

IMPROVING UPON OUR DIG LAWS: HOW STATE LEGISLATURES CAN HELP US DIG SAFER



**ALLIANCE FOR INNOVATION
AND INFRASTRUCTURE**

FM 261

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EXECUTIVE SUMMARY

The Common Ground Alliance's DIRT reports are an invaluable tool in helping industry and policy-makers better understand excavation damage incident trends, causes, and more. This report reviews and analyzes the data behind the most recent annual damage prevention data reports, Damage Information Reporting Tool, Volume 11 (2015) and Damage Information Reporting Tool, Natural Gas Distribution Facilities Report (2016), provides insight into what conclusions can and can't be drawn, and makes recommendations on where to focus future efforts to improve excavation safety.

DIRT serves as a great foundation for future damage prevention safety efforts. However, while looking at what the DIRT data tells us, it is equally important to look at what it does not tell us. The primary takeaways from these reports was:

- Insufficient participation in voluntary reporting combined with relatively weak predictive modeling makes it difficult to discern excavation damage Trends from year to year;
- Half of all incidents are attributable to insufficient excavation practices.
- 811 is a valuable tool, but should not be viewed as a silver bullet;
- Contract locators were more reliable than utility locators in 2014.
- Most incidents lead to utility service interruptions;
- The overall costs of excavation incidents may be underestimated due to incomplete data sets.

In considering these takeaways, Aii recommends targeted changes to state Damage Prevention programs and provides insight as to how DIRT could update its data collection and analysis to make future reports more effective.

Based on the data included in the 2014 DIRT reports, we recommend that all states consider the following recommendations:

- 1) Implement mandatory incident reporting requirements in state laws and regulations;
- 2) Increase enforcement efforts to encourage stronger adherence to laws, regulations, and best practices; and
- 3) Improve utility locating practices to remedy disparity between accuracy of jobs performed by locate firms and those performed by in-house utility locators.

To improve efficacy of DIRT, CGA should consider the following recommendations:

- 1) DIRT should organize data by state instead of region; and
- 2) DIRT should look at increasing the number of root cause categories to include more narrow incident causes and require more specific incident cause descriptions for submissions.

INTRODUCTION

This report examines the Common Ground Alliance's most recent annual damage prevention data reports, *Damage Information Reporting Tool, Volume 11 (2015)* and *Damage Information Reporting Tool, Natural Gas Distribution Facilities Report (2016)*. The analysis provides a review of the data, insight into what conclusions can and can't be drawn, and makes recommendations of where to focus future efforts to improve excavation safety.

Common Ground Alliance

The Common Ground Alliance (CGA)¹ is a member-driven association focused on “saving lives and preventing damage to underground infrastructure by promoting effective damage prevention practices.”² CGA's stated mission is to “provide clear and tangible value to [its] stakeholders by helping to reduce damages to North America's underground infrastructure.”³

The organization aims to achieve this by working cooperatively to protect underground facilities through identifying and sharing best practices, creating and increasing public awareness, sharing damage prevention tools and technologies, and collecting and disseminating damage prevention related data.⁴ Its vision is to create a damage prevention culture across North America where calling before digging is the norm and underground facilities are identifiable and accurately mapped.⁵

Damage Information Reporting Tool

In 2005, CGA began publishing an annual report detailing damage prevention incident data. This report, the Damage Information Reporting Tool (DIRT) provides a summary and analysis of all submitted “events” for the year prior to publication. An “event” is defined by CGA as “the occurrence of downtime, damages, and near misses” during excavation.⁶ DIRT allows parties to submit events anonymously to encourage participation and facilitate a more comprehensive database.

1 CGA has more than 1700 members, including individuals, organizations, and sponsors.

2 Common Ground Alliance, *About Us*, accessed on March 14, 2016.

3 Ibid.

4 Ibid.

5 Ibid.

6 Common Ground Alliance, *Damage Information Reporting Tool, Volume 11*, September 8, 2015.

OVERVIEW OF EVENTS

According to the most recent DIRT report, there were 273,599 events submitted in 2014 (the most recent year data is available) – this was a significant increase from 2013, when 224,616 events were submitted.⁷ It is important to note that submissions are made on a voluntary basis, meaning that while submissions may be instructive as to trends, they are not necessarily indicative of improvements, or lack thereof, in incident rates in a given year.

Who Submits the Data?

Utility locating firms are responsible for more than half of the submissions included in the 2014 DIRT data set. In that year, locate firms submitted approximately 57 percent of reported events,⁸ while natural gas facility operators accounted for roughly 20 percent of submissions, followed by One Call centers at 11 percent, and telecommunication facility operators at 7 percent.⁹ The remaining 6 percent of submissions were made by (in order from most to least): excavators, state regulators, liquid pipeline operators, public works, and electric facility operators.¹⁰

Damage Estimation Methodology

The predictive value of DIRT’s damage estimation methodology is low. Because the data is not all inclusive, DIRT uses linear regression modeling, including factors such as building permits, construction spending, land area, population, and population density, that draws information from states that “appear to have a substantial number of damages reported to DIRT” to formulate an estimate of event occurrences in a given year.¹¹

DIRT identifies these states using state statutes and regulations, Pipeline and Hazardous Material Safety Administration (PHMSA) classification, a survey of state representatives, as well as other sources. Using this model, DIRT estimates there were approximately 349,000 events in 2014, compared to 335,000 estimated in 2013.¹² However, the number of events alone is not indicative of the efficacy of safety efforts. It is important to look at how many events occurred within the context of how much excavation activity occurred in a given year and how many facilities were exposed to potential danger.

Beginning in the 2013 report, DIRT used damages per 1,000 transmissions (in place of damages per 1,000 incoming requests) to gauge overall safety trends.¹³ According to data provided to DIRT, each incoming locate request to a One Call

⁷ Damage Information Reporting Tool, Volume 11 at p. 2

⁸ Damage Information Reporting Tool, Volume 11 at p. 12

⁹ Ibid.

¹⁰ Ibid.

¹¹ Damage Information Reporting Tool, Volume 11 at p. 2

¹² Ibid.

¹³ Damage Information Reporting Tool, Volume 11 at p. 3

center generated an average of 7.17 outgoing transmissions to member facilities.¹⁴ Using these numbers, CGA found a 2014 damage rate of 1.60 damages per 1,000 transmissions, down from 2.07 damages per 1,000 transmissions in 2013.¹⁵

This finding implies that despite an increase in the number of incidents, the excavation process itself is actually safer. However, this conclusion is suspect considering all of the input data is derived from estimates using a series of regression models from a limited number of states, and average transmissions per notification estimates. Rather than collecting a small subset of data and using a relatively unreliable predictive methodology, laws requiring mandatory incident reporting in all states would go a long way in strengthening data collection and ultimately improving damage prevention practices in the future.

ANALYSIS OF 2014 DATA

Root Cause Groups

Half of all incidents were attributed to insufficient excavation practices, while the remaining half are spread amongst the four other root cause groups. The DIRT report identifies three major opportunities throughout the excavation process to reduce the likelihood of damage to underground facilities.¹⁶

- 1) Contacting 811 or otherwise requesting that underground facilities in the excavation area are located and marked;
- 2) Correctly marking underground facilities in the excavation area;
- 3) Employing proper excavation techniques considering the excavation site's characteristics and conditions.

By identifying these opportunities, CGA “enables stakeholders to more effectively direct efforts and resources” to prevent future incidents.¹⁷ Each of these components is critical. The incidents themselves are attributed to one of five root causes.

The distribution of known events in the report categorized by root cause is as follows:¹⁸

- Excavation Practices Not Sufficient: 50%;
- Notification Not Made: 25%;
- Locating Practices Not Sufficient: 17%;
- Miscellaneous Root Causes: 7%;
- Notification Practices Not Sufficient 1%.

¹⁴ Damage Information Reporting Tool, Volume 11 at p. 3 (footnote 6)

¹⁵ Damage Information Reporting Tool, Volume 11 at p. 4

¹⁶ Ibid.

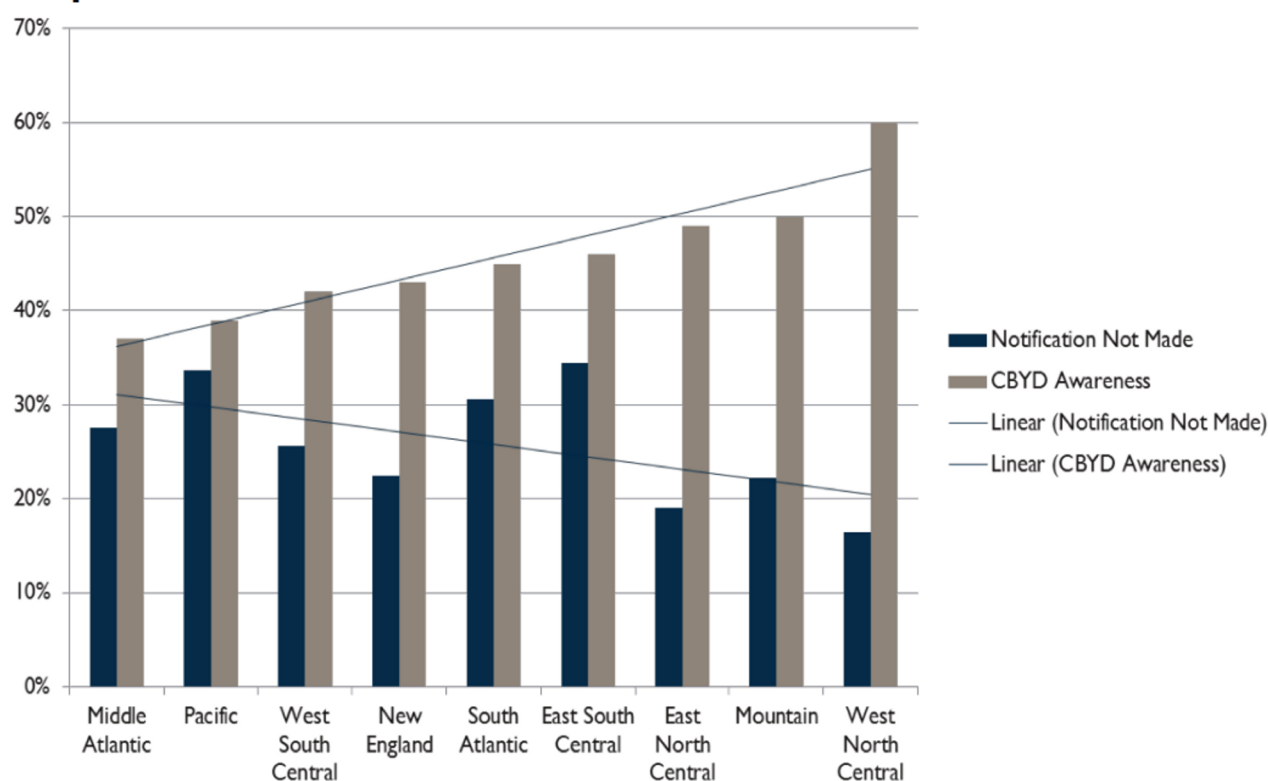
¹⁷ Damage Information Reporting Tool, Volume 11 at p. 5

¹⁸ Damage Information Reporting Tool, Volume 11 at p. 6.

Despite “Notification Not Made” accounting for only 25 percent of events in 2014, the report states that notification is still the single most effective way to reduce the likelihood of an event during an excavation project.¹⁹ The likelihood of an event occurring after a proper notification was less than one percent, whether calculated using events per locate or events per transmission.²⁰

The report also points out that raising awareness of the “Call Before You Dig” program is the best way to prevent accidents attributed to “Notification Not Made.” A CGA survey conducted to determine the correlation between awareness and outcomes found that awareness ranges from 37 percent (Middle Atlantic) to 60 percent (West North Central) amongst the nine census divisions, and that increased awareness correlates with a drop in events attributed to “Notification Not Made” as depicted in Figure 1.²¹

Figure 1 – Comparison of “Call Before You Dig” General Awareness and Percentage of Events Attributed to “Notification Not Made” in 2014²²



¹⁹ Ibid.

²⁰ Damage Information Reporting Tool, Volume 11 at p. 7.

²¹ Damage Information Reporting Tool, Volume 11 at p. 7-8.

²² Damage Information Reporting Tool, Volume 11 at p. 8.

Increasing awareness of 811 is not a silver bullet. Raising awareness is an important feature of any damage prevention program, but even if events attributed to “Notification Not Made” were completely eliminated, the remaining 75 percent of events still need to be addressed. The purpose of this analysis is to explore the data in an effort to determine the most effective way to prevent those remaining events.

Digging deeper into the data behind each of the other root causes, it becomes clearer as to what factors may be contributing to these events:

“Locating Practices Not Sufficient” includes several sub- causes:²³

- Facility could not be found or located;
- Facility marking or location not sufficient (69%);
- Facility was not located or marked (19%);
- Incorrect Facility Records or Maps.

All in all, of incidents classified under “Locating Practices Not Sufficient”, 68 percent (including all sub-causes) had visible but incorrect markings, and 29 percent had markings not visible (possibly not made at all).²⁴

“Excavation Practices Not Sufficient” (rounded to the nearest percentage point):²⁵

- Other Excavation Practices Not Sufficient (84%);
- Clearance Not Maintained (8%);
- Hand Tools Not Used (5%);
- Marks Not Maintained (2%);
- Exposed Facility Not Supported (<1%);
- Backfilling Improper (<1%).

Excavators are responsible for the largest share of damages, but due to vague reporting the causes are nearly impossible to discern. There are a number of reasons an event could be identified as resulting from “Excavation Practices Not Sufficient.” In this year’s report, 84 percent of events attributed to this root cause are not categorized, making it difficult or impossible to determine how to best prevent these incidents. It also calls into question whether these events were mischaracterized to begin with.

Other Factors to Consider with Root Causes

²³ Damage Information Reporting Tool, Volume 11 at p. 10. Note: Percentile distribution data included where made available in the report.

²⁴ Ibid.

²⁵ Ibid.

“Notification Not Made” is responsible for a smaller share of incidents than the top line data suggests. A closer look at the underlying data indicates the other four root causes are responsible for a larger share of incidents than meets the eye. Sixty-one percent of damages involving excavators classified as Occupant/Farmer were attributed to “Notification Not Made” – far more than the 25 percent of incidents attributed to this root cause when considering all excavators.²⁶ Landowners –classified as Occupant/Farmer for purposes of DIRT – are often exempt from state “Dial Before You Dig” requirements, making “Notification Not Made” a far more likely root cause for incidents caused by this group. Removing this group from the data set provides better insight into the root causes incidents that occur during day-to-day excavation activities.

As the numbers below demonstrate, extracting incidents involving excavators classified as Occupant/Farmer increases the share of total damages attributed to root causes other than “Notification Not Made” by 9 percent, to 84 percent:²⁷

- Excavation Practices Not Sufficient: 55% (+5%);
- Notification Not Made: 16% (-9%);
- Locating Practices Not Sufficient: 20% (+3%);
- Miscellaneous Root Causes: 8% (+1%);
- Notification Practices Not Sufficient 2% (+1%).

Contract locators were more reliable than utility locators in 2014. Another significant metric contributing to the likelihood of an event is who actually performs the locate. In 2014, 90 percent of all locates included in the data set were performed by contract locators, while the remaining 10 percent were performed by utility locators. Of the 90 percent performed by the contractors, 92 percent of the markings were visible and 87 percent of those were correct.²⁸ Conversely, of the 10 percent performed by utility locators, only 74 percent of the marks were visible and only 74 percent of those were correct.²⁹ This means that in total, 80 percent of the locates performed by contract locators in this data set were ultimately marked correctly,³⁰ while only 55 percent of those marked by utility locators were correct.

Damages

Most incidents led to utility service interruptions. As defined for purposes of DIRT’s reports (see page 1), “events” include damages and near misses. In 2014, 97 percent of events led to facility damage, with only 3 percent being classified as near misses. Of the damages, where data on service interruptions was available, 78 percent of incidents led to service interruptions.³¹ Telecommunications infrastructure experienced the highest share of service interruptions³² at 48 percent, while natural gas facilities experienced the second highest share at 31 percent.³³

²⁶ Damage Information Reporting Tool, Volume 11 at p. 9.

²⁷ Ibid. Note: +/- in the parenthetical identifies the change in attribution to each root cause when the Occupant/Farmer incident is removed. Rounding decimals accounts for the 1 percent difference between the 9 percent reduction in “Notification Not Made” and the 10 percent aggregate increase in other categories.

²⁸ Damage Information Reporting Tool, Volume 11 at p. 17.

²⁹ Ibid.

³⁰ Ibid.

³¹ Damage Information Reporting Tool, Volume 11 at p. 19.

³² Ibid.

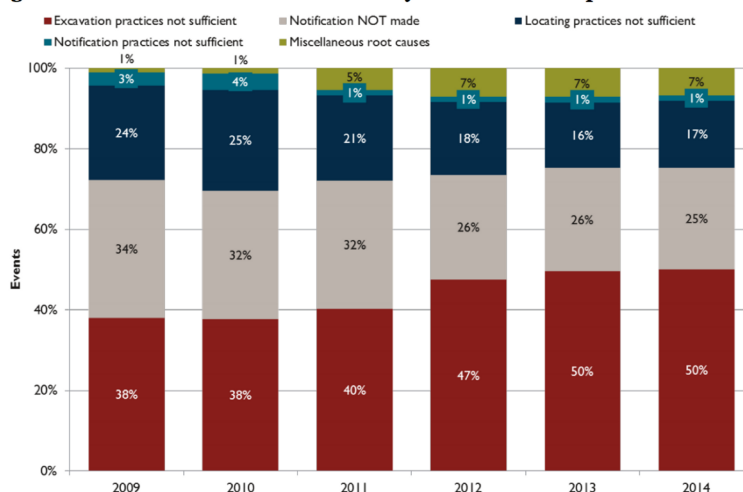
³³ Ibid.

The overall costs of damages may be underestimated due to incomplete data sets. The DIRT report also shows 87 percent of damages in the data set incurred costs of \$2,500 or less.³⁴ This statistic, while reflective of the data collected, may be misleading. For example, there is no breakdown of costs incurred for the 13 percent of accidents that led to more than \$2,500 in damages. However, the Pipeline and Hazardous Materials Safety Administration's (PHMSA) incident database shows that in 2014 alone, there were at least 60 excavation damage incidents to pipeline infrastructure with a total cost of more than \$39 million in damages.³⁵ Further, outage to telecommunications, water, sewer and other infrastructure might have very high hidden costs not reflected in these estimates, like missed economic opportunity or missed days in a classroom or lesson plan requiring online access. The damages themselves are important, but how they disrupt commerce and peoples' lives should be considered a valuable metric as well.

Unfortunately, it is nearly impossible to create an apples to apples comparison of the number of damages and root causes from year to year because of the complex formulas used to estimate instances of damage and the fact that the estimates are extrapolated from actual submissions, rather than reflecting those submissions directly. For example, DIRT estimates that there were 675,000 damages in 2004 and 349,000 damages in 2014 despite the fact that there were roughly 20,000 submissions in 2004 and more than 260,000 submissions in 2014.³⁶

Assuming DIRT's estimates are accurate, the number of damages have held relatively steady with small peaks and valleys for the past five years.³⁷ What is more surprising is that while incident rates have been relatively static, root causes have moved significantly. As you can see in Figure 2, from 2009 to 2014, events attributed to "Excavation Practices Not Sufficient" have increased from 38%-50%, those attributed to "Notification Not Made" decreased from 34% (from 50% in 2004) to 25%, "Locating Practices not Sufficient" accounted for 17% down from 24%, events attributed to "Notification Practices Not Sufficient" fell from 3% to 1%, and "Miscellaneous" was named the root cause for 7% up from 1%.

Figure 2 – Distribution of Known Events by Root Cause Group³⁸



34 Ibid.

35 U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Pipeline Incidents by Cause," accessed on March 30, 2016.

36 Damage Information Reporting Tool, Volume 11, See Exhibit 1 at p. 3.

37 Ibid.

38 Ibid.

RECOMENDATIONS

Aii's recommendations are broken down into two parts. First, recommendations on changes to state Damage Prevention programs that each state should carefully consider integrating into the relevant state laws or regulations. Second, two suggested recommendations on how CGA could modify the DIRT process to make it more effective.

Recommendations for States

1. Implement mandatory incident reporting requirements in state laws and regulations:

All states should have mandatory incident reporting requirements. Allowing subjective reporting or requiring reporting under only certain circumstances necessarily leads to a skewed data set. While CGA is largely successful in collecting and classifying data using DIRT, CGA has no legal authority and therefore, mandatory reporting is not an option for DIRT. However, both government entities at every level, and industry groups, like CGA, would benefit from a more comprehensive and accurate data set.

As discussed later in this section, strict enforcement is very important, but the true goal of any regulatory program should be prevention. Without precise information about how many incidents occurred, where they occurred, why they occurred, who caused them, and what infrastructure was damaged, it is impossible to identify narrow root causes and improve programs to address them.

A more accurate data set would also allow for the comparison of incident rates in a number of ways. One could compare incident rates before and after a policy change and also identify particular contractors or work practices that correlate with higher rates of incident. There are an unlimited number of ways to analyze the data and look for areas of improvement.

In addition to incomplete data, another significant issue with non-mandatory, or permissive, reporting is that it is more likely to reflect what a submitter would like to convey – whether consciously or subconsciously – than what policy makers need to know.

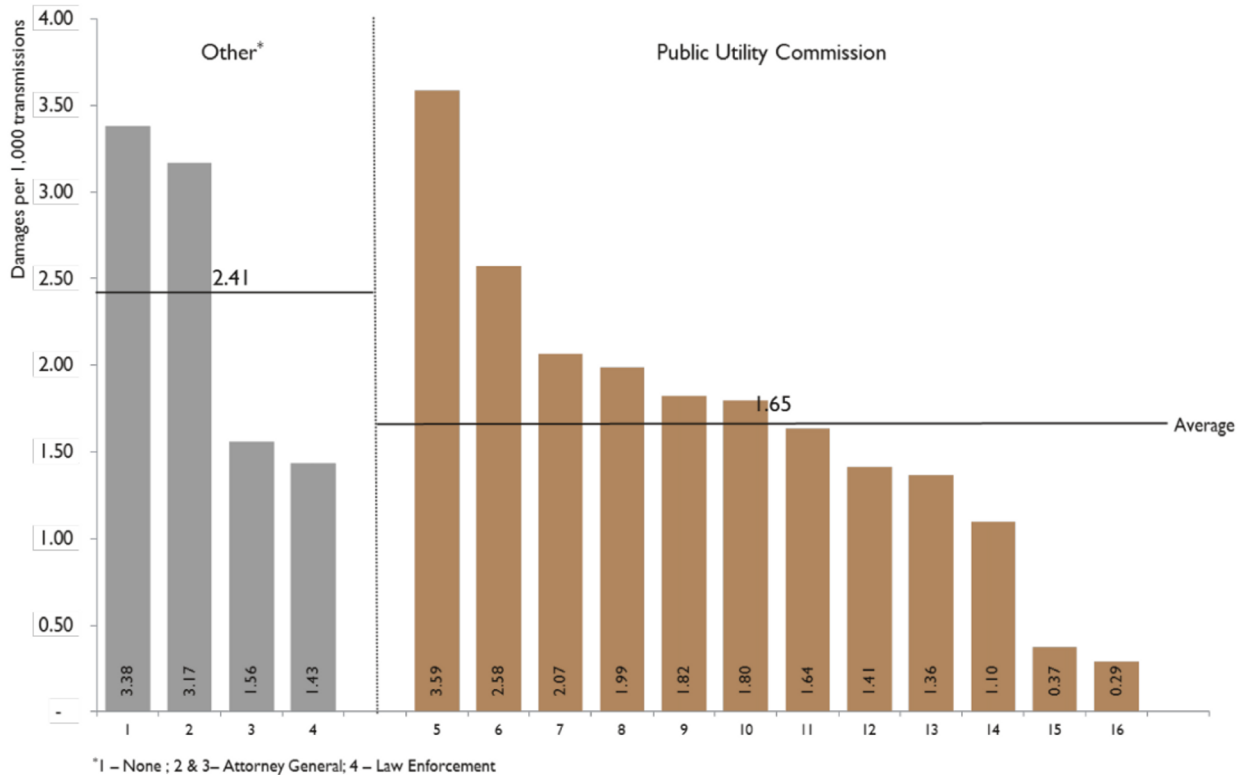
2. Increase enforcement efforts to encourage stronger adherence to laws, regulations, and best practices:

Even if states have stringent laws and regulations on the books, their benefits are muted if they are not properly enforced. The 2014 DIRT report drilled down on the numbers behind sixteen states the report classified as “substantial reporting” states, twelve of which have strong enforcement programs overseen by the respective state’s public utilities commission (PUC), and four of which do not.

As you can see in Figure 3, the twelve states with strong PUC programs have a combined average rate of 1.65 incidents of damage per 1,000 transmissions.³⁹ Compare this to the four states without such enforcement programs, which average 2.41 incidents of damage per 1,000 transmissions⁴⁰

Further, despite the fact that some individual states without PUC enforcement programs have a statistically lower damage rate average than some individual states with PUC enforcement programs, a deeper statistical dive explains these disparities and confirms the positive impact of strong enforcement. For example, the states with the most mature enforcement programs show damage incident rates of 0.29 and 0.31 per 1,000 transmissions, respectively, compared to the four states without PUC programs, which have individual damage incident rates of 1.43, 1.56, 3.17, and 3.38 per 1,000 transmissions⁴¹

Figure 3 – Damages Per 1,000 Transmissions by Enforcement Authority for Substantial Reporting States



Comparatively, the states with PUC enforcement programs that began in 2013 (one year prior to the data set being reviewed) showed damage incident rates of 2.58 and 3.59, respectively – the worst rates of all states with PUC enforcement programs.⁴² While the impact of these states was to skew the numbers from what would have been an even sharper contrast between states with and without PUC enforcement programs, there is a silver lining. Despite having worse rates than the other states with PUC enforcement programs, these states reduced their own incident rates by more than 20 percent each since introducing their new enforcement programs.⁴³

³⁹ Damage Information Reporting Tool, Volume 11 at p. 24.

⁴⁰ Ibid.

⁴¹ Damage Information Reporting Tool, Volume 11 at p. 25.

⁴² Damage Information Reporting Tool, Volume 11 at p. 24-25.

⁴³ Damage Information Reporting Tool, Volume 11 at p. 24.

It is clear strong enforcement programs are instrumental in improving damage prevention outcomes, but one of the less obvious benefits is how enforcement can impact cost-benefit considerations from a business perspective. Strong damage prevention programs should encourage or require investments in available communications and safety technologies. Many companies are reluctant to increase overhead costs above what is required by law or regulation up front, even if the outcome is to improve safety and likely reduce overall costs in the long run. Strong enforcement programs that increase the cost of each incident may make the up front investments in safety technology more financially attractive when performing a cost-benefit analysis.

3. Improve utility locating practices to remedy disparity between accuracy of jobs performed by locate firms and those performed by in-house utility locators:

Regulatory micromanaging of an industry sector is rarely a good idea, but safety efforts may be one place where certain prescriptive rules are appropriate if there is a significant data set demonstrating a need. As described more thoroughly in the “Analysis of 2014 Data” section of this report, 80 percent of the locates performed by contract locators in this data set were ultimately marked correctly, while only 55 percent of those marked by faculty employed utility locators were correct.

Over a high volume of excavation projects a 25 percent improvement in marking being accurate and visible when performed by a contract locator rather than an in-house locator should not be ignored. States should consider requiring or strengthening locator training and certification practices. At the end of 2015, the National Utility Locating Association (NULCA) introduced a new locator training accreditation program, which should serve as a model for future state locator training and certification efforts.

Recommendations for DIRT

1. DIRT should organize data by state instead of region:

DIRT data is broken down geographically into nine U.S. regions (Canada is also included in the data, becoming the 10th region). However, DIRT receives submissions with information including the state or province of where the incident occurred. Displaying the data by region rather than state is not the most effective way to determine whether there is a correlation between state damage prevention programs and outcomes. A better approach would be to show statistics on a state-by-state level, which would assist policy makers in looking for correlations between state laws, regulations, and best practices, and incident rates.

DIRT says certain data trends raise concern and “may suggest the need to develop underground excavation damage best practices specific to some geographies.”⁴⁴ This may be true, but the same could be said of states. While the regional comparisons are valuable, state breakdowns would be even more valuable in identifying other trends unrelated to geography. Better state level data would allow for a more thorough comparison of which laws, regulations and best practices demonstrate a direct correlation with low incident rates compared to states with less stringent standards.

Further, including state level data would not reduce the value of DIRT’s regional analysis. The regional analysis may become more instructive when paired with state data, as it will assist in discerning between which incident causes are common in certain regions regardless of state boundaries, and which are more attributable to the state’s themselves.

2. DIRT should look at increasing the number of root cause categories to include more narrow incident causes and require more specific incident cause descriptions for submissions:

While it is true that all incidents must stem from either a lack of notification, poor locating practices, or poor excavation practices, it is also true that identifying one of those three categories doesn’t always provide enough information to promote corrective action in the future. Many of the events attributed to poor locating practices or poor excavation practices could actually be avoided by improving communication and information sharing practices. DIRT should consider adding the following as root cause groups for purposes of data collection:

- Worksite description not sufficient, i.e. no visual images, including worksite photos and/or digital maps;
- Communication between one call center and locator not sufficient, i.e. lack of positive response;
- Communication between operator and locator insufficient, i.e. not sharing original facility maps;
- Communication between one call center, locator and excavator not sufficient, i.e. failure to notify if locate not made in time.

Without separating these causes and identifying where poor communication practices and insufficient information sharing were the underlying cause of an excavation incident, rather than substandard work, it is impossible to know why incidents attributed to “Excavation Practices Not Sufficient” occur. This is especially troubling considering 84 percent of these incidents are classified as “other.”

Providing additional options may help excavators better articulate what went wrong when submitting an event to DIRT. DIRT seemingly acknowledged this when pointing out, that “[b]etter categorization of the insufficient excavation practices could lead to more targeted corrective actions.”⁴⁵ Additionally, with new technologies entering the Damage Prevention market at a rapid pace, it is important to identify when these tools could be helpful in preventing an incident by allowing for simpler communication and information sharing platforms.

⁴⁵ Common Ground Alliance, Damage Information Reporting Tool, Natural Gas Distribution Facilities Report, January 7, 2016 at p. 8.

CONCLUSION

The DIRT report is an invaluable tool in helping industry and policy-makers better understand incident trends, causes, and more. Every legislative, regulatory or best-practice setting process should rely on comprehensive data and analysis as the cornerstone of the rulemaking effort. DIRT serves as a great foundation for efforts to improve excavation safety. However, while looking at what the DIRT data tells us, it is equally important to look at what it does not tell us.

For example, DIRT tells us that events attributed to “Notification Not Made” have reduced steadily over the past decade. It also tells us that events attributed to “Excavation Practices Not Sufficient” have picked up most of that slack. What it doesn’t tell is what specifically about excavation practices is lacking, as more than 80 percent of incident attributed to substandard excavation practices are categorized as “other.” It also doesn’t tell us which states experience the highest and lowest volume of events, making it nearly impossible to determine whether there is a strong correlation between the strength of each state’s damage prevention statutes and regulations, and their excavation damage outcomes.

Based on the data included in the 2014 DIRT reports, we recommend that all states consider the following recommendations:

- 1) Implement mandatory incident reporting requirements in state laws and regulations;
- 2) Increase enforcement efforts to encourage stronger adherence to laws, regulations, and best practices; and
- 3) Improve utility locating practices to remedy disparity between accuracy of jobs performed by locate firms and those performed by in-house utility locators.

To improve efficacy of DIRT, CGA should consider the following recommendations:

- 1) DIRT should organize data by state instead of region; and
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2016

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ALLIANCE FOR INNOVATION
AND INFRASTRUCTURE
