



Infrastructure Protection Coalition

American Pipeline Contractors Association • www.americanpipeline.org
Distribution Contractors Association • www.dcaweb.org
National Utility Contractors Association • www.nuca.com
Nulca — representing utility locating professionals • www.nulca.org
Power & Communication Contractors Association • www.pccaweb.org

About the Infrastructure Protection Coalition

The Infrastructure Protection Coalition is a coalition of industry groups who represent regular users and stakeholders in the 811 system and who want to see it run safely and efficiently. Members include: the American Pipeline Contractors Association (APCA); Distribution Contractors Association (DCA); National Utility Contractors Association (NUCA); Nulca — representing utility locating professionals; and Power & Communications Contractors Association (PCCA).

Study Conducted By:



Capital

(913) 345-0403 • www.continuumcapital.net











©2021 Infrastructure Protection Coalition • www.ipcweb.org

Table of Contents

| Exhibit 1 - State Quartile Ranking |
|---|
| Georgia Recommendations5-8Georgia Recommendation Summary.5Exhibit 4 - State Utility Locate System Cost Impacts.5Georgia Recommendation Details6-8 |
| Georgia Summary Conclusions |
| Georgia Findings and Observations10-13Georgia Interview Rated Question Analysis.10Exhibit 5 - Stakeholder Ratings & Feedback.10Exhibit 6 - Stakeholder Satisfaction.10Georgia Process Mapping Diagrams.11-12Exhibit 7 - 811 & Damage Adjudication Process Comparison.11Exhibit 8 - 811 Process Duration.11Exhibit 9 - Georgia 811 Process Map.12Georgia 811 Board Structure.13Exhibit 10 - 811 Board Composition.13Exhibit 11 - 811 Board Size.13 |
| Resources |
| State Specific Research Library Bibliography |
| National Research Library Bibliography |

811 EMERGENC

\$61 Billion Lost in System to Protect Underground Utilities

Georgia Executive Summary

Georgia is ranked in the 4th Quartile (Exhibit 1 - State Quartile Ranking) and overall, the current structure and process is not efficient or effective compared to other states. A total of eight areas were used to rate and rank each state in order to place them into an overall quartile rank for performance. Georgia performed in the 4th Quartile for six characteristics, the 2nd Ouartile for one characteristic, and the 1st Ouartile for one characteristic (Exhibit 2 - State Overall Performance).



The 2019 Georgia estimated total damage cost is approximately \$2.4 billion in annual and out-of-pocket cost to the system. In addition to this observable cost is an invisible cost originating from the following: 1) daily unneeded locate requests; 2) daily locator wasted time due to poor instructions; 3) an additional

| Exhibit 2 State Overall Per | formance | | |
|--------------------------------|-----------------|-----------------------|--------------------------------|
| Continuum Rating | PHMSA DP Rate | Stakeholder Rating | Unneeded Loc.? |
| Very Dissatisfied | Adequate | Satisfied | Daily |
| Poor Instructions | Destroyed Marks | Cont. Wait Time | Est. Damage Cost (Millions) |
| Daily | Daily | Daily | \$2,438.13 |
| | | | |

10% in locator wasted time due to destroyed marks; and 4) daily contractor wasted time waiting for asset owner compliance with locate request or taking "defensive excavation" practices at additional cost and lost productivity in an attempt to avoid unlocated facilities.

These costs amount to an additional \$3 billion in waste, inefficiency, and excess cost that is embedded in the system and largely invisible. Regardless of where or from whom these costs originate, they migrate over a 3-5-year timeline toward the most professional contractors and locators, and by default to their utility customers who are primarily the highly regulated electric and gas utilities and ultimately their ratepayers.

Once known and visible, these costs can be eliminated and mitigated. The six recommendations proposed, will eliminate \$2.8 billion of these costs over a 3-5-year timeline and while there are implementation expenditures associated with these recommendations, the gain achieved outweighs the cost by a factor of 70x over the 3-5-year implementation timeline. These savings represent both damage frequency and waste embedded in the system. Severe damage reduction and public safety or societal benefits are not calculated and are on top of these figures.

Ultimately, it is possible to drive out waste, inefficiency, and excess cost from the damage prevention and utility locate process while improving public safety and lowering the total cost to ratepayers, asset owners, and operators (utilities, department of transportation, municipalities).

811 EMERGENCY

\$61 Billion Lost in System to Protect Underground Utilities

Exhibit 3 One Page Summary

| | | | | Georgia | | | | |
|--|--|---|--|--|--|--|--|---|
| State Quartile | Continuum Rating | | Stakeholder Rating | Unneeded Loc.? | Poor Instructions | Destroyed Marks | Cont. Wait Time | Est. Damage Cos (Millions) |
| 4th Quartile | Very Dissatisfied | Adequate | Satisfied | Daily | Daily | Daily | Daily | \$2,438.13 |
| | | | 4.11 | emographic Info | ormation | 2. 24 | Wileys Transporte | nc = not calculate |
| State Capital | State Population | Density per Mile | (metropolitan | st MSA statistical area) | # MSA>250,000 | (milli | id; Growth Rate | |
| Atlanta | 10,617,423 | 186.26 | Atlanta-Sandy Springs-Alpharetta | 6,020,364 | 4 | \$39,984 | 4.0% | |
| | nd; Growth Rate lions) | | d; Growth Rate ions) | | | | | |
| \$26,680 | 5.4% | \$256 | -7.0% | | 780 - 176-m | | | |
| | | ••• | | ystem Characte | ristics | | | |
| The Coordin Lithit | Facility Protection Ac | | tory | Chantor 0 Plasting | or Evacuating Noor | System Name Utilities Protection | Law Adopted 1969 Limited; 1986 | Last Updated 2017 |
| Utility Facilities, Se | ections 35-9-1 to 35-9 | | on came in 2017 that days to 30 days. | increased the locate | icket duration time | Center, Inc. | Comprehensive | |
| Inbound Tickets | Outbound Tickets | Out/In Ratio 2020 | 811 Exempt? | Total Locate Days | Call Day? | Notice Days | Notice Exempt? | Ticket Life (Day |
| 1,359,090 | 16,524,098 | 12.2 | Yes | 3 | 1 | 2 | Yes | 30 |
| Whitelining Req.? | Pos. Resp. Excv. | Pos. Resp. 811 | Who 811 Exempt? | 3rd Party Board | Mand. Report U? | Mand. Report C? | Who Exempt? Agr/Road&Rail Mai | Enforce Auth. |
| 30 | 15 | 811 Board Composition | | | | 29 | 7 | 6 |
| State Law Define? | Board Size | | | | | 3rd Party | For Profit? | |
| | *************************************** | | Board Composition | 131 | Balanced? | Operator? | For Profit? | |
| No | Board Size | Asset Owners Coordinating C balanced group of GPSC rule makin | Board Composition or Utilities: 12 (The ouncil (GUCC) is a s used to influence leging. It creates more ba | Georgia Utility sperate and well- slative action and alance among the | | | For Profit? Not-For-Profit; 501(c)(6) | |
| | *************************************** | Asset Owners Coordinating C balanced group of GPSC rule makin | Board Composition or Utilities: 12 (The ouncil (GUCC) is a s used to influence leging. It creates more ba dders that participate i | Georgia Utility sperate and well- slative action and alance among the | Balanced? Low | Operator? | Not-For-Profit; | |
| DIRT (Damage Damages) for eac | 12 Reporting Information h state as a total, dam | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep nages per 1000 outbo (Per sq. Mile), and e | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a s used to influence legi ng. It creates more be iders that participate i 811 resents the number of ound tickets (Per 1000 estimated state dama) | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage | Low Data damages reported to per 100,000 of the state cost) in millions base | Operator? None the CGA in 2019 (Dilate population (Per 10 sed on the 2019 data | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage | es per square mile |
| No DIRT (Damage Damages) for eac DIRT 19 Damages | 12 Reporting Information h state as a total, darr Per 1000 Tickets | Asset Owners Coordinating C balanced group GPSC rule makir Georgia stakehol Reporting Tool) rep nages per 1000 outbo (Per sq. Mile), and e | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a s used to influence legi ng. It creates more be ders that participate i 811 resents the number o ound tickets (Per 1000 estimated state dama) Per sq. Mile | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage Est. Damage Cost | Low Low Data damages reported to per 100,000 of the state Cost) in millions base DIRT 18 Damages | Operator? None the CGA in 2019 (Dilete population (Per 10 sed on the 2019 data Per 1000 Tickets | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage | es per square mile Per sq. Mile |
| No DIRT (Damage Damages) for eac | 12 Reporting Information h state as a total, dam | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep nages per 1000 outbo (Per sq. Mile), and e | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a s used to influence legi ng. It creates more be ders that participate i 811 resents the number o ound tickets (Per 1000 estimated state dama) Per sq. Mile 241.7 | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage | Low Low Data damages reported to per 100,000 of the state Cost) in millions base DIRT 18 Damages 29,844 | Operator? None the CGA in 2019 (Dilate population (Per 10 sed on the 2019 data | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage | es per square mile |
| No DIRT (Damage Damages) for eac DIRT 19 Damages 43,538 | 12 Reporting Information h state as a total, darr Per 1000 Tickets | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep rages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a s used to influence legion g. It creates more be iders that participate it 811 resents the number o ound tickets (Per 1000 setimated state dama) Per sq. Mile 241.7 PH sate & damage preve | Georgia Utility perate and well- slative action and alance among the n the 811 system) Performance I of underground utility Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessm | Low Low Data damages reported to per 100,000 of the state Cost) in millions base DIRT 18 Damages 29,844 | Operator? None the CGA in 2019 (Diffuse population (Per 10 ged on the 2019 data. Per 1000 Tickets 2.0 Dior coded ratings to a | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. | Per sq. Mile 167.2 |
| No DIRT (Damage Damages) for eac DIRT 19 Damages 43,538 2014 PHMSA ass | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep rages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a s used to influence legion g. It creates more be iders that participate it 811 resents the number o ound tickets (Per 1000 setimated state dama) Per sq. Mile 241.7 PH sate & damage preve | Georgia Utility perate and well- slative action and alance among the n the 811 system) Performance I of underground utility Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessm | Data Jamages reported to per 100,000 of the state Cost) in millions base 29,844 DIRT 18 Damages 29,844 Dent onverted PHMSA's or and 1 and the lowest part of the state of t | Operator? None the CGA in 2019 (Diffuse population (Per 10 ged on the 2019 data. Per 1000 Tickets 2.0 Dior coded ratings to a | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. | Per sq. Mile 167.2 |
| No DIRT (Damage Damages) for eac DIRT 19 Damages 43,538 2014 PHMSA ass | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characters | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep pages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 | Board Composition or Utilities: 12 (The ouncil (GUCC) is a s used to influence legion g. It creates more be iders that participate it 811 resents the number o ound tickets (Per 100) estimated state dama Per sq. Mile 241.7 PH sate & damage preve erformance, 5 as aw | Georgia Utility perate and well- slative action and alance among the n the 811 system) Performance I of underground utility Tickets), damages ge cost (Est. Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessmition process. IPC coerage performance, a | Data Jamages reported to per 100,000 of the state Cost) in millions base 29,844 DIRT 18 Damages 29,844 Dent onverted PHMSA's or and 1 and the lowest part of the state of t | Operator? None the CGA in 2019 (Diffused on the 2019 data. Per 1000 Tickets 2 0 performance. | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. 283.7 | Per sq. Mile 167.2 |
| No DIRT (Damage Damages) for eac DIRT 19 Damages 43,538 2014 PHMSA ass Communication 10.0 | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characte Partnering 10.0 | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep nages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 Peristics of the utility loc the highest p Perf. Measures 10.0 | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a s used to influence legion g. It creates more be iders that participate it 811 resents the number of ound tickets (Per 1000 estimated state dama) Per sq. Mile 241.7 PH sate & damage preve erformance, 5 as aw Training 10.0 Rated C | Georgia Utility perate and well- slative action and alance among the n the 811 system) Performance I of underground utility Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessan ntion process. IPC or erage performance, a Public Ed. 10.0 tuestion & Survey F | Data Jamages reported to per 100,000 of the state Cost) in millions base 29,844 DIRT 18 Damages 29,844 Dent onverted PHMSA's cound 1 and the lowest part is sue Resolution 10.0 Geedback | Operator? None the CGA in 2019 (Diffuse population (Per 10 seed on the 2019 data. Per 1000 Tickets 2.0 polor coded ratings to a performance. Fair Enforcement 10.0 | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. 283.7 a numerical format was Tech Use 10.0 | Per sq. Mile 167.2 there 10 represent Cont. Improve |
| No DIRT (Damage Damages) for each damages) for each damages 43,538 2014 PHMSA ass Communication 10.0 Over 4000 responsible for the communication for t | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characte Partnering 10.0 onses and 450 intervier g), enforcement effect | Asset Owners Coordinating C balanced group i GPSC rule makin Georgia stakehol Reporting Tool) rep lages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 Perf. Measures 10.0 aws rated on a 1 to 10 giveness (Enforcement | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a sused to influence legiong. It creates more badders that participate in the state dama, Per sq. Mile 241.7 PH cate & damage prevenerformance, 5 as avector only a suspension of the control of the state damage prevenerformance, 5 as avector only called the cate of the control of the cate of th | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility of Tickets), damages ge cost (Est. Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessa ntion process. IPC or erage performance, a Public Ed. 10.0 Question & Survey F og "Very Dissatisfied" d law alignment and | Data damages reported to per 100,000 of the state Cost) in millions base 29,844 tent DIRT 18 Damages 29,844 tent DIRT 18 Damages 10,844 tent DIRT 18 Damages 10,944 tent DIRT 18 | Operator? None the CGA in 2019 (Diffuse population (Per 10 and the 2019 data. Per 1000 Tickets 2.0 performance. Fair Enforcement 10.0 "Very Satisfied"; from ation & Law) only, apprentions. | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. a numerical format we see 10.0 | Per sq. Mile 167.2 there 10 represents Cont. Improve 10.0 estions combined |
| No DIRT (Damage Damages) for each damages) for each damages 43,538 2014 PHMSA ass Communication 10.0 Over 4000 responsible for the communication for t | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 character Partnering 10.0 onses and 450 intervier | Asset Owners Coordinating C balanced group i GPSC rule makin Georgia stakehol Reporting Tool) rep lages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 Perf. Measures 10.0 aws rated on a 1 to 10 giveness (Enforcement | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a sused to influence leging. It creates more be ders that participate in 811 resents the number of ound tickets (Per 1000 estimated state damage Per sq. Mile 241.7 PH cate & damage prevenerformance, 5 as aver Training 10.0 Rated CO oscale; 1 representing the only, regulatory and sefficiency) only, with | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility of Tickets), damages ge cost (Est. Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessa ntion process. IPC or erage performance, a Public Ed. 10.0 Question & Survey F og "Very Dissatisfied" d law alignment and | Low Low Low Lamages reported to per 100,000 of the state Cost) in millions base DIRT 18 Damages 29,844 Tenent Insurerted PHMSA's count 1 and the lowest place in the lowest place i | Operator? None the CGA in 2019 (Diffuse population (Per 10 and the 2019 data. Per 1000 Tickets 2.0 performance. Fair Enforcement 10.0 "Very Satisfied"; from ation & Law) only, apprentions. | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. a numerical format we see 10.0 | Per sq. Mile 167.2 There 10 represent Cont. Improve 10.0 estions combined performance metric state specific. |
| No DIRT (Damage Damages) for eac DIRT 19 Damages 43,538 2014 PHMSA ass Communication 10.0 Over 4000 respon (Stakeholder Ration (Metrics) or Stakeholder | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characte Partnering 10.0 onses and 450 intervie g), enforcement effect | Asset Owners Coordinating C balanced group i GPSC rule makir Georgia stakehol Reporting Tool) rep pages per 1000 outbc (Per sq. Mile), and e Per 100,000 Pop. 410.1 Peristics of the utility loc the highest p Perf. Measures 10.0 Pews rated on a 1 to 10 inveness (Enforcemer adjudication (Process | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a sused to influence leging. It creates more be ders that participate in 811 resents the number of ound tickets (Per 1000 estimated state damage Per sq. Mile 241.7 PH cate & damage prevenerformance, 5 as aver Training 10.0 Rated CO oscale; 1 representing the only, regulatory and sefficiency) only, with | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessa ntion process. IPC or erage performance, a Public Ed. 10.0 Question & Survey F ig "Very Dissatisfied" id law alignment and n segregations for con | Low Low Low Lamages reported to per 100,000 of the state Cost) in millions base DIRT 18 Damages 29,844 Tenent Insurerted PHMSA's count 1 and the lowest place in the lowest place i | Operator? None the CGA in 2019 (Differ population (Per 10 sed on the 2019 data Per 1000 Tickets 2.0 plor coded ratings to a performance. Fair Enforcement 10.0 "Very Satisfied"; from stion & Law) only, app, and Continuum only | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. 283.7 a numerical format was 10.00 Pop. 283.7 | Per sq. Mile 167.2 There 10 represent Cont. Improve 10.0 estions combined terformance metric state specific. Continuum Rati |
| No DIRT (Damage Damages) for each DIRT 19 Damages 43,538 2014 PHMSA ass Communication 10.0 Over 4000 respon (Stakeholder Rating (Metrics) or Stakeholder Rating Satisfied Measures agree | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characte Partnering 10.0 onses and 450 intervice g), enforcement effect tyly, 811 and damage Enforcement Satisfied ement that locate (UL faced; Workforce grow | Asset Owners Coordinating C balanced group i GPSC rule makin Georgia stakehol Reporting Tool) rep ages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 eristics of the utility loo the highest p Perf. Measures 10.0 ews rated on a 1 to 10 iveness (Enforcemer adjudication (Process Regulation & Law Satisfied Challenging?), dam wth rate (Workforce N | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a sused to influence leging. It creates more be ders that participate in the state of the | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessn ntion process. IPC or erage performance, a Public Ed. 10.0 uestion & Survey F g "Very Dissatisfed" d law alignment and n segregations for cor Process Structure Satisfied Challenging?), and a set demand for utility of | Data damages reported to per 100,000 of the state Cost) in millions base 29,844 tent DIRT 18 Damages 29,844 tent proverted PHMSA's cound 1 and the lowest place Resolution 10.0 feedback and 10 representing effectiveness (Regulantractor, locator, utility, Contractor Only Satisfied lack of nationwide dal | Operator? None the CGA in 2019 (Dilite population (Per 10 sed on the 2019 data Per 1000 Tickets 2.0 polor coded ratings to a performance. Fair Enforcement 10.0 "Very Satisfied"; from atton & Law) only, appropriation & Law) only, appropriation & Law only Locator Only Satisfied mage prevention met lenge; Frequency of use of the control of the co | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage 10,000 Pop.), damage 283.7 a numerical format was 10.00 pop. 283.7 a numerical format was 10.00 pop. 283.7 between the thick of thi | Per sq. Mile 167.2 There 10 represent Cont. Improve 10.0 estions combined terformance metric state specific. Continuum Rati Very Dissatisfied d') are the most equests (Unneede |
| No DIRT (Damage Damages) for each DIRT 19 Damages 43,538 2014 PHMSA ass Communication 10.0 Over 4000 respons (Stakeholder Rating (Metrics) or Stakeholder Rating Satisfied Measures agrechallenging issues UL Challenging? | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characte Partnering 10.0 onses and 450 intervice g), enforcement effect tyly, 811 and damage Enforcement Satisfied ement that locate (UL faced; Workforce grov Loc.?); and a calculate DP Challenging? | Asset Owners Coordinating C balanced group i GPSC rule makin Georgia stakehol Reporting Tool) rep ages per 1000 outbo (Per sq. Mile), and e Per 100,000 Pop. 410.1 Peristics of the utility loo the highest p Perf. Measures 10.0 Persequency of the coordination (Process Regulation & Law Satisfied Challenging?), dama with rate (Workforce N ation of frequency of w DP Metric Need? | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a sused to influence leging. It creates more be ders that participate in the summer of the summer | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assess ntion process. IPC or erage performance, a Public Ed. 10.0 Question & Survey F g "Very Dissatisfied" d law alignment and n segregations for cor Process Structure Satisfied Challenging?), and a et demand for utility of by locators and excar Unneeded Loc.? | Data Idamages reported to per 100,000 of the star cost) in millions base DIRT 18 Damages 29,844 Lent converted PHMSA's contractor details and 1 and the lowest process (Regular tractor, locator, utility and 10 representing effectiveness (Regular tractor, locator, utility Satisfied lack of nationwide da construction as a chall valors due to infreque Poor Instructions | Operator? None the CGA in 2019 (Diffuse population (Per 10 ged on the 2019 data. Per 1000 Tickets 2.0 Per 1000 Tickets 10.0 Very Satisfied"; from ation & Law) only, app, and Continuum only Locator Only Satisfied mage prevention met lenge; Frequency of unt compliance or ineff Destroyed Marks | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage Per 100,000 Pop. 283.7 a numerical format was 10.00 every state for all quilication and use of persponses. Data is Utility Only Very Satisfied trics (DP Metric Neeunnecessary locate process Cont. Wait Time | Per sq. Mile 167.2 There 10 represents Cont. Improve 10.0 estions combined terformance metric state specific. Continuum Rati Very Dissatisfied d') are the most equests (Unneeder |
| No DIRT (Damage Damages) for each DIRT 19 Damages 43,538 2014 PHMSA ass Communication 10.0 Over 4000 respon (Stakeholder Rating (Metrics) or Stakeholder Rating Satisfied Measures agreechallenging issues | Reporting Information h state as a total, dam Per 1000 Tickets 2.5 essment of 9 characte Partnering 10.0 onses and 450 intervice g), enforcement effect ly, 811 and damage Enforcement Satisfied ement that locate (UL faced; Workforce grov Loc.?); and a calcular | Asset Owners Coordinating C balanced group i GPSC rule makin Georgia stakehol Reporting Tool) rep ages per 1000 outbe (Per sq. Mile), and e Per 100,000 Pop. 410.1 Peristics of the utility loo the highest p Perf. Measures 10.0 Person a 1 to 10 process (Enforcement adjudication (Process Regulation & Law Satisfied Challenging?), dama with rate (Workforce N ation of frequency of vertices of the coordinate of | Board Composition s or Utilities: 12 (The ouncil (GUCC) is a sused to influence leging. It creates more be ders that participate in the state of the | Georgia Utility perate and well- slative action and alance among the n the 811 system) I Performance I of underground utility 0 Tickets), damages ge cost (Est Damage Est. Damage Cost \$2,438.13 MSA 2014 Assessn ntion process. IPC or erage performance, a Public Ed. 10.0 tuestion & Survey F ng "Very Dissatisfied" d law alignment and n segregations for cor Process Structure Satisfied Challenging?), and a tet demand for utility of by locators and excar | Low Low Low Low Low Low Low Low | Operator? None the CGA in 2019 (Diffuse population (Per 10 and the 2019 data. Per 1000 Tickets 2.0 Per 1000 Tickets 10.0 Very Satisfied"; from ation & Law) only, appropriation & Law) only, appropriation & Law (Per 10 and Continuum only and Continuum only Satisfied mage prevention meters (Per 10 and Compliance or inefficiency) | Not-For-Profit, 501(c)(6) RT 19 Damages) an 0,000 Pop.), damage 10,000 Pop.), damage 283.7 a numerical format was 10,000 Pop. 283.7 | Per sq. Mile 167.2 There 10 represent Cont. Improve 10.0 estions combined terformance metric state specific. Continuum Rati Very Dissatisfied d') are the most equests (Unneede |

Georgia Recommendations

Recommendation Summary

Overall, Georgia achieves less than adequate performance as measured by CGA's DIRT Report, IPC, and stakeholders. There are weaknesses or gaps in the Georgia dig law that are directly related to its low performance. Opportunities for further improvement include the following:

- 1. Mandatory Damage Reporting: Refine the dig law to require reporting of all damages (not necessarily investigation into all damages) to all underground utility types to support more effective data collection, process improvement, damage adjudication, and enforcement.
- 2. Third-Party Enforcement Board: Develop or enhance 3rd party investigation and enforcement board, with a balanced number of representatives from each stakeholder group, imbued with both responsibility and authority to manage the entire damage adjudication process
- **3. Effective Metrics:** Identify, develop, collect, and track metrics that effectively support trending and continuous improvement of the state damage prevention performance. Mandatory reporting is necessary to accomplish this effort. Develop and track metrics that support behavioral change in addition to metrics designed to track violations of the law.
- **4. Annual Reporting to CGA and DIRT:** Require state entity(s) responsible for the oversite of the 811 system and collection and adjudication of compliance or damage reports, ticket volumes, etc. to submit data to the Common Ground Alliance (CGA) to support the preparation of the annual DIRT report.
- 5. Excavation Site Accurate Description:
 - **a. Premark** / **White-line Requirement:** Require pre-mark or white-lining of any proposed excavation area that includes traditional reference to intersecting streets/roadways paired with one or more of the following options: GPS coordinates, electronic white-line using aerial image(s), or physical white-lining.
 - **b. GIS System Adoption by Asset Owners:** By 2030, cause all asset owners to adopt a GIS system for asset mapping and require notification through 811 using GPS coordinates.
- **6. Standardize Ticket Size Distance, Duration, and Life:** Standardize the ticket size, distance, duration, and life to the described characteristics.

As previously noted, the 2019 Georgia estimated total damage cost is approximately \$2.4 billion in annual and out-of-pocket cost to the system with an additional largely invisible \$3 billion in waste, inefficiency, and excess cost imbedded in the system. The six recommendations proposed, will eliminate \$2.8 billion of these damage and waste costs over a 3-5-year timeline and these benefits exceed the implementation cost of \$36 million by a factor of 70x over the 3-5-year implementation timeline (Exhibit 4 – State Utility Locate System Cost Impacts).

| Exhibit 4 | |
|---|--|
| State Utility Locate System Cost Impacts | |

| System Cost Category | Current | Recommendation | Damage & Waste | Damage & Waste |
|-------------------------------------|------------|-----------------|-----------------|------------------------|
| | Conditions | Cost (Millions) | Reduction % | Reduction % (Millions) |
| 2019 Damage Frequency | 43,538 | | 50% | (\$1,300.00) |
| Damage Severity | nc | | nc | nc |
| Unneeded Locates | Daily | \$36.00 | 55% | (\$14.00) |
| Poor Instruction to Locator | Daily | Ψ30.00 | 55% | (\$31.00) |
| Destroyed Marks | Daily | | 55% | (\$16.00) |
| Contractor Wait Time | Daily | | 50% | (\$1,500.00) |
| Source: Proprietary Continuum analy | sis. | | Total Reduction | (\$2,861.00) |

Recommendation Detail

To support investigation and potential implementation of the identified recommendation, the following additional information is provided for research and discussion purposes and includes the following:

- Tactical / Process Issue Addressed: A description of the tactical activity or process breakdown and inefficiency identified.
- Recommendation: Summary description of the proposed recommendation.
- Solution Summary: A description of the condition, characteristic, practice, process, or law that was identified as high functioning in another state and is a starting point for research and discussion purposes.
- Solution Reference: A description of where or how to access additional information about the condition, characteristic, practice, process, or law that was identified as high functioning in another state.

1. Mandatory Damage Reporting

Tactical / Process Issue Addressed – Process: Hold responsible parties accountable for damages and cause them to change future behavior. Structure system to support continuous improvement efforts through the collection of data to identify trends, conduct root cause analysis, and ultimately support building a culture that embraces damage prevention.

Recommendation – Mandatory Damage Reporting: Refine the dig law to require reporting of all damages (not necessarily investigation into all damages) to support more effective damage adjudication and enforcement.

Solution Summary – New Hampshire law states...each operator shall file monthly, with the commission, on or before the 15th day of the following month, probable violations of PUC 800, damages to underground facilities, or both. Excavators are required to notify 811 of any damage as well as...report the damage within 72 hours, excluding weekends and holidays, to the commission.

Solution Reference – New Hampshire Code of Administrative Rules, Chapter PUC 800 - Underground Utility Damage Prevention Program, parts 802, 804 & 805

2. Third-Party Enforcement Board

Tactical / **Process Issue Addressed** – Tactical: Ineffective or lack of enforcement. Cause a behavior change in responsible parties to support effective damage prevention. Structure system to support continuous improvement efforts through the collection of data to identify trends, conduct root cause analysis, and ultimately support building a culture that embraces damage prevention.

Recommendation – Third-Party Enforcement Board: Develop or enhance 3rd party investigation and enforcement board, with a balanced number of representatives from each stakeholder group, imbued with both responsibility and authority to manage the entire damage adjudication process.

Solution Summary – The principal purpose of the Idaho Damage Prevention Board...is to reduce damages to underground facilities and to promote safe excavation practices through education directed toward excavators, underground facility owners, and the public at large. The board also shall review complaints of alleged violations. It shall be the responsibility and duty of the administrator to administer the requirements of the law, and the administrator shall exercise such powers and duties as are reasonably necessary to enforce the provisions of the law.

Solution Reference – State of Idaho Title 55 - Property in General, Chapter 22 - Underground Facilities Damage Prevention, Parts 2201 & 2203. (see also Tennessee Code Title 65, Chapter 31, Part 114, 115, 116 & 117) (see also North Carolina Code §87.129)

3. Effective Metrics

Tactical / **Process Issue Addressed** – Tactical: Lack of consistent and critical data for the development of continuous improvement efforts designed to change future behaviors and build a culture that embraces damage prevention.

Recommendation – Effective Metrics: Identify, develop, collect, and track metrics that effectively support trending and continuous improvement of the state damage prevention performance.

Solution Summary – The most widely recognized metric is the total number of damages per 1000 tickets. This should be further refined to - total number of damages per 1000 transmissions, or outgoing tickets. It should be noted that there are several factors in the locate notification process that vary from state to state that make this metric unpredictable. National standardization of the notification process would potentially transform the industry through the direct result of stable data (see Standardize Ticket Size, Distance, Duration, and Life Recommendation). States that choose not to standardize would require substantial additional analysis in order to develop normalized metrics to support state-to-state and year-to-year analysis. Additional metrics include, but are not limited to:

- # of damages per construction spend or more specifically utility construction spend (normalization)
- # of damages per customer served (normalization)
- # of damages per state population (normalization)
- the trending of damages against GDP growth
- the trending of damages against urban density or state average density

Solution Reference - North Carolina approach to data requirements, tracking, and analysis.

4. Annual Reporting to CGA and DIRT

Tactical / Process Issue Addressed – Tactical: Lack of formal requirement to consistently report state performance data to Common Ground Alliance. Structure a system to support continuous improvement efforts through the collection of data to identify trends, conduct root cause analysis, and ultimately support building a culture that embraces damage prevention.

Recommendation – Annual Reporting to CGA and DIRT: Require state entity(s) responsible for the oversight of the 811 system and collection and adjudication of compliance or damage reports, ticket volumes, etc. to submit data to the Common Ground Alliance (CGA) in support of the annual DIRT report.

Solution Summary – The Common Ground Alliance (CGA) is established and nationally recognized as the industry standard for continuous improvement and industry best practices specific to damage prevention. CGA's focus is solely on damage prevention and the update or development of best management practices along with the publication of the annual DIRT report highlighting state-by-state damage prevention performance.

Solution Reference - www.commongroundalliance.com

5. Excavation Site Accurate Description

Tactical / **Process Issue Addressed** – Process: Reduce or eliminate confusion describing where excavation will occur from ticket marking instructions.

Recommendation

- 1. Premark / White-line Requirement*: Require pre-mark or white-lining of any proposed excavation area that includes traditional reference to intersecting streets/roadways paired with one or more of the following options:
 - a. GPS coordinates
 - b. Electronic white-line using aerial image(s)
 - c. Physical white-lining using white paint or flags
- 2. GIS System Adoption by Asset Owners: By 2030, cause all asset owners to adopt a GIS system for asset mapping and require notification through 811 using GPS coordinates.

Solution Summary – §18.7(a), Prior to giving notice...an excavator shall mark, if applicable according to the specific excavation area using white paint flags, or stakes. §18.3(c), When an excavation site cannot be clearly identified and described on a line locate ticket, the excavator shall use white-lining to mark the excavation area prior to giving notice to the notification center and before the locator arrives on the excavation site.

Solution Reference - Texas Economic Regulation, Title 16, Chapter 18, Rules 18.3 and 18.7

6. Standardize Ticket Size, Distance, Duration, and Life

Tactical / **Process Issue Addressed** – Tactical: Lack of consistent and ongoing improvements to various processes that support a high-functioning damage prevention program.

Recommendation – Standardize Ticket Size, Distance, Duration, and Life: Standardize the ticket size, distance, duration, and life to the described characteristics.

A national standard supports and vastly improves efficiency throughout the utility locate and damage prevention process. Standardizing four basic elements of a notification request opens the possibility to complete robust analysis, build continuous improvement into the system, and simplify training and education programs. The four elements of notification and ticket standardization:

- 1. 3 working day notification time (addressed in Standardize Minimum Notification Time recommendation above)
- 2. 30 calendar day ticket duration
- 3. Ticket type:
 - a. Standard*
 - b. Complex*
 - c. Design
- 4. Ticket size limit:
 - a. Standard urban = 1,000 LF
 - b. Standard rural = 2,500 LF
 - c. Complex = joint meet, 5 working day clear
 - d. Design = joint meet, 10 working day clear

Solution Reference – Brings consistency to the notification process and ticket elements; balancing reasonable notification time for locators with ticket size and ticket life preferences. Creates an opportunity for locators to plan and resource level effectively, raising the likelihood of successful damage prevention and profit generation. In addition, the standardization streamlines locator, excavator, and stakeholder education and training.

^{*}This requirement applies regardless of excavation length.

^{*} Standard and Complex tickets are limited to one (1) refresh before a new notification is required.

Georgia Summary Conclusions

Overall, Georgia is ranked in the 4th Quartile of states in the design and implementation of its utility locate and damage prevention process and achieves less than adequate performance as measured by CGA's DIRT Report, IPC, and stakeholders' frequency in experiencing wasted time. Areas highlighted and contributing to this low performance include:

1. Lack of Compliance & Consistency:

- a. Telecom companies in Georgia have adopted the approach of making the repair instead of spending the time and dollars to locate their facilities, making them non-compliant with the law.
- b. Interviewees described inadequate number of investigatory staff that yielded different levels of investigation both geographically and in asset damage type, impacting the pace of damage adjudication.

2. Inconsistent & Inefficient 811 Process:

- a. The GA locate process overall rating is approximately 0.2 points below the average across all other states and ranks 28th among them, indicating that it is an average performing state compared to others.
- b. The GA damage adjudication process effectiveness and pace supporting the overall impact and behavior change objectives is viewed as too slow to effectively support the desired behavior change.

3. <u>Mixed Performance Perspective from All Stakeholders:</u>

- a. Georgia achieves satisfactory performance in the eyes of all stakeholders in enforcement application and approach, regulation and law structure and application, the 811-notification process and structure, and infrequency of destroyed marks
- b. There are multiple areas for improvement that revolve around frequent unneeded locate requests, poor instructions, destroyed marks, and contractor wait time associated with asset owner or locator's non-compliance with locate requests, locates not completed during the notice period, or excavator actions or requests that impact locator wasted time.

4. <u>811 Board Composition Unbalanced:</u>

- a. The Georgia 811 Board, which is not specifically addressed in the dig law, does not have balanced stakeholder representation but is of reasonable size.
- b. The use of the Georgia Utility Coordinating Council (GUCC), that is a well-balanced group, to influence legislative action and GPSC rule making creates more balance among the Georgia stakeholders that participate in the 811 system.

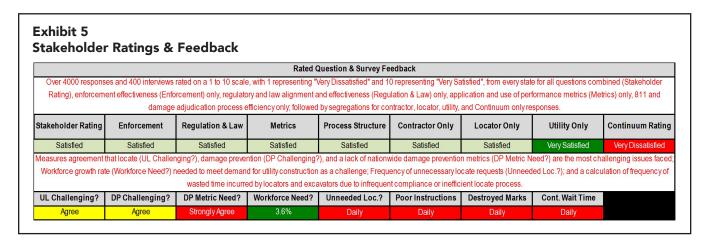
5. <u>2014</u>, <u>2017-2019</u>, and <u>2019/2020 PHMSA Assessments</u>:

- a. 2014 PHMSA Statewide Damage Prevention Programs Assessment no major areas of improvement noted.
- b. 2019 PHMSA Gas State Program Evaluation rating of 93.6 out of 100.0 possible points.
- $c. \ \ 2020\ PHMSA\ State\ Damage\ Prevention\ Enforcement\ Program\ Assessment\ -\ rating\ of\ "adequate"\ with\ no\ qualifications.$

Georgia Interview Rated Question Analysis

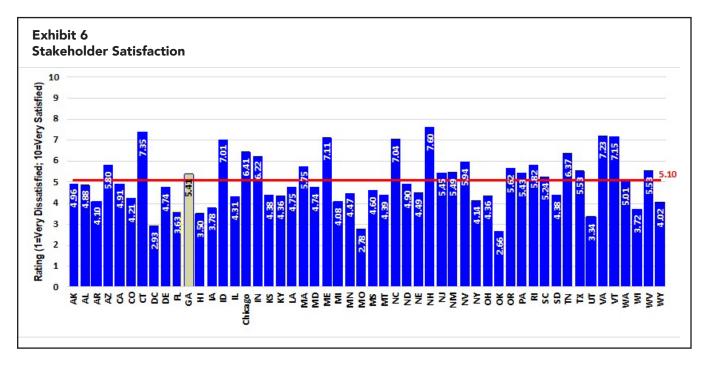
Conclusions

Overall, Georgia is ranked in the 4th Quartile despite the "satisfied" ratings from the stakeholders in the areas of enforcement, regulation and law structure and application, process structure, and metrics: all of which fall into the 2nd Quartile. There are multiple areas for improvement that revolve around frequent unneeded locate requests, poor instructions, destroyed marks, and contractor wait time associated with asset owner or locator's non-compliance with the locate request or locates not completed during the notice period (Exhibit 5 - Stakeholder Ratings & Feedback).



Findings & Observations

Georgia stakeholders rate all aspects of the 811 process as slightly above average yielding a total score of 5.41 on a 1 to 10 scale (Exhibit 6 – Stakeholder Satisfaction). The standard deviation or variance in response is very low indicating consistent opinions. Multiple areas fell into the 4th Quartile, including the frequency of unneeded locate requests, poor instructions, and contractor wait time associated with asset owner or locator's non-compliance with the locate request or locate completion during the notice period.



Georgia 811 Process Mapping

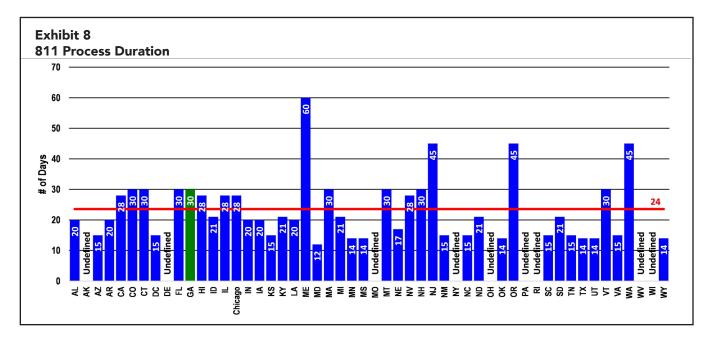
Conclusions

Overall, Georgia is ranked in the 4th Quartile, however, the 811-notification process is well defined and relatively efficient in terms of having the majority of components in place that lend themselves to high performance. The damage adjudication process, however, does not balance stakeholder perspectives with effectiveness and pace. (Exhibit 7 - 811 & Damage Adjudication Process Comparison)

| | | | | Georgia | | | | |
|----------------------------|---|--------------------|------------------------|----------------------|----------------------|-----------------|----------------------|--------------------|
| 811 System Characteristics | | | | | | | | |
| Inbound Tickets | Outbound Tickets | Out/In Ratio 2020 | 811 Exempt? | Total Locate Days | Call Day? | Notice Days | Notice Exempt? | Ticket Life (Days) |
| 1,359,090 | 16,524,098 | 12.2 | Yes | 3 | 1 | 2 | Yes | 30 |
| Whitelining? | Pos. Resp. Excv. | Pos. Resp. 811 | Who 811 Exempt? | 3rd Party Board | Mand. Report U? | Mand. Report C? | Who Exempt? | Enforce Auth.? |
| Yes | Yes | Yes | Resi | Yes | Yes | Yes | Agr/Road&Rail Mai | PUC |
| | pping of state specific ess duration (DA Prod S | cess Days); Number | of touches (# of Touch | nes 811 & # of Touch | es DA) required to o | | number of steps (# o | |
| 811 Process Days | # of Touches 811 | # of Steps 811 | | | DA Process Days | # of Touches DA | # of Steps DA | # of Functions DA |
| | 15 | | | | Undefined | 29 | 7 | C |

Findings & Observations

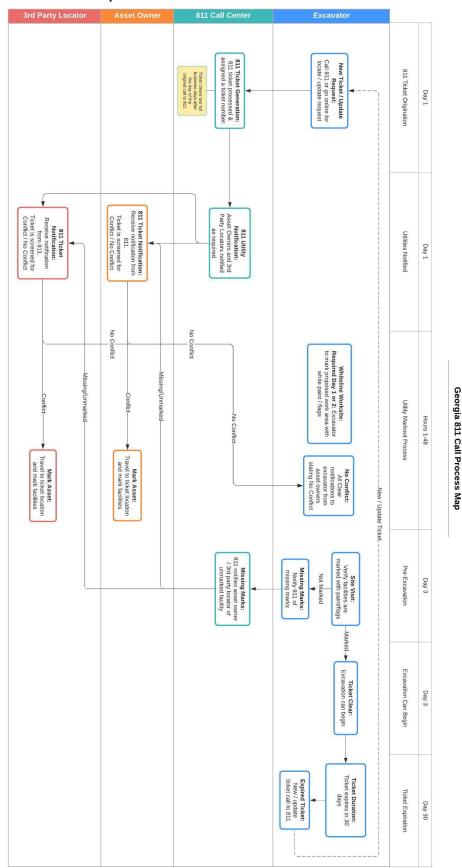
Georgia's ticket life of 30 days falls within the preferred range of 15-30 days; however, this 30-day timeline does not yield an efficient 811 notification process that balances the needs of all the stakeholders involved. The number of 811 process touches and steps fall below the national average, making Georgia's process more efficient in comparison to other states. (Exhibit 8 – 811 Process Duration and Exhibit 9 - Georgia 811 Process Map)



The Damage Adjudication process in Georgia includes a separate board tasked with the investigation & adjudication of damages; however, this board is a volunteer group that still falls under the PUC umbrella and can only recommend penalties and other actions that will ultimately be accepted or rejected by the PUC.

.

Exhibit 9 811 Process Map



Georgia 811 Board Structure

Conclusions

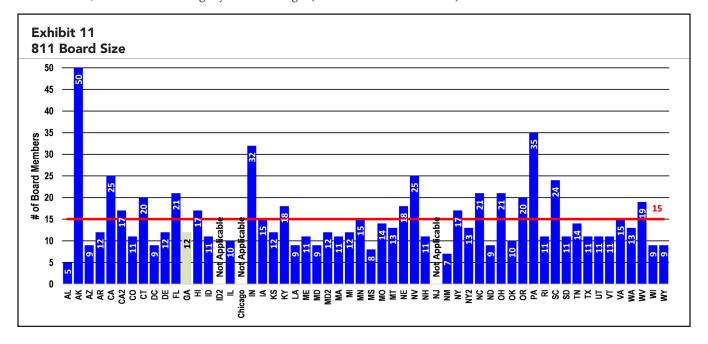
Overall, Georgia is ranked in the 4th Quartile. An additional factor contributing to this performance is the nature and characteristics of the 811 Board. Specifically, the Georgia 811 Board, which is not addressed in the dig law, does not have well-balanced stakeholder representation but is of reasonable size. (Exhibit 10 – 811 Board Composition)

| | | Georgia | | | | |
|----------------------|------------|--|-----------|------------------------|------------------------------|--|
| | | 811 Board Composi | tion | | | |
| State Law Define? | Board Size | Board Composition | Balanced? | 3rd Party Operator? | For Profit? | |
| No | 12 | Asset Owners or Utilities: 12 (The Georgia Utility Coordinating Council (GUCC) is a sperate and well- balanced group used to influence legislative action and GPSC rule making. It creates more balance among the Georgia stakeholders that participate in the 811 system) | Low | None | Not-For-Profit, 501(c)(6) | |

Findings & Observations

The composition of the 811 Board is not specifically addressed in the Georgia dig law. Because it is not addressed, there are no requirements put in place to ensure equal stakeholder representation, resulting in an unbalanced board that is only made up of 12 asset owners or utilities, with The Georgia Utility Coordinating Council (GUCC) serving as a separate and well-balanced group to influence legislative action and GPSC rule making, creating balance among the Georgia stakeholders that participate in the 811 system.

Across the US, the Board size is slightly below average. (Exhibit 11 - 811 Board Size)



State Specific Research Library Bibliography

- Georgia General Assembly. (2017). TITLE 25. FIRE PROTECTION AND SAFETY. CHAPTER 9. BLASTING OR EXCAVATING NEAR UTILITY FACILITIES. O.C.G.A. TITLE 25 Chapter 9 (2017).
- U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. (2020). 2019 Gas State Program Evaluation for Georgia Public Service Commission. U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration.
- U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. (2019). 2018 Gas State Program Evaluation for Georgia Public Service Commission. U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration.
- 177 U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration. (2018). 2017 Gas State Program Evaluation for Georgia Public Service Commission. U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration.
- 308 Georgia 811. (2016). Excavator Manual Georgia 811. Georgia 811.
- 363 PHMSA. (2014). Statewide Damage Prevention Programs and the Nine Elements 2014 (Georgia). PHMSA.
- 405 PHMSA. (2010). 2009 One Call Report Analysis & Recommendations. PHMSA.
- 419 Reepe III, Robert. (2019). Georgia Power's Strategic Overhead to Underground Conversions. Georgia Power.
- Brooks, Douglas L. (n.d.). Watch Where You Dig! Strict Liability of Excavators Under the Georgia Utility Facility Protection Act. The Law Firm of Douglas L. Brooks, P.C.

National Research Library Bibliography

- 1 CGA. (2021). Best Practices: The Definitive Guide for Underground Safety & Damage Prevention. CGA.
- 2 Cycla Corporation. (1999). COMMON GROUND Study of One-Call Systems and Damage Prevention Best Practices. U.S. Department of Transportation's Office of Pipeline Safety.
- 10 Christopher, Mel. (2020). Safety in Numbers. dp-PRO.
- 12 Twohig, Michael A. (2020). How has our Underground Mapping Documentation Practices Improved over time. dp-PRO.
- 15 Unknown. (2020). One Call Process Industry Survey Results. dp-PRO.
- 16 Cummins, Ray. (2020). Signal Boost: Enhancing Damage Prevention Assurance for the 5G Revolution. dp-PRO.
- 19 Willmets, Michael J. (2019). Trenchless Technology: A Growing Industry for Infrastructure Management. dp-PRO.
- 21 Harshbarger, Chris. (2019). Mobile Technology: A Tool No Professional Should Be Without. dp-PRO.
- 23 Hyland, Jeni. (2019). Trends in Pipeline Safety: Preventing Third Party Damage. dp-PRO.
- 27 Twohig, Michael A. . (2019). Mobile Mapping: Safety for the Work, and the Workers. dp-PRO.
- 28 Kