Utility of Delmarva; 146 South State Street, Dover, DE 19901, (302) 678-1421.

International Representatives

Eastern Canada
(New Brunswick, Quebec, Nova Scotia, Newfoundland)
Jean Fortin — Bell Canada; 1050 University Avenue, Room 435, Montreal, Quebec, (514) 870-4763.

Western Canada
(Alberta, British Columbia, Saskatchewan, Manitoba)
Scott P. Henley — Alberta One Call Location Corporation; Box 14, Canadian Western Center, 909-11 Avenue S.W., Calgary, Alberta T2R 1L8, (403) 245-9993.

Republic of China - All Territories
Kenneth Hsi — Ministry of Communications; 42 Jeu Al Road, Section 1, Taipei, Taiwan, 100, Rep. of China.

United Kingdom
Richard T. Nitze — Secretary, National Joint Utilities Group, The Electricity Council; Engineering Dept., 30 Millbank, London, SWIP 4RD, United Kindgom.

Denmark
Bo Linneke — Cables, Posts and Telegraphs; Long Lines Office, Valdendorfsgade 9, DK-1151, Kobenhaven, K.

One Call Systems

1. **ALABAMA**

   1a. MISS ALL (Alabama Line Location Center)
   Center # 1-800-292-8525 (in Alabama)
   Contact # (205) 972-3986
   3196 Highway 280 South, Room 103N, Birmingham, AL 35243
   Steve Fraas, Supervisor
   In-House/26 Members/Statewide
   Coverage: 51,609 sq. mi./95% population
   Legislation: No; Request Time: 48 hours

2. **ALASKA**

3. **ARIZONA**

   3a. BLUE STAKE (Phoenix)
   Center # (602) 263-1100
   Contact # (602) 234-2023
   3105 N. Third Street, Phoenix, AZ 85012
   Jim Gronek
   Contract/20 Members/Maricopa County
   Coverage: 55.7% population
   Legislation: Yes; Request Time: 2 work days

   3b. BLUE STAKE CENTER (Sierra Vista)
   Center # (602) 458-6900;
   Contact # (602) 235-3155 Al Meins
   (602) 234-2023 Jim Gronek
   150 Willcos Drive, Sierra Vista, AZ 85635
   Al Meins, Jim Gronek
   Contract/6 Members/Sierra Vista Area
   Coverage: 57% population
   Lesiglation: Yes; Request Time: 2 work days

   3c. BLUE STAKE (Cottonwood)
   Center # (602) 634-2717;
   Contact # (602) 235-3155 Al Meins
   (602) 234-2023 Jim Gronek
   322 South Sixth Street, Cottonwood, AZ 86326
   Al Meins, Jim Gronek
   In-House/4 Members/Cottonwood, Sedona, Campe Verde
   Coverage: 1.7% population
   Legislation: Yes; Request Time: 2 work days

3d. BLUE STAKE (Prescott)
Center # (602) 778-0050;
Contact # (602) 235-3155 Al Meins
(602) 234-2023 Jim Gronek
255 East Gurley Street, Prescott, AZ 86301
Al Meins, Jim Gronek
In-House/6 Members/Prescott Area
Coverage: 1% population
Legislation: Yes; Request Time: 2 work days

3e. BLUE STAKE (Tuscon)
Center # (602) 792-2211;
Contact # (602) 235-3155 Al Meins
(602) 234-2023 Jim Gronek
P.O. Box 26500, Tucson, AZ 85726
Al Meins, Jim Gronek
Contract/10 Members/Tucson Area
Coverage: 18% population
Legislation: Yes; Request Time: 2 work days

3f. BLUE STAKE (Flagstaff)
Center # (602) 779-5139;
Contact # (602) 235-3155 Al Meins
(602) 234-2023 Jim Gronek
1421 South Milton, Flagstaff, AZ 86002
Al Meins, Jim Gronek
Contract/6 Members/Flagstaff Area
Coverage: 2% population
Legislation: Yes; Request Time: 2 work days

4. ARKANSAS

4a. ARKANSAS ONE CALL SYSTEM, INC.
Center # 1-800-482-8998; Contact # (501) 225-3914
P.O. Box 56373; Little Rock, AR 72205
Dale Enoch, Manager
Contract/45 Members
Coverage: Statewide
Legislation: No; Request Time: 48 hours

5. CALIFORNIA

5a. USA SOUTH (Underground Service Alert)
Center # 1 800-422-4133, Contact # (714) 956-5230
320 North Wilshire, Anaheim, CA 92801
Mark Hoyal, President
In-House/253 Members
Coverage: 9 Counties
Legislation: Yes; Request Time: 2 working days

5b. USA NORTH (Underground Service Alert)
Center # 1-800-642-2444; Contact # (415) 798-9504
2190 Meridian Park Blvd., Concord, CA 94520
Mike Heyer
Contract/212 Members
Coverage: 50 Counties
Legislation: No; Request Time: 2 working days

6. COLORADO

6a. MESA COUNTY BURIED UTILITIES LOCATION SERVICE
Center # (303) 245-2555; Contact # (303) 244-4325
619 Main, Grand Junction, CO 81501
Contract/Members/Grand Valley Area
Legislation: Yes; Request Time: 2 working days

6b. BLUE STAKE
Center # (303) 534-6700; Contact # (303) 571-3730
Room 203, 1123 West Third Avenue, Denver, CO 80223
In-House/12 Members/Denver Metro Area
Legislation: Yes; Request Time: 2 working days

6c. CENTRAL LOCATING UNIT
Center # (303) 636-5333
350 Karen Lane, Colorado Springs, CO 80909
In-House/4 Members/Metro Area
Legislation: Yes; Request Time: 2 working days

6d. FORT COLLINS-LOVELAND ONE CALL
Center # (303) 484-0300; Contact # (303) 221-6605
700 Wood Street, Fort Collins, CO 80521
Jay M. Kole
In-House/6 Members/Larimer County
Lesiglation: Yes; Request Time: 2 working days

7. CONNECTICUT

7a. CALL BEFORE YOU DIG
Center # 1-800-922-4455 (In-state)
(203) 281-5435 (Out-of-state)
Contact # (203) 281-3702
105 Sanford Street, Hamden, CT 06514
Stephen G. Rieben, Manager
Contract/296 Members
Coverage: Statewide
Legislation: Yes; Request Time: 2 working days

8. DELAWARE

8a. "MISS UTILITY" OF DELAMARVA
Center # 1-800-282-8555 (In-state)
1-800-441-8355 (Out-of-state)
Contact # (302) 678-1421
146 S. State Street, Dover, DE 19901
Melvin R. Wyatt
In-House/22 Members
Coverage: Delmarva Peninsula
Legislation: Yes; Request Time: 2 working days

9. FLORIDA

9.a. "CALL CANDY"
Center # 1-800-282-8881; Contact # (813) 224 7750
610 Morgan St., MC-1795, Tampa, FL 33602
Jan Klatt, Manager
In-House/25 Members
Coverage: 7 Counties
Legislation: Yes; Request Time: 2 working days

9b. CALL U.N.C.L.E. (Utility Notification Center)
Center # 1-800-432-4775; Contact # (305) 492-3127
Room 505, 6451 N. Federal Highway, Ft. Lauderdale, FL 33308
Charles C. Kimbrell
In-House/28 Members
Coverage: 6 Counties
Legislation: Yes; Request Time: 2 working days

9c. UNDERGROUND UTILITIES NOTIFICATION CENTER
Center # (305) 264-6820; 1-800-432-4160
Contact # (305) 264-6878
Room 359, 666 Northwest 79th Avenue, Miami, FL 33126
Charles C. Kimbrell, Manager
In-House/14 Members
Coverage: Dade County
Legislation: Yes; Request Time: 2 working days

9d. CALL BEFORE YOU DIG
Center # (904) 877-6688; Contact # (904) 599-1352
P.O. Box 2214, Tallahassee, FL 32304
Bill McGlamery, Manager
In-House/5 Members
Coverage: 4 Counties
Legislation: Yes; Request Time: 24 hours

10. GEORGIA

10a. UTILITIES PROTECTION CENTER
Center # 1-800-282-7411; (404) 325-5000 Metro Atlanta
Contact # (404) 391-5780
276-100 Perimeter Center Pl., Atlanta, GA 30346
Claudette L. Campbell, Manager
In-House/62 Members
Coverage: Statewide
Legislation: Yes; Request Time: 3 working days

11. HAWAII

12. IDAHO

12a. PALOUSE EMPIRE UNDERGROUND COORDINATING COUNCIL
Center # (208) 882-1794; Contact # (509) 332-2911
122 East 4th Street, Moscow, ID 83843
Van Lybyer
In-House/7 Members
Coverage: Latah County
Legislation: No; Request Time: 24 hours

12b. UTILITIES UNDERGROUND LOCATION CENTER
Center # 1-800-426-1444 (In-state)
1-800-424-5555 (In Washington)
Contact # (206) 454-6888
1251 Bel-Red Road, Bellevue, WA 98005
Tom Odegaard
Contract/13 Members
Coverage: 6 Counties
Legislation: No; Request Time: 2 working days

12c. DIG-LINE
Center # (208) 343 6700; Contact # (208) 385-2512
1315 W. Amity, Boise, ID 83707
Bob Banks
Contract/6 Members
Coverage: 3 Counties
Legislation: No; Request Time: 48 hours

12d. PANHANDLE UTILITY COORDINATING COMMITTEE
Center # ZE-9169; Contact # (208) 765-4451
General Telephone, I & M Dept.,
P.O. Box 1057, Cocur D'Arlene, ID 83814
Bob Van Skyock
Contract/17 Members
Coverage: 3 Counties
Lesiglation No; Request Time: 24 hours

13. ILLINOIS

13a. J.U.L.I.E.
Center # 1-800-892-0123; Contact # (815) 740-4500
Suite 218, 3033 W. Jefferson, Joliet, IL 60435
Larry Pattenaude
Contract/150 Members
Coverage: Statewide except Chicago
Legislation: No; Request Time: 2 working days

13b. DIGGER (Chicago Utility Alert Network)
Center # (312) 744-7000; Contact # (312) 744-4062
Room 802, 121 N. LaSalle, Chicago, IL 60602
Fred Stone
In-House/6 Members/Chicago Area
Coverage: 1,400 sq. mi./26% population
Legislation: No; Request Time: 2 working days

14. INDIANA

14a. INDIANA UNDERGROUND PLANT PROTECTION SERVICE, INC.
Center # 1-800-382-5544;
1-800-428-5200 (Out-of-state)
Contact # (317) 842-8378
Suite 205, 6535 E. 82nd Street, Indianapolis, IN 46250
Herman E. Keesee, Manager
Contract/84 Members/Statewide
Coverage: 36,291 sq. mi./100% population
Legislation: No; Request Time: 48 hours

15. IOWA

15a. UNDERGROUND PLANT LOCATION SERVICE, INC.
Center # 1-800-292-8989 (In-state);
1-800-248-2013 (Out-of-state)
Contact # (319) 326-3829
2711 West 63rd Street, Davenport, IA 52806
Bill Burbridge
Contract/26 Members
Coverage: Statewide
Legislation: No; Request Time: 2 working days

16. KANSAS

16a. KANSAS ONE CALL CENTER
Center # 1-800-DIG-SAFE; Contact # (316) 687-4286
1097 Parklane, Wichita, KS 67218
Earlene Lumrey
Contract/82 Members
Coverage: Statewide
Legislation: No; Request Time: 48 hours

17. KENTUCKY

17a. BUD (Before-U-Dig)
Center # 1-800-752-6007; Contact # (502) 582-8239
P.O. Box 32410, 521 W. Chesnut, Louisville, KY 40232
Rendi Mann-Stadt
In-House/25 Members
Coverage: Statewide except Cinncinati Bell Area
Legislation: No; Request Time: 48 hours

18. LOUISIANA

18a. DOTTIE (Dial One Time to Inform Everyone)
Center # 1-800-272-3020 (In-state); Contact # (504) 383-7474
Room 402, 525 Florida Street, Baton Rouge, LA 70801
Harold J. Burke, Manager
Contract/80 Members
Coverage: Statewide
Legislation: No; Request Time: 48 hours

19. MAINE

19a. DIG-SAFE
(See 21a Massachusetts)
Center # 1-800-225-4977 (In-state);
(617) 229-2770 (Out-of-state)
Legislation: Yes; Request Time: 48 hours

20. MARYLAND

20a. MISS UTILITY
Center # (301) 559-0100; Contact # (301) 779-7334
6505 Belcrest Road, Suite 7, Hyattsville, MD 20782
Tom Hoff
Contract/29 Members
Coverage: Northern Virginia, Maryland & Washington, D.C.
Legislation: Yes; Request Time: 2 working days

20b. "MISS UTILITY" OF DELMARVA
Center # 1-800-282-8555 (In-state);
1-800-441-8355 (Out-of-state)
Contact # (302) 678-1421
146 S. State Street, Dover, DE 19901
Melvin R. Wyatt
In-House/22 Members
Coverage: Eastern Maryland
Legislation: Yes; Request Time: 2 working days

21. MASSACHUSETTS

21a. DIG-SAFE
Center # 1-800-322-4844; Contact # (617) 229-2770
Corporate Place #4, 111 S. Bedford St., Burlington, MA 01802
Contract/80 Members
Coverage: Maine, Massachusetts, New Hampshire, Vermont, Rhode Island
Lesiglation: Yes; Request Time: 72 hours

22. MICHIGAN

22a. MISS DIG
Center # 1-800-482-7171 (In-state);
(313) 647-7344 (Out-of-state)
Contact # (313) 549-4301
4600 Coolidge Highway, Royal Oak, MI 48068
Mike Digon
Contract/483 Members
Coverage: Statewide
Legislation: Yes; Request Time: 2 working days

23. MINNESOTA

24. MISSISSIPPI

24a. MISSISSIPPI ONE CALL CENTER
Center # 1-800-227-6477; Contact # (601) 362-4322
2906 N. State Street, Jackson, MS 39216
Sam Johnson
Contract/55 Members
Coverage: Statewide
Legislation: No; Request Time: 48 hours

25. MISSOURI

25a. TO BEGIN
Center # (417) 862-3446; Contact # (417) 831-8541
Jewell Station, P.O. Box 551, Springfield, MO 65801
Wendell Jones, P.E./Richard Cox, L.S.
In-House/4 Members/Springfield Area
Legislation: Yes; Request Time: 48 hours

26. MONTANA

27. NEBRASKA

27a. ONE CALL COVERS ALL
Center #(402) 344-3565;
1-800-642-8434 (in WATS)
Contact # (402) 558-0041
910 North 43rd Avenue, Omaha, NE 68131
Lou Mayberry
In-House/9 Members
Coverage: Metro Omaha (Statewide for Telephone Co. only)
Legislation: No; Request Time: 2 working days

27b. LINCOLN UTILITIES COORDINATING COUNCIL
Center # (402) 477-0547; Contact # (402) 476-5349
P.O. Box 81309, Lincoln, NE 68501
Don Williams
In-House/5 Members
Coverage: Lincoln Area
Legislation: No; Request Time: 24 hours

28. NEVADA

28a. USA NORTH (Underground Service Alert)
Center # 1-800-227-2600; Contact # (415) 798-9504
J.G. Heyer, Manager
Contract/212 Members
Coverage: Statewide
Legislation: No; Request Time: 2 working days

29. NEW HAMPSHIRE

29a. DIG-SAFE
(See 21a Massachusetts)
Center # 1-800-225-4977 (In-state);
(617) 229-2770 (Out-of-state)
Legislation: Yes; Request Time: 72 hours

30. NEW JERSEY

30a. GARDEN STATE UNDERGROUND PLANT LOCATION SERVICE, INC.
Center # 1-800-272-1000 (In-state);
(201) 232-1232 (Out-of-state)
Contact # (201) 232-9559
2450 Westfield Avenue, Scotch Plains, NJ 07076
Anthony Chiaramonte, Manager
Contract/32 Members/Statewide
Coverage: 7,520 sq. mi./100% population
Legislation: Yes; Request Time: 3 days

31. NEW MEXICO

31a. BLUE STAKE (Farmington)
Center # (505) 327-3777; Contact # (505) 327-7711
P.O. Box 900, Farmington, NM 87401
Chuck Gile, Utility Council President
In-House/9 Members
Coverage: 1 County
Lesiglation: Yes; Request Time: 24 hours

31b. BLUE STAKE (Grants-Milan Utility Council)
Center # (505) 287-9292; Contact # (505) 285-4621
P.O. Box 879, Grants, NM 87020
Dave Bryant, Utility Council President
In-House/6 Members
Coverage: 1 County
Legislation: Yes; Request Time: 2 working days

31c. BLUE STAKE (Albuquerque)
Center # (505) 765-1234; Contact # (505) 766-7467
Room 403, City Hall, 400 Marquette Avenue, NW,
Albuquerque, NM 87103
Thomas A. Shaffer, Coordinator
In-House/5 Members
Coverage: 6 Counties
Legislation: No; Request Time: 2 working days

31d. BLUE STAKE (Gallup)
Center # (505) 863-3330; Contact # (505) 268-7104
P.O. Box 1270, Gallup, NM 87301
Don Jordan, Utility Council Secretary
In-House/6 Members
Coverage: 1 County
Legislation: Yes, Request Time: 2 working days

31e. BLUE STAKE (Santa Fe)
Center # (505) 988-8841; Contact # (505) 471-0056
P.O. Box 1389, Santa Fe, NM 87501
Tom Perry, Utility Council President
In-House/5 Members
Coverage: 2 Counties
Legislation: Yes, Request Time: 24 hours

31f. BLUE STAKE (Las Vegas)
Center #(505) 425-3898; Contact # (505) 425-5843
P.O. Box 150, Las Vegas, NM 87701
Bill Swift, Supervisor
In-House/3 Members
Coverage: 1 County
Legislation: Yes; Request Time: 24 hours

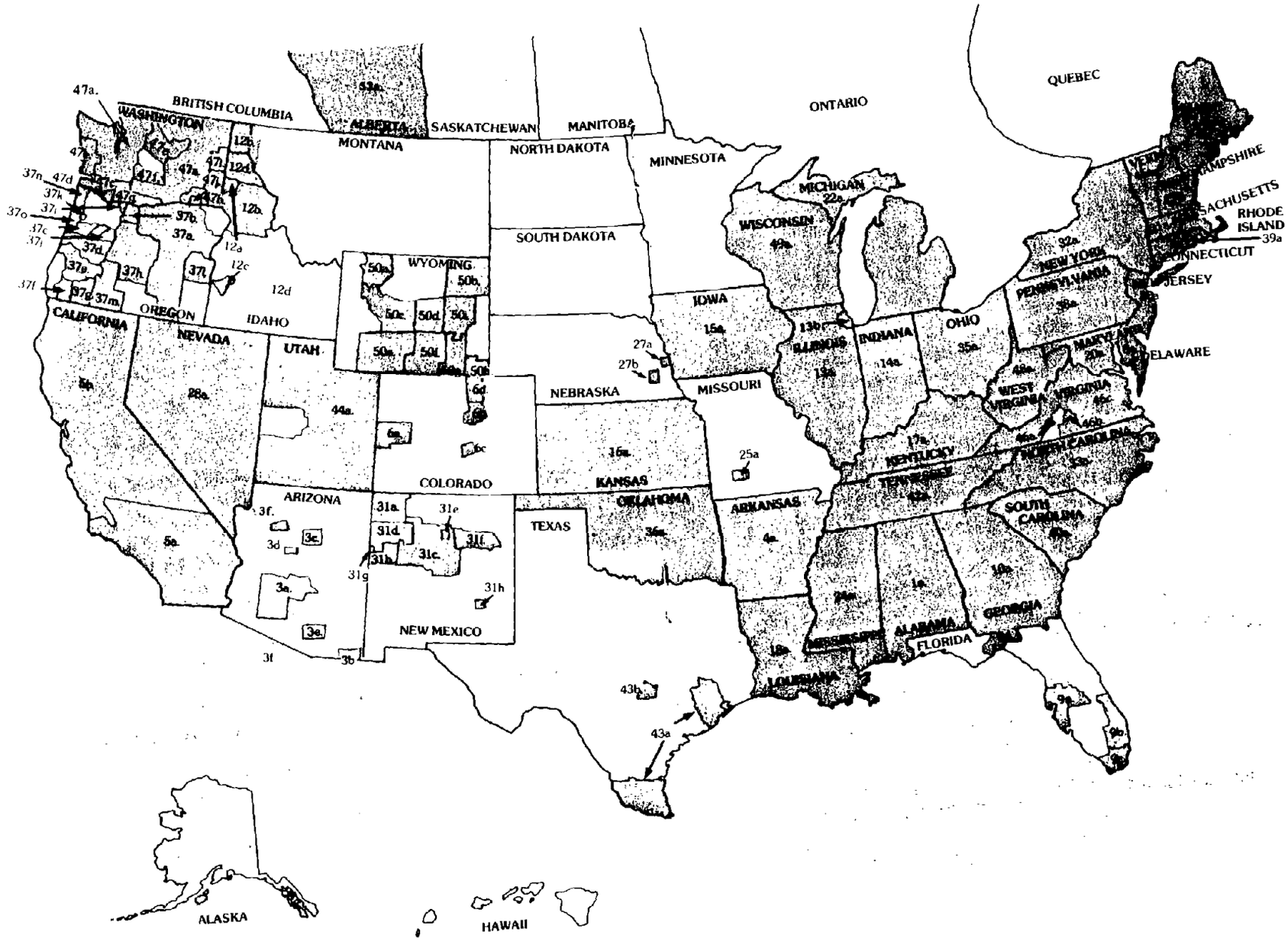
31g. BLUE STAKE (Zuni)
Center # (505) 782-4411; Contact # (505) 782-4411
P.O. Box 466, Zuni, NM 87327
Dick Lenius, Manager
In-House/5 Members
Coverage: 1 County
Legislation: Yes; Request Time: 24 hours

31h. BLUE STAKE (Roswell)
Center # (505) 622-1234; Contact # (505) 622-3838
D.E. McDaniel
In-House/5 Members
Coverage: Roswell and vicinity
Legislation: Yes; Request Time: 2 working days

32. NEW YORK

32a. UTILITY COORDINATING COMMITTEE
Center # 1-800-962-7962; Contact # (716) 442-2000
89 East Avenue, Rochester, NY 14649
Ray Ottman, Committee Chairman
Contract/6 Members
Coverage: 5 Counties
Legislation: Yes; Request Time: 2 working days

32b. UNDERGROUND FACILITIES PROTECTION ORGANIZATION, INC.
Center # (315) 437-7333; 1-800-962-7962;
Contact # (315) 696-5855
3650 James Street, Syracuse, NY 13206
Bob Foster, Chairman
Contract/50 Members
Coverage: 38 counties
Legislation: Yes; Request Time: 2 working days


BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
MICHIGAN
WISCONSIN
SOUTH DAKOTA
WYOMING
IOWA
NEW YORK
PENNSYLVANIA
OREGON
IDAHO
NEBRASKA
ILLINOIS
INDIANA
OHIO
CALIFORNIA
NEVADA
UTAH
COLORADO
KANSAS
MISSOURI
WEST VIRGINIA
KENTUCKY
ARIZONA
OKLAHOMA
ARKANSAS
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
TEXAS
NEW MEXICO
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
LOUISIANA
RHODE ISLAND
CONNECTICUT
DELAWARE
ALASKA
HAWAII

32c. UNDERGROUND UTILITY LOCATING SERVICE
Center # (716) 893-1133; Contact # (716) 849-0785
Room 400, Convention Tower, Buffalo, NY 14202
Beverly Josephs
Contract/5 Members
Coverage: 8 Counties
Legislation: Yes; Request Time: 2 working days

32d. UNDERGROUND UTILITIES CALL CENTER
Center # 1-800-245-2828; Contact # (412) 323-7111
Three Allegheny Center, Pittsburgh, PA 15212
William G. Kiger, Director of Operations
Contract/17 Members
Coverage: 9 Counties
Lesiglation: Yes; Request Time: 2 working days

32e. UTILITY CALL CENTER
Center # (516) 661-6000; Contact # (516) 231-6500
780 Sunrise Highway, W. Babylon, NY 11704
M.R. Neuwirth
Contract/2 Members
Coverage: 3 Counties
Legislation: Yes; Request Time: 2 working days

33. NORTH CAROLINA

33a. UTILITIES LOCATION CO., INC. "ULOCO"
Center # 1-800-632-4949; Contact # (919) 855-5760
Suite 110, 2306 W. Meadowview Road, Greensboro, NC 27407
Carolyn Carter, Manager
Contract/50 Members
Coverage: Statewide
Legislation: No; Request Time: 48 hours

34. NORTH DAKOTA

35. OHIO

35a. OHIO UTILITIES PROTECTION SERVICE
Center # 1-800-362-2764; Contact # (216) 744-5191
City Center One, 100 Federal Plaza E, Youngstown, OH 44503
Chuck Gabriel, Manager
In-House/62 Members
Coverage: Statewide
Legislation: No; Request Time: 2 working days

35b. UNITED UTILITIES PROTECTION SERVICE
Center # (513) 397-4664; Contact # (513) 397-3441
201 E. 4th Street, Room 274, Cincinnati, OH 45201
Jim Hodde
In-House/2 Members
Coverage: 7 Counties
Legislation: No

36. OKLAHOMA

36a. OKLAHOMA ONE-CALL SYSTEM, INC.
Center # 1-800-522-6543; Contact # (405) 840-9955
Suite 261, 6161 North May Avenue, Oklahoma City, OK 73112
James A. Hill, Executive Director
Contract/130 Members
Coverage: Statewide
Legislation: Yes; Request Time: 48 hours

37. OREGON

37a. UTILITIES UNDERGROUND LOCATION CENTER
Center # 1-800-424-5555; Contact # (206) 454-6888
12951 Belp-Red Road, Bellevue, WA 98005
Tom Odegaard
Contract/14 Members
Coverage: 9 Counties
Legislation: No; Request Time: 2 working days

37b. WASCO COUNTY UNDERGROUND COORDINATING COUNCIL
Center # (503) 298-5152; Contact # (503) 296-2060
P.O. Box 599, The Dalles, OR 97058
Contract/12 Members
Coverage: Wasco County
Legislation: No; Request Time: 24 hours

37c. LINN BENTON UTILITIES COORDINATING COUNCIL
Center # (503) 752-8631; Contact # (503) 929-3124
P.O. Box 1664, Corvallis, OR 97339
Mel Rowie
Contract/9 Members
Coverage: Benton & NW Linn County
Legislation: No; Request Time: 24 hours

37d. LANE UTILITIES COORDINATING COUNCIL
Center # (503) 342-6676; Contact # (503) 746-8451, ext. 407
P.O. Box 300, Springfield, OR 97477
V. Pauline Clark
Contract/40 Members
Coverage: Lane County
Legislation: No; Request Time: 24 hours

37e. DOUGLAS UTILITIES COORDINATING COUNCIL
Center # (503) 673-6676; Contact # (503) 672-1165
P.O. Box 1520, Roseburg, OR 97470
Al Haskit
Contract/21 Members
Coverage: Douglas County
Legislation: No; Request Time: 24 hours

37f. JOSEPHINE UTILITIES COORDINATING COUNCIL
Center # (503) 476-6676; Contact # (503) 476-6804
P.O. Box 1023; Grants Pass, OR 97526
John Schwendener
Contract/7 Members
Coverage: Josephine County
Lesiglation: No; Request Time: 24 hours

37g. ROUGE BASIN UTILITY COORDINATING COUNCIL
Center # (503) 668-6676; Contact # (503) 826-3122
P.O. Box 1148, Medford, OR 97501
Larry James
Contract/Jackson County
Legislation: No; Request Time: 24 hours

37h. CENTRAL OREGON COORDINATING COUNCIL
Center # (503) 389-6676; Contact # (503) 382-1011
P.O. Box 1209, Bend, OR 97701
Bill Inman
Contract/8 Members
Coverage: 5 Counties
Legislation: No; Request Time: 24 hours

37i. HOODRIVER UNDERGROUND COORDINATING COUNCIL
Center # (503) 386-4505; Contact # (503) 386-0710
1206 12th Street, Hoodriver, OR 97031
Bill Broderick
Contract/20 Members
Coverage: Hoodriver County
Legislation: No; Request Time: 24 hours

37j. EAST LINN COORDINATING COUNCIL
Center # (503) 259-2992; Contact # (503) 929-3124
P.O. Box 582, Lebanon, OR 97355
Richard Burdick
Contract/12 Members
Coverage: Eastern Linn County
Legislation: No; Request Time: 24 hours

37k. CITY OF DALLAS UTILITY COORDINATING COUNCIL
Center # (503) 623-2338; Contact # (503) 623-2338, ext. 39
P.O. Box 67, Dallas, OR 97338
Barbara Cooper
In-House/6 Members
Coverage: City of Dallas
Legislation: No; Request Time: 24 hours

37l. MALHEUR UTILITY COORDINATING COUNCIL
Center # (503) 889-2468; Contact # (503) 889-5391
P.O. Box 550, Ontario, OR 97914
George Vikers
Contract/8 Members
Coverage: Malheur County
Legislation: No; Request Time: 24 hours

37m. KLAMATH UTILITY COORDINATING COUNCIL
Center # (503) 884-6676; Contact # (503) 882-3411
P.O. Box 516, Klamath Falls, OR 97601
Contract/6 Members
Coverage: Klamath County
Legislation: No; Request Time: 24 hours

37n. NORTH LINCOLN COUNTY UTILITY COORDINATING COUNCIL
Center # (503) 994-3900; Contact # (503) 996-2151
P.O. Box 50, Lincoln City, OR 97363
Mary Salinas
Contract/10 Members
Coverage: North Lincoln County
Legislation: No; Request Time: 48 hours

37o. SOUTH LINCOLN COUNTY UTILITY COORDINATING COUNCIL
Center # (503) 265-7725; Contact # (503) 265-4291
810 Swalder, Newport, OR 97365
Larry Chrisler
Contract
Coverage: Southern Lincoln County
Legislation: No; Request Time: 48 hours

38. PENNSYLVANIA

38a PENNSYLVANIA ONE CALL SYSTEM, INC.
Center # 1-800-242-1776; (412) 323-7100 (Out-of-state)
Contact # (412) 323-7111
Three Allegheny Center, Pittsburgh, PA 15212
William G. Kiger, Director of Operations
Contract/52 Members
Coverage: Statewide
Legislation: Yes; Request Time: 3 working days

39. RHODE ISLAND

39a. DIG-SAFE
(See 21 Massachusetts)
Center # 1-800-225-4977 (In-state);
(617) 229-2770 (Out-of-state);
Lesiglation: Yes; Request Time: 48 hours

40. SOUTH CAROLINA

40a. PALMETTO UTILITY LOCATIONS SERVICE
Center # 1-800-922-0983 (In-state Only)
1-800-845-2594 (Out-of-state)
Contact # (803) 791-5367
Suite C, Granby Bldg., 1801 Charleston Highway, Cayce, SC 29033
Nell Elder
Contract/67 Members
Coverage: Statewide
Legislation: Yes; Request Time: 3 working days

41. SOUTH DAKOTA

42. TENNESSEE

42a. TENNESSEE ONE CALL SYSTEM, INC.
Center # 1-800-351-1111; Contact # (615) 367-0625
293 Plus Park Blvd., Suite E, Nashville, TN 37217
Leamon Andrews
Contract/92 Members
Coverage: Statewide
Legislation: Yes; Request Time: 72 hours

43. TEXAS

43a. TEXAS ONE CALL SYSTEM
Center # 1-800-245-4545; (713) 223-4567 (Houston)
Contact # (412) 323-7111
Three Allegheny Center, Pittsburgh, PA 15212
Bill Kiger, Director of Operations
Contract/22 Members
Coverage: 21 Counties
Legislation: No; Request Time: 2 working days

43b. ONE CALL (AUSTIN AREA UTILITY COORDINATING COUNCIL
Center # (512) 472-2822; Contact # (512) 477-6511, ext. 2877
c/o Construction Inspection Division, Public Works Depatment
P.O. Box 1088, Austin, TX 78745
Joetta M. Collins
In-House/9 Members
Coverage: City of Austin
Legislation: No; Request Time: 48 hours

44. UTAH

44a. BLUE STAKES CENTER
Center # 1-800-662-4111; Contact # (801) 487-6861
Central Park Plaza, Suite 117,
2880 South Main, Salt Lake City, UT 84115
Roger Swensen
Contract/10 Members
Coverage: Statewide except Daggett County
Legislation: Yes; Request Time: 48 hours

45. VERMONT

45a. DIG-SAFE
(See 21 Massachusetts)
Center # 1-800-225-4977;
(617) 229-2770 (Out-of-state)
Legislation: No; Request Time: 48 hours

46. VIRGINIA

46a. ROANOKE VALLEY UNDERGROUND LOCATION SERVICE
Center # (703) 892-2400; Contact # (703) 982-4522
2001 Patterson Avenue, Roanoke, VA 24016
D.W. Jennings
Contract/7 Members/Roanoke Area
Coverage: 303 sq. mi./4% population
Legislation: Yes; Request Time: 2 working days

46b. MISS UTILITY OF VIRGINIA
Center # 1-800-552-7001; Contact # (804) 780-0101
3600 W. Broad Street, Richmond, VA 23230
Philip Thompson
In-House/51 Members
Coverage: 59 Counties
Legislation: Yes; Request Time: 2 working days

46c. MISS UTILITY
Center # (301) 559-0100; Contact # (301) 779-7334
6505 Belcrest Road, Suite 7, Hyattsville, MD 20782
Tom Hoff
Contract/29 Members
Coverage: Northern Virginia
Legislation: Yes; Request Time: 48 hours

46d. MISS UTILITY OF DELMARVA
Center # 1-800-282-8555 (In-state);
1-800-441-8355 (Out-of-state); Contact # (302) 679-1421
146 S. State Street, Dover, DE 19901
Melvin R. Wyatt
In-House/22 Members
Coverage: Delmarva Peninsula
Legislation: Yes; Request Time: 2 working days

47. WASHINGTON

47a. UTILITIES UNDERGROUND LOCATION CENTER
Center # 1-800-424-5555; Contact # (206) 454-6888
12951 Bel-Red Road, Bellevue, WA 98005
Tom Odegaard
Contract/154 Members
Coverage: 30 Counties/75% population
Legislation: Yes; Request Time: 2 working days

47b. GRAYS HARBOR & PACIFIC COUNTY UTILITY COORDINATING COUNCIL
Center # (206) 532-3550; Contact # (206) 482-2812
c/o Pacific Northwest Bell, 101 E. Market, Aberdeen, WA 98520
George Caldwell
Contract/22 Members
Coverage: Grays Harbor County & Pacific County
Lesiglation: Yes; Request Time: 2 working days

47c. COWLITZ COUNTY UTILITY COORDINATING COUNCIL
Center # (206) 452-2506; Contact # (206) 577-3030
P.O. Box 128, Longview, WA 98632
Ron Colbert
Contract/9 Members
Coverage: Cowlitz County
Legislation: Yes; Request Time: 2 working days

47d. CLARK COUNTY UTILITY LOCATING SERVICE
Center # (206) 696-4848; Contact # (206) 699-2454
P.O. Box 182, Vancouver, WA 98660
Bruce Cross
Contract/8 Members
Coverage: Clark County
Legislation: Yes; Request Time: 2 working days

47e. CHELAN-DOUGLAS UTILITY COORDINATING COUNCIL
Center # (509) 663-6111; Contact # (509) 662-6101
P.O. Box 511, Wenatchee, WA 98801
Bob Burke
Contract/12 Members
Coverage: Chelan County & Douglas County
Legislation: Yes; Request Time: 24 hours

47f. UPPER YAKIMA COUNTY UNDERGROUND UTILITIES COUNCIL
Center # (509) 248-0202; Contact # (509) 925-1425
c/o Ellensburg Telephone Co., P.O. Box 308, Ellensburg, WA 98926
Jack Morfield
Contract/16 Members
Coverage: Upper 1/2 of Yakima County
Legislation: Yes; Request Time: 2 working days

47g. KLICKITAT-SKAMANIA COORDINATING COUNCIL
Center # (509) 493-3199; Contact # (206) 577-5151
c/o Pacific Northwest Bell, 865 Douglas St., Longview, WA 98632
Blair Anderson
Contract/18 Members
Coverage: Klickitat County & Skamania County
Legislation: Yes; Request Time: 2 working days

47h WALLA WALLA AREA UTILITY COORDINATING COUNCIL
Center # (509) 6363; Contact # (509) 525-0510
P.O. Box 128, College Place, WA 99324
Paul Hartwig
Contract/9 Members
Coverage: City of Walla Walla & Surrounding Area
Legislation: Yes; Request Time: 2 working days

47i. INLAND EMPIRE UTILITY COORDINATING COUNCIL
Center # (509) 456-8000; Contact # (509) 535-0391
P.O. Box 3266 T.A., Spokane, WA 99220
Rol Herriges
Contract/16 Members
Coverage: Spokane County
Legislation: Yes; Request Time: 2 working days

47j. PALOUSE EMPIRE UNDERGROUND COORDINATING COUNCIL
Center # (208) 882-1974; Contact # (509) 332-2911
P.O. Box 72, Pullman, WA 99163
Van Lyber
Contract/7 Members
Coverage: Whitman
Legislation: Yes; Request Time: 24 hours

48. WEST VIRGINIA

48a. MISS UTILITY OF WEST VIRGINIA, INC.
Center # 1-800-245-4848 (In-state); Contact # (412) 323-7111
Three Allegheny Center, Pittsburgh, Pennsylvania 15212
William G. Kiger
Contract/22 Members
Coverage: Statewide
Legislation: No; Request Time: 3 working days

49. WISCONSIN

49a. DIGGERS HOTLINE
Center # 1-800-242-8511;
(414) 344-5111
Contact # (414) 344-7398
Suite 380, 2040 W. Wisconsin Ave., Milwaukee, WI 53233
Susan J. Horejs
Contract/30 Members
Coverage: Statewide
Legislation: Yes; Request Time: 72 hours

50. WYOMING

50a. WEST PARK UTILITY COORDINATING COUNCIL
Center # (307) 587-4800; Contact # (307) 587-4201
1338 Rumsey, Cody, WY 82414
Chuck Eicher
In-House/5 Members
Coverage: Park County
Lesiglation: Yes; Request Time: 48 hours

50b. CALL-IN-DIG-IN SAFETY COMMISSION
Center # (307) 682-9811; Contact # (307) 682-5106
407 N. Gillette Ave., Gillette, WY 82716
Arnie Davis
Contract/10 Members
Coverage: Campbell, Crook, Weston Counties
Legislation: Yes; Request Time: 48 hours

50c. FREEMONT COUNTY UTILITY COORDINATING COUNCIL
Center # (307) 332-9562;
Contact # (307) 856-2332 / (307) 332-2413
P.O. Box 1232, Riverton, WY 82501
Rich Cisar, Ed Allender
Contract/11 Members
Coverage: Freemont County
Legislation: Yes; Request Time: 48 hours

50d. CENTRAL WYOMING UTILITY COORDINATING COUNCIL
Center # (307) 265-5252; Contact # (307) 266-1000
200 N. David, Casper, WY 82601
Don Roseboom
Contract
Coverage: Natrona County
Legislation: Yes; Request Time: 48 hours

50e. SWEETWATER COUNTY UTILITY COORDINATING COUNCIL
Center # (307) 362-8888 (Rock Springs)
(307) 875-4644 (Green River); Contact # (307) 362-2642
Ed Lewis, Rock Springs
Contract/15 Members
Coverage: Sweetwater County
Legislation: Yes; Request Time: 48 hours

50f. CARBON COUNTY UTILITY COORDINATING COUNCIL
Center # (307) 324-6666; Contact # (307) 324-2761
P.O. Box 700, Rawlings, WY 82301
Pierre Francis, Chairman
Contract/6 Members
Coverage: Carbon County Area
Legislation: Yes; Request Time: 48 hours

50g. ALBANY COUNTY UTILITY COORDINATING COUNCIL
Center # (307) 742-3615; Contact # (307) 766-2250
P.O. Box 3227, University Station, Laramie, WY 82071
Fred Crowell
Contract/15 Members
Coverage: Albany County
Legislation: Yes; Request Time: 48 hours

50h. SOUTHEASTERN WYOMING UTILITY COORDINATING COUNCIL
Center # (307) 638-6666; Contact # (307) 638-3361
4719 Ridge Road, Cheyenne, WY 82001
John Lichenwalter
Contract/7 Members
Legislation: Yes; Request Time: 48 hours

50i. CONVERSE COUNTY UTILITY COORDINATING COUNCIL
Center # (307) 358-5566; Contact # (307) 358-5351
P.O. Box 263, Douglas, WY 82633
Richard Cayer
In-House/5 Members
Legislation: Yes; Request Time: 48 hours

51. DISTRICT OF COLUMBIA

51a MISS UTILITY
Center # (301) 559-0100, Contact # (301) 779-7334
6505 Belcrest Road, Suite 7, Hyattsville, MD 20782
Tom Hoff
Contract/28 Members
Coverage: 61.4 sq. mi./100% population
Legislation: Yes; Request Time: 2 working days

Canada

52. ALBERTA PROVINCE

52a. ALBERTA ONE CALL SYSTEM
Center # 1-800-242-3447; Contact # (403) 245-9993
P.O. Box 14, 909-11 Avenue S.W., Calgary, Alberta T2R1L8
Scott Henley
Contract/20 Members
Coverage: Entire Province
Legislation: No; Request Time: 2 working days

International Centers

53. REPUBLIC OF CHINA

53a. DIG CENTER
Center # 02-351-2345; Contact # 02-351-2345
Taiwan Telecommunication Administration
Ministry of Communications
42 Jen Al Road, Sec. 1, Taipei, Taiwan 100 Republic of China

54. SCOTLAND

54a. SUSIEPHONE
Center # dial 100 as for freephone 8400;
Contact # 031-556-2533
Blandfield House, 140 Broughton Road, Edinburgh, Scotland EH7 4LP
Norman Gilkison
Contract/5 Members/Lothian Region
Lesiglation: No

Summary
Current Damage Prevention Laws
August 1984

State	Law	Protects	Exempts	Accuracy of Location	Notification Time	Positive Response	Protection Required of Excavation	Color Code	Penalty Clause	Emergency Clause	Issue Permits
Alabama	No										
Alaska	No										
Arizona	H.B. 3474 Title 40 Art. 6.4	All Utilities Includes Overhead			2 Days		Excavate in careful & prudent manner		$1000	Yes	
Arkansas	No										
California	A.B. 1606 A.B. 3470	Effective July 1, 1983 the law requires any operator of underground facilities, except the DOT, to join a one-call system. All Pressurized Underground facilities	Non-pressurized Drain Lines		48 hours	No	Careful & prudent manner	No	Determined by court	Yes	No
Colorado	S.B. 172 Art. 1.5	All utilities	None	Within 18"	2 days	Yes	Careful & prudent manner	No	Injunctive relief determined by court	Yes	No
Connecticut	Public Acts 77-350 & 81-146	All utilities	Drainage facilities	Within 1-1/2 ft.	2 days	Yes	If gas hand dig within 18"	Yes	Up to $10,000	Yes	No
Delaware	Title 26, Chapter 8	All utilities	Homeowners, tilling of soil	Within 18"	2-10 days	Yes	Careful & prudent	Yes	$100 to $1000	Yes	No
District of Columbia	3-240	All utilities	D.C. Govt U.S. Govt	18"	2-10 days	Yes	If gas, hand dig in prox. unless D.C. has prev. dug test pit	No	Damage without notification, trouble damages can be recovered $1000 CWK	Yes	Yes
Florida	Sec. 553.851 1977 Rev. 1979	Gas flammable	All others	12" horizontal 18" vertical	2 days min	Yes	Excavate in careful & prudent manner	No	Determined by court	Yes	Yes
Georgia	H.B. 128 1969 H.B. 1663 1970 H.B. 450 1975 H.B. 1268 1978	Gas		24"	3-10 days	Yes			Misdemeanor	Yes	
Hawaii	No										
Idaho	No										
Illinois	Ill. Com Comm. Ge. Ord. 185 Rev. 1976	All utilities			48 hours						
Indiana	No										
Iowa	No										
Kansas	No										
Kentucky	No										
Louisiana	Rev. Statute 38.2223 1977	All utilities		Accurately diagram	30 days	Yes					
	Applies only to Orleans Parish. No state law.										
Maine	Chp. 284 Pub. Law 1971	All utilities	Conditional		48 hours				$50-$100	Yes	Yes
Maryland	Art. 78 Sec. 28a 1974	All utilities	None	3 ft. either side	48 hours	Yes	Excavate in careful & prudent manner		$1000 or 10 times cost of damage	Yes	No
Massachusetts	Sec. 40 Chap. 82 1984, Chap. 502 1980	All utilities			72 hours	Yes	Avoid damage		$200 1st offense $500 2nd $1000 subsequent	Yes	Yes
	Mandate membership/participation in one-call center.										
Michigan	Pub. Act 53 1974	All utilities	None	Within 1-1/2 ft.	2 days	No	Must employ hand dig test holes	Yes	Up to $1000	Yes	No
Minnesota	Fire Code 15.1201	Requires notification in area of combustible gases									
Mississippi	None										
Missouri	Chap. 319 1976 Ord. 2713	All utilities	Agricultural & extracting natural resources	Correct location	2 days	Yes	Excavate in careful & prudent manner		Suspension of business	Yes	
Montana	None										
Nebraska	None										
Nevada	None										
New Hampshire	374-51	All utilities			72 hours	No			$500	Yes	No
New Jersey	Chap. 53 1964 Chap. 122 1976	Gas lines	Power poles & hwy. dept.		3-30 days	Yes	Avoid damage			Yes	

Summary
Current Damage Prevention Laws
August 1984

State	Law	Protects	Exempts	Accuracy of Location	Notification Time	Positive Response	Protection Required of Excavation	Color Code	Penalty Clause	Emergency Clause	Issue Permits
New Mexico	Chap 62 Art. 14 1978 H B 65 Eff 4-81	All Utilities			48 hours	Yes	Maintain 18" from cutting edge		$1000	Yes	
New York	Chap 818 1974, Rule 53 1975	All utilities		Within 2 ft. of edge of facility	2-10 days	Yes	Hand dig test holes cannot employ pwr equip w/in 4"	Yes	$500 1st violation $500 each violation on same project	Yes	
North Carolina	New bill to be introduced.										
North Dakota	S B 2036 Sec. 11-18-16 1973	All utilities		Accurate	3 days	Yes					
Ohio	H.B. 538 Enrolled 1981-82 session	Protects all & asks for depth	Engineer must locate facilities on the print.		48 hours						
Oklahoma	Title 63, Sect 142 1-11	All underground utilities	Certain agencies under certain conditions	2 ft. either side	2-10 days	Yes	Hand dig test holes, cannot employ pwr equip over marked line until exposed & protected	Yes	No	Yes	No
Oregon	None										
Pennsylvania	Act No 287 1974	All utilities	Excavation for for Nat. Res	Obtain location	Not less than 3 days	Yes			$100 min $1000 max + up to 90 days in jail	Yes	
Rhode Island	Sec 39-2 1984	All utilities	None	18"	48 hours	No	Detailed precautions	Yes	$100 1st $500 2nd $1000 subsequential	Yes	No
South Carolina	H.B 4020 1978	All utilities	Conditional	2' either side	3 days min 10 days max	Yes	Operators shall inform notification center but not required to join		$1000 max	Yes	No
South Dakota	H.B. 639 1977	All utilities	RR & Dept. of Transp.	Accurate	2 days	Yes				Yes	
Tennessee	Pub Chap 692 S B. 1726 1978	All utilities	None	2' either side	3-10 days	Yes	Maintain clearance	Yes	$1000	Yes	No
Texas	No										
Utah	U C A. 54-8a-1 et. seq.	All utilities	Pub. Util. employees; tilling of soil	Location of facility	2 days	Yes	Cannot start excavation until cleared by util response	No	$299 plus damages	Yes	No
Vermont	No										
Virginia	Chap 291 Title 56	All utilities	Conditional	Within 2' either side	48 hours	Yes	Excavation careful & prudent manner	Yes	None	Yes	No
Washington	Chp 144 Title 19 RCW	All utilities	Excavation of less than 12"	2' either side	2 days	No	Excavate in careful & prudent manner	Yes	$1000 plus damages	Yes	No
West Virginia	H B. in Legislation										
Wisconsin	S.B 182 0175 1977	All utilities		Mark in manner to enable excav. to locate	3 days	Yes	Maintain 18" clearance cutting edge-stake	Yes	$1000 to $2000	Yes	No
Wyoming	Chap 46 Art. 3 1978			Within 18" of edge	2 days	Yes	Excavate in careful & prudent manner			Yes	

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APPENDIX D

GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS, 1983 - 85**

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	ALABAMA	
MISS ALL		
Alabama Gas Corporation		1974
Alabama - Tennessee Natural Gas Company		1983
City of Athens Utilities		1983
City of Atmore		1983
Boaz Gas Board		1983
City of Calera Water & Gas Boards		1983
Carbon Hill Gas Board		1983
Central Gas Company		1983
Citronelle Utilities		1980
Columbiana Gas Board		1983
Conecuh - Monroe County Gas District		1983
Cullman - Jefferson Counties Gas District		1983
The Decatur Utilities		1983
Dekalb - Cherokee Counties Gas District		1983
East Central Gas		1982
City of Fairhope Utilities Board		1983
Gas Board of Fayette		1983
Florida Gas Transmission Company		1984
Fultondale Water Works & Gas Board		1983
Graysville Municipal Gas System		1983
Hokes Bluff Water & Gas Board		1983
City of Jacksonville Water Works, Gas & Sewer Boards		1983
City of Lafayette Gas System		1983
Lamar County Gas District		1983

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APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
ALABAMA (CONTINUED)		
Marshall County Gas		1978
Mobile Gas Service		1976
City of Montevallo Gas System		1983
Town of Moulton Gas Board		1983
City of Mulga		1983
North Alabama Gas		1980
Northwest Alabama Gas District		1983
City of Oneonta Utilities Board		1983
Pell City Gas System		1983
Piedmont Water Works, Gas & Sewer Boards		1983
City of Pleasant Grove Utilities Board		1983
Sheffield Utilities		1981
Southern Natural Gas		1977
South Georgia Natural Gas Co.		1977
Utilities Board of Sylacauga		1983
Transcontinental Gas Pipeline		1978
Trussville Utilities		1981
City of Tuscumbia Gas Department		1983
Town of West Jefferson Gas System		1983
United Gas Pipeline		1977
ALASKA		
NO ONE-CALL SYSTEMS IN THE STATE (AS OF 1/1/84)		

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
ARIZONA		
BLUE STAKE (Phoenix)		
Arizona Public Service		1974
City of Mesa		1974
El Paso Natural Gas		1983
BLUE STAKE CENTER (Sierra Vista)		
Arizona Public Service		c. 1981
BLUE STAKE (Cottonwood)		
No pipeline participation information available		
BLUE STAKE (Prescott)		
No pipeline participation information available		
BLUE STAKE (Tucson)		
No pipeline participation information available		
BLUE STAKE (Flagstaff)		
No pipeline participation information available		
ARKANSAS		
ARKANSAS ONE CALL SYSTEM, INC.		
Arkansas-Louisiana Gas Co.		NA
Arkansas-Oklahoma Gas Co.		NA
Arkansas Western Gas Co.		NA

APPENDIX D. GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
ARKANSAS (CONTINUED)		
Associated Natural Gas		NA
Delhi Gas Pipeline		1983
Gulf Central Pipeline		NA
Ideal Basics/La. Nevada Transmission Pipeline		NA
J&W Operating		NA
Mississippi River Transmission		1983
Natural Gas Pipeline		NA
Oklahoma Gas & Electric		NA
Ozark Pipeline		NA
Sun Pipeline		NA
Tennessee Gas Pipeline		NA
Texas Gas Transmission Pipeline		NA
Trunkline Gas Co.		NA
Union Gas Co.		NA
CALIFORNIA		
Effective in 1983, state law requires participation by all owning subsurface installations, except the state Department of Transportation, in a regional notification center.		
USA NORTH		
Arco Oil and Gas Co.		1982
Blaiz Co. Inc.		1982
Chevron USA Inc.		1975
Dow Chemical USA		1977
Exxon Production		1983
Getty Oil Co.		1975

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	CALIFORNIA (CONTINUED)	
Kern Oil & Refining Co.		1981
Mobil Oil		1981
Pacific Gas and Electric		1975
Petroleum Terminal Management (Now Tennco Services, Inc.)		1983
Shell Oil Co.		1977
Petro-Stop Corp.		1981
Southern California Gas Co.		1976
Southwest Gas Corp.		1981
Standard Pacific Gas Line		1975
Union Oil Co.		1975
USA SOUTH		
San Diego Gas & Electric Company		1982
Southern California Gas Gompany		1976
Arco Oil & Gas Company		1982
Atlantic Richfield Corporation		1976
Chevron, U.S.A.		1976
Dow Chemical, USA		1981
Edgington Oil Company		1980
Exxon Company, USA		1983
Fletcher Oil Company		1980
GATX Terminals Corporation		1982
Getty Oil Company		1980
Long Beach, City of, Gas Dept.		1977
Marlex Oil & Refining, Inc.		1982
Pacific Coast Gasoline Company		1982
Pacific Gas & Electric Company		1979

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
CALIFORNIA (CONTINUED)		
Powerine Oil Company		1980
CP National		NA
Southern California Edison		NA
San Diego Pipeline		1977
SCE-Fuel Pipeline		1980
Shell Oil Company		1977
Southwest Gas Corporation		1979
Sun Exploration & Production Company		1980
U.S.A. Petrochem Company		1983
Union Oil		NA
COLORADO		
BLUE STAKE		
Public Service Co. of Colorado		1973
Panhandle Eastern Pipeline Co.		1982
MESA COUNTY BURIED UTILITIES LOCATION SERVICE		
Public Service of Colorado		1980
Western Gas		1983
CENTRAL LOCATING UNIT		
City of Colorado Springs		1974
FORT COLLINS-LOVELAND ONE CALL		
No pipeline participation information available		

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
CONNECTICUT		
Effective in 1977, state law requires participation in the state-wide one-call system by all public utilities having underground facilities, except sanitary sewer or water facilities owned or operated by a city, town, or borough.		
"CALL BEFORE YOU DIG"		
Algonquin Gas Transmission Co.*		1974
Northeast Utilities*		1974
Connecticut Natural Gas Corp.*		1974
Energy Unlimited		c. 1978
Jet Lines Gas Transmission Co.		c. 1978
New Haven Terminal Authority		c. 1978
Pequot Gas Co.		c. 1978
Southern Connecticut Gas Co.*		1974
Tennessee Gas Transmission Co.*		1974
Norwich, Town of		c. 1978
*Members of Connecticut Underground Utility Protection Plan, predecessor of current system.		
DELAWARE		
"MISS UTILITY" OF DELMARVA		
Chesapeake Utilities Corp. (DE/MD)		1974
Delmarva Power & Light (DE/MD/VA)		1974
Eastern Shore Gas Co., Inc.		1980

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	FLORIDA	
"CALL CANDY"		
Peoples Gas Systems		1976
Florida Gas Transmission		1976
Plant City Natural Gas		1982
Southern Gas		1976
Clearwater, City of		1977
CALL U.N.C.L.E.		
Florida Gas Transmission Co.		1983
Peoples Gas Inc.		1977
UNDERGROUND UTILITIES NOTIFICATION CENTER		
Florida Gas Transmission Co.		1980
Peoples Gas Inc.		1976
CONSTRUCTION CONTROL CENTER		
City of Tallahassee		1976
	GEORGIA	
UTILITIES PROTECTION CENTER		
Americus Utility Commission		1983
Atlanta Gas Light Co.		1975
Austell Gas System		1983
City of Adel		1983
City of Ashburn		1985
City of Bainbridge		1983
City of Barnesville		1984

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE JOINED ONE-CALL SYSTEM
	GEORGIA (CONTINUED)	
City of Blakely		1983
City of Buford		1983
City of Cairo		1983
City of Cartersville		1985
City of Claxton		1983
Colonial Pipeline		1981
City of Commerce		1984
City of Covington		1983
City of Crawfordville		1983
City of Cuthbert		1983
City of Dublin		1983
City of Eatonton		1983
City of Forest Park		1981
City of Fort Gaines		1984
Ft. Valley Utilities Commission		1983
City of Fitzgerald		1984
City of Hawkinsville		1985
City of Hapeville		1981
City of Hartwell		1984
City of Lawrenceville		1984
City of Lafayette Gas Dept.		1983
City of Lumpkin		1984
City of Madison		1983
City of Manchester		1983
City of Meigs		1983
City of Millen		1983
City of Monroe		1983
City of Monticello		1984

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE JOINED ONE-CALL SYSTEM
GEORGIA (CONTINUED)		
City of Montezuma		1983
City of Nashville		1983
City of Pelham		1983
City of Perry		1983
City of Riverdale		1984
City of Sandersville		1985
City of Social Circle		1983
City of Sparta		1983
City of Summerville		1983
City of Sylvania		1984
City of Talbotton		1983
City of Tallapoosa		1983
City of Tifton		1984
City of Toccoa		1983
City of Winder		1984
City of Wrens		1983
Transcontinental Gas Pipeline*		1981
United Cities Gas Co. - Columbus		1983
United Cities Gas Co. - Gainesville		1984

*in Metropolitan Atlanta only

HAWAII

NO ONE-CALL SYSTEMS IN THE STATE (AS OF 1/1/85)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM

IDAHO

PALOUSE EMPIRE UCC

No pipeline participation information available

UTILITIES UNDERGROUND LOCATION CENTER

See Washington

DIG-LINE

No pipeline participation information available

ILLINOIS

In 1976, the Illinois Commerce Commission issued an Order mandating the establishment of a statewide one-call system; all utilities were subject to the ICC Order except railroads, utilities in the Chicago area (where a one-call system already existed), and municipal electric, water, and sewer facilities. It is reported that many municipal gas utilities have only recently begun to conform to the ICC Order.

JULIE

City of Aledo	1982
Amoco Pipeline Co.	1979
Amoco Pipeline Products	1983
Amoco Oil	1981
ANR Pipe Line Co.	1977
ARCO Pipe Line Co.	1980
Ashland Pipe Line Co.	1982
Badger Pipe Line Co.	1981
Bethany, Village of	1981
Bluford, City of	1981
Buckeye Pipe Line Co.	1982

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	ILLINOIS (CONTINUED)	
Cairo Public Utility		1981
Central Illinois Light Co.		1977
Chester, City of		1980
Cisne, Village of		1980
Clay City, Village of		1981
Consumers Gas Co.		NA
Crossville, City of		1981
Divernon, City of		1985
Dome Pipeline Co.		1981
Edinburg, Village of		1983
Fairfield, City of		1981
Findlay, Village of		1981
Flora, City of		1981
Geff, Village of		1981
Getty Synthetic Fuels, Inc.		1983
Grayville, City of		1985
Gulf Central Pipe Line		1983
Hydrocarbon Transmission		1985
Illinois Gas Co.		1980
Illinois Power Co.		1977
Interstate Power Co.		1980
Iowa-Illinois Gas & Electric Co.		1977
Kaskaskia Gas Co.		1981
Lakehead Pipeline Co.		1983
Louisville, Village of		1981
Marathon Pipeline Co.		1981
Martinville, City of		1981
McLeansboro, City of		1981

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	ILLINOIS (CONTINUED)	
Midwestern Gas Transmission Co.		1979
Milford Gas & Water		1981
Monarch Gas Co.		1980
Morton, Village of		1980
Moweaqua, Village of		1983
Mt. Carmel Public Utility Co.		1980
Nashville, City of		1981
Natural Gas Pipeline Co.		1977
New Boston, City of		NA
North Shore Gas co.		1977
Northern Illinois Gas Co.		1977
Panhandle Eastern Pipe Line Co.		1977
Pawnee, Village of		1981
Pinckneyville, City of		1980
Pittsburg, Village of		1981
Pittsfield, City of		1982
Pleasant Hill, Village of		1980
Riverton, City of		1980
Roodhouse, City of		1980
Rossville, City of		1983
Salem, City of		1981
Shell Pipe Line Co.		1984
Sims, Village of		1981
South Beliot Water, Gas and Electric Co.		NA
Stonington, Village of		1981
Sullivan, City of		1980
Tamms, Village of		1985

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
ILLINOIS (CONTINUED)		
Texaco Cities Service Pipe Line Co.		1981
Texas Pipeline Co.		1981
Trunkline Gas co.		1977
Union Electric Co.		1980
United Cities Gas Companies		1980
Vienna, City of		1981
Waterloo Gas Co.		1981
Wayne City, Village of		1981
Westville Gas		1985
White Hall, City of		1981
Winchester, City of		1981
DIGGER		
Peoples Gas Light & Coke Co.		1975
INDIANA		
INDIANA UNDERGROUND PLANT PROTECTION SERVICE		
Bainbridge City Utility		1984
Citizens Gas and Coke Utility		1981
Community Natural Gas		1982
Fountaintown Gas Co.		1982
Hoosier Gas Company		1983
Indiana Gas Company		1982
Indiana Utilities		1983

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	INDIANA (CONTINUED)	
Kokomo Gas & Fuel		1982
Lincoln Natural Gas		1982
Midwest Natural Gas		1982
Midwestern Gas Transmission		1982
Michigan-Wisconsin Pipeline		1981
Montezuma City Utilities		1983
Northern Indiana Fuel & Light		1982
Northern Indiana Public Service		1981
Ohio Valley Gas Corp.		1982
Panhandle-Eastern Pipeline		1981
Peoples Gas & Power		1983
Rensselaer City Utilities		1983
Richmond Gas Company		1983
Southern Indiana Gas & Electric		1983
Southeastern Indiana Natural Gas		1983
Switzerland Co. Gas Company		1983
Terre Haute Gas Company		1982
Texas Gas Transmission		1983
Trunkline Pipeline		1981
Participation information for the one-call systems preceding IUPPS is unavailable		
UNITED UTILITIES PROTECTION SERVICE		
See Ohio		

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	IOWA	
UNDERGROUND PLANT LOCATION SERVICE, INC.		
Interstate Power		1981
Iowa Gas		1980
Iowa Illinois Gas and Electric Co.		1980
Iowa Power		1980
Natural Gas Pipeline Co. of America		1982
Northern Natural Gas		1981
People's Natural Gas Co.		1982
	KANSAS	
KAN-U-DIG-IT		
Gas Service Co.		1980
Arkla Gas Service Company		1983
	KENTUCKY	
BUD		
A N R Pipeline Co. (Michigan-Wisconsin)		1981
City of Drakesboro Gas		1984
City of Hazard Natural Gas System		1984
City of Morgantown Gas		1983
Columbia Gulf Transmission Co.		1981
Indiana Utilities Corp.		1982
Kentucky Ohio Gas Co.		1984
Louisville Gas and Electric Co.		1974
Midwestern Gas Transmission Co.		1980

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	KENTUCKY (CONTINUED)	
Tennessee Gas Pipeline		1979
Texas Gas Transmission Co.		1980
Western Kentucky Gas Co.		1979
UNITED UTILITIES PROTECTION SERVICE		
See Ohio		
	LOUISIANA	
DOTTIE		
No pipeline participation information available		
	MAINE	
DIG-SAFE		
See Massachusetts		
	MARYLAND	
"MISS UTILITY" DELMARVA		
See Delaware		
MISS UTILITY		
Baltimore Gas & Electric		NA
Columbia Gas of VA		NA
Columbia Gas Transmission Co.		NA
Commonwealth Gas Co.		NA
Frederick Gas Co.		NA

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
MARYLAND (CONTINUED)		
Shenandoah Gas Co.		NA
Transcontinental Gas Pipe Line		NA
Virginia Electric & Power Co.		NA
Washington Gas Light Co.		NA
MASSACHUSETTS		
Effective in 1980, state law requires participation in the state-wide one-call system.		
DIG SAFE		
No specific pipeline participation information available		
MICHIGAN		
Effective in 1975, state law requires participation in an "association for mutual receipt of notification of construction," in areas served by such, by all public utilities having underground facilities.		
MISS DIG		
Aurora Gas Co.		1984
Battle Creek Gas Co.		1976
Citizens Gas Fuel Co.		1975
Consumers Power Co.		1970
Great Lakes Gas Transmission Co.		1975
Hayes-Albion Co.		1976
Michigan Consolidated Gas		1971
Michigan Gas Storage		1975
Michigan Gas Utilities Co.		1973
Michigan Power Co.		1976

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
MICHIGAN (CONTINUED)		
Peninsular Gas Co.		1976
Southeastern Michigan Gas Co.		1972
Wisconsin Public Service Corp.		1976
MINNESOTA		
NO ONE-CALL SYSTEMS IN THE STATE (AS OF 1/1/85)		
MISSISSIPPI		
MISSISSIPPI ONE CALL CENTER		
No pipeline participation information available		
MISSOURI		
"TO BEGIN"		
City Utilities of Springfield		1977
MONTANA		
NO ONE-CALL SYSTEMS IN THE STATE (AS OF 1/1/85)		
NEBRASKA		
ONE CALL COVERS ALL		
Metropolitan Utilities District		1971
Northern Natural Gas		1972
Peoples Natural Gas		1972

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
NEBRASKA (CONTINUED)		
LINCOLN UCC		
Minnegasco (Cengas)		1976
Northern Natural Gas		1980
NEVADA		
USA NORTH		
C P National		1981
Southwest Gas Corp.		1981
NEW HAMSPHIRE		
Effective in 1983, state law requires participation by public utilities in an underground utility damage prevention system.		
DIG SAFE		
See Massachusetts		
NEW JERSEY		
GARDEN STATE UNDERGROUND PLANT LOCATION SERVICE		
Public Service Electric and Gas Co.		1975
South Jersey Gas Co.		1975
New Jersey Natural Gas Co.		1975
Elizabethtown Gas Co.		1975
Algonquin Gas Transmission Co.		1976
Tennessee Gas Pipeline Co.		1976
Transcontinental Gas Pipeline Co.		1975

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	NEW MEXICO	
BLUE STAKE (Albuquerque)		
Gas Co. of New Mexico		1973
BLUE STAKE (Farmington)		
Gas Co. of New Mexico		NA
BLUE STAKE (Grants-Milan)		
No pipeline participation information available		
BLUE STAKE (Gallup)		
No pipeline participation information available		
BLUE STAKE (Santa Fe)		
Gas Co. of New Mexico		1976
BLUE STAKE (Las Vegas)		
No pipeline participation information available		
BLUE STAKE (Zuni)		
No pipeline participation information available		
BLUE STAKE (Roswell)		
Gas Company of New Mexico		1983

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	NEW YORK	
UFPO		
Columbia Gas of New York, Inc.		1978
Consolidated Gas Corp.		1970
Miller Brewing Co.		1977
New York State Elect. & Gas		1970
Niagara Mohawk Power Corp.		1970
Rochester Gas & Electric*		1983
Syracuse Suburban Gas		1970
Tennessee Gas Pipeline		1970
*Joined through expansion. Previously participated in UTILITY COORDINATING COMMITTEE in Monroe County, which began operation in 1964.		
UTILITY COORDINATING COMMITTEE		
Has merged many of its functions with UFPO		
UNDERGROUND UTILITIES CALL CENTER		
Algonquin Gas Transmission		1976
Central Hudson Gas & Electric		1976
Consolidated Edison Co. of N.Y. (West Chester County)		1976
NYSEG		1976
Niagara Mohawk Power Corp.		c. 1983
Orange & Rockland Utilities, Inc.		1976
Tennessee Gas Pipeline Co.		1976

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
NEW YORK (CONTINUED)		
UNDERGROUND UTILITY LOCATING SERVICE		
National Fuel Gas Co.		1970
New York State Electric and Gas Co.		1972
Tennessee Gas Pipeline		1983
UTILITY CALL CENTER		
Long Island Lighting Co.		c. 1975
NORTH CAROLINA		
Beginning in 1981, the North Carolina Utilities Commission has required that all gas pipelines in the state participate in a one-call system.		
UTILITIES LOCATION CO., INC.		
Bessemer City		1983
Colonial Pipeline		1979
Dixie Pipeline		1978
Exxon Pipeline		1980
Greenville Utilities Comm.		1978
City of Kings Mountain		1983
City of Lexington		1978
City of Monroe		1978
N.C. Natural Gas Corp.		1978
N.C. Gas Service		1979
Piedmont Natural Gas		1978
Plantation Pipeline		1982
Public Service Gas		1978
City of Rocky Mount		1980

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
NORTH CAROLINA (CONTINUED)		
City of Shelby		1983
Transco Pipeline		1978
City of Wilson		1978
NORTH DAKOTA		
NO ONE-CALL SYSTEMS IN THE STATE (AS OF 1/1/85)		
OHIO		
OHIO UTILITIES PROTECTION SERVICE		
East Ohio Gas Company		1975
Columbia Gas Company		1975
National Gas & Oil Corporation		1978
West Ohio Gas Company		1983
Columbia Gas Transmission Co.		1978
Panhandle Eastern Pipeline Co.		1977
Consolidated Gas Supply Corp.		1983
(ANR) Michigan-Wisconsin Pipe Line Co.		1976
Texas Gas Transmission Corp.		1983
Tennessee Gas Pipeline Co.		1984
Toledo Edison		c. 1979
UNITED UTILITIES PROTECTION SERVICE		
Cincinnati Gas and Electric Co.		c. 1976
Union Light, Heat and Power Co. (KY)		c. 1976
Lawrenceburg Gas Co. (IN)		c. 1976

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	OKLAHOMA	
OKLAHOMA ONE-CALL SYSTEM		
ANR Pipeline Co.		1980
Arco Oil & Gas Co.		1983
Arkla Gas Co.		1980
Arkansas Oklahoma Gas Corp.		1981
Boettcher Oil and Gas		1983
Champlin Petroleum Co.		1982
Colorado Interstate Gas Co.		1980
Continental Pipe Line Co.		1982
Delhi Gas Pipeline Corp.		1980
El Paso Natural Gas Co.		1982
Esperanza Transmission Co.		1982
Funk Fuels Corp.		1984
The Gas Service Co.		1982
Guymon, City of		1982
Lone Star Gas Co.		1980
Mobil Oil Corp.		1982
Mustang Fuel Corp.		1980
Natural Gas Pipeline Co. of America		1980
Northern Natural Gas Co.		1980
Northwest Central Pipeline Corp.		1980
Oklahoma Gas and Electric Co.		1980
Oklahoma Natural Gas Co.		1980
Ozark Gas Transmission System		1982
Panhandle Eastern Pipe Line Co.		1980
Phillips Petroleum Co.		1980
Pioneer Gas Products Co.		1980

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	OKLAHOMA (CONTINUED)	
Sun Gas Co.		1982
Sun Pipe Line Co.		1980
Texaco, Inc.		1981
Warren Petroleum Co.		1983
Western Gas Interstate Co.		1982
Ambassador Oil Corp.		1983
ANR Production Co.		1983
Beard Oil Co.		1983
Chevron, USA		1983
Dawn Energy Co.		1983
East Central Oklahoma Gas Auth.		1983
Southern Natural Gas Co.		1982
Witt Energy Resources Inc.		1983
Southwestern Public Service Co.		1981
	OREGON	
HOOD RIVER UNDERGROUND COORDINATING COUNCIL		
Pacific Power & Light		1979
Northwest Natural Gas		1979
UTILITIES UNDERGROUND LOCATION CENTER		
No pipeline participation information available		
WASCO COUNTY UCC		
No pipeline participation information available		

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	OREGON (CONTINUED)	
LINN BENTON UCC		
Northwest Natural Gas		1968
Northwest Pipeline		1974
LANE UCC		
No pipeline participation information available		
DOUGLAS UCC		
No pipeline participation information available		
JOSEPHINE UCC		
No pipeline participation information available		
ROUGE BASIN UCC		
No pipeline participation information available		
CENTRAL OREGON COORDINATING COUNCIL		
No pipeline participation information available		
EAST LINN COORDINATING COUNCIL		
Northwest Natural Gas		NA
Northwest Pipeline		NA
CITY OF DALLAS UCC		
No pipeline participation information available		

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
OREGON (CONTINUED)		
MALHEUR UCC		
No pipeline participation information available		
KLAMATH UCC		
CP National Gas		c. 1979
Pacific Gas Transmission		c. 1979
Northwest Pipeline		c. 1979
NORTH LINCOLN COUNTY UCC		
No pipeline participation information available		
SOUTH LINCOLN COUNTY UCC		
No pipeline participation information available		
PENNSYLVANIA		
PENNSYLVANIA ONE CALL SYSTEM, INC.		
Air Products & Chemicals Inc.		NA
Apollo Natural Gas Co.		1985
Cabot Oil & Gas Corp.		c. 1984
Carnegie Natural Gas Co.		1985
Columbia Gas of PA		1972
Columbia Gas Transmission		1977
Consolidated Gas Transmission Corp.		c. 1983
Equitable Gas Co.		1972
Equitable Gas Production & Transmission Co.		c. 1983
Equitable Gas - Energy Co.		c. 1984

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	PENNSYLVANIA (CONTINUED)	
National Fuel Distribution co.		c. 1976
National Fuel Supply Co.		c. 1978
Northeastern Gas Pipeline, Inc.		c. 1984
Pennsylvania Gas & Water Co.		c. 1978
Peoples Natural Gas Co.		1972
Philadelphia Electric Co.		1972
Philadelphia Gas Works		1977
Tennessee Gas Pipe Line Co.		c. 1980
Transcontinental Gas Pipe Line Corp.		c. 1978
UGI Corp.		c. 1978
Wainoco Oil & Gas Co.		c. 1983
	RHODE ISLAND	
DIG SAFE		
See Massachusetts		
	SOUTH CAROLINA	
PALMETTO UTILITY LOCATION SERVICE		
Bamberg, City of		1984
Bennettsville, City of		1984
Blacksburg, Town of		1980
Carolina Pipeline Co.		1979
Chester County Nat. Gas Auth.		1979
Clinton-Newberry Nat. Gas. Auth.		1984
Colonial Pipeline Co.		1981
Dixie Pipeline		1978

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	SOUTH CAROLINA (CONTINUED)	
Fountain Inn Nat. Gas. Sys.		1984
Ft. Hill Nat. Gas Auth.		1980
Greenwood Dept. of Pub. Works		1979
Greer Comm. of Pub. Works		1984
Laurens Comm. of Pub. Works		1980
Lancaster County Nat. Gas		1979
Piedmont Nat. Gas Co.		1979
Santee Cooper Pub. Ser. Auth.		1980
Southern Natural Gas Co.		1983
S. C. Electric & Gas Co.		1979
Transcontinental Pipeline		1979
United Cities Gas Co.		1979
Winnsboro, Town of		1983
York County Gas Co.		1979
	SOUTH DAKOTA	
NO ONE-CALL SYSTEMS IN THE STATE (AS OF 1/1/85)		
	TENNESSEE	
"DARE DIG"		
Merged with TENNESSEE ONE CALL SYSTEM		
MISS LOCATE		
No pipeline participation information available		

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM

TENNESSEE (CONTINUED)

ONE CALL SYSTEM OF TENNESSEE

No pipeline participation information available

TEXAS

TEXAS ONE CALL SYSTEM

Entex	1972
Houston Pipe Line	1983
Rio Grande Valley Gas Co.	1983
Transcontinental Gas P. L. Co.	1983
United Texas Transmission Co.	1983
Valero Interstate Transmission Co.	c. 1984

AUSTIN AREA ONE CALL SYSTEM

Southern Union Gas	c. 1979

UTAH

Effective in 1977, state law requires participation in an "association for mutual receipt of notification of excavation activities," in areas served by such, by all public utilities having underground facilities. It is reported that this law is very often ignored.

BLUE STAKE

Mountain Fuel Supply	1974

VERMONT

DIG-SAFE

See Massachusetts

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	VIRGINIA	
"MISS UTILITY" OF DELMARVA		
See Delaware		
"MISS UTILITY" OF VIRGINIA		
City of Charlottesville		1980
City of Danville		1980
City of Richmond		1976
Colonial Pipeline Co.		1976
Columbia Gas Co.		1981
Commonwealth Gas Pipeline		1984
Commonwealth Gas Services		1976
Plantation Pipeline Co.		1976
Roanoke Gas Co.		1983
Suffolk Gas Corp.		1983
Virginia Natural Gas		1976
ROANOKE VALLEY UNDERGROUND LOCATION SERVICE		
No pipeline participation information available		
MISS UTILITY OF LYNCHBURG		
Lynchburg Gas Company		1978
MISS UTILITY OF MARYLAND		
See Maryland		

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	WASHINGTON	
CHELAN-DOUGLAS UCC		
Northwest Pipeline Corp.		c. 1973
Cascade Natural Gas		c. 1973
UPPER YAKIMA COUNTY UNDERGROUND UTILITIES COUNCIL		
Cascade Natural Gas		1975
Northwest Pipeline Corp.		1975
INLAND EMPIRE UCC		
Pacific Gas Transmission Co.		1975
Northwest Pipeline Corp.		1975
Washington Water Power Co.		1975
UTILITIES UNDERGROUND LOCATION CENTER		
Cascade Natural Gas		NA
COWLITZ COUNTY UCC		
No pipeline participation information available		
GREY'S HARBOR AND PACIFIC COUNTY UCC		
Cascade Natural Gas		c. 1974
CLARK COUNTY UTILITIES LOCATING SERVICE		
Northwest Natural Gas Co.		1970
Northwest Pipeline Co.		1975
Olympic Pipeline Co.		1983

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
WASHINGTON (CONTINUED)		
KLICKITAT-SKAMANIA CC		
No pipeline participation information available		
WALLA WALLA AREA UCC		
No pipeline participation information available		
WEST VIRGINIA		
MISS UTILITY OF WEST VIRGINIA, INC.		
Ajax Pipe Line Company		1984
Bluefield Gas Co.		c. 1983
Boone Regional Utility Team, Inc.		NA
Cabot Corp.		c. 1980
Carnegie Gas Company		1985
Columbia Gas Transmission		1981
Consolidated Gas Transmission (Hope Gas)		1981
Consumers Gas Utility Co.		1981
Cumberland Gas Co.		1985
Eastern American Energy Corp.		1985
Equitable Gas Co.		1981
Eureka Pipe Line Co.		1985
Lumberport-Shinnston Gas Co.		1984
Mountaineer Gas Co.		NA
Nycotex Gas Transport		1984
Pennzoil Co.		NA
Shenandoah Gas Co.		c. 1983

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
WEST VIRGINIA (CONTINUED)		
Southern Public Service Co.		c. 1984
Tennessee Gas Pipeline Co.		1985
Union Carbide Corp.		NA
Union Oil & Gas Inc.		c. 1984
Welch Gas Coop. Assn.		c. 1985
WISCONSIN		
DANE COUNTY "ONE-CALL" SYSTEM		
Merged with DIGGERS HOTLINE		
DIGGERS HOTLINE		
Madison Gas and Electric		NA
Wisconsin Gas		NA
Wisconsin Natural Gas		NA
Wisconsin Power & Light		NA
Wisconsin Southern Gas Co.		NA
WYOMING		
Effective in 1978, state law requires participation in a "association for mutual receipt of notification of excavation activities," in areas served by such, by all public utilities, municipalities, or others with underground facilities. It is reported that this law is very often ignored.		
CALL-IN-DIG-IN SAFETY COMMISSION		
M.G.T.C.		1985
Petrolane-Wyoming		c. 1963

APPENDIX D. **GAS PIPELINE PARTICIPATION IN ONE-CALL PROGRAMS** (CONTINUED)

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
	WYOMING (CONTINUED)	
FREEMONT COUNTY UCC		
Northern Utilities Inc.		1973
SWEETWATER COUNTY UCC		
Mountain Fuel Supply Co.		1975
Northwest Pipeline		1978
Colorado Interstate Gas		1979
Cities Service Co.		1980
CARBON COUNTY UCC		
Pasco Pipeline (now Sinclair Pipeline)		1975
Continental Pipeline		1975
Mountain Fuel Supply Co.		1975
Northern Gas		1975
Colorado Interstate Gas		1975
Amoco Production		1975
Northwest Central Pipeline		1978
ALBANY COUNTY UCC		
Northern Gas Div., Kansas Nebraska Gas Co.		c. 1974
Cities Service Pipeline		c. 1980
SOUTHEASTERN WYOMING UCC		
Cheyenne Light, Fuel, and Power Co.		1978
Northwest Central Pipeline Corp.		1981

ONE-CALL SYSTEM AND GAS PIPELINE MEMBERS	STATE	YEAR PIPELINE BEGAN PARTICIPATION IN ONE-CALL SYSTEM
WYOMING (CONTINUED)		
CONVERSE COUNTY UCC		
K-N Energy		1982
WEST PARK UCC		
Pacific Power & Light		1981
Cody Gas		1981
CENTRAL WYOMING UCC		
Northern Utilities		1976
Pacific Power & Light		1976
DISTRICT OF COLUMBIA		
Effective in 1981, district law requires all public utility operators in D.C. "to form and operate" a one-call system.		
MISS UTILITY		
See Maryland		

Source of information: Written and/or telephone communication with the various one-call systems.

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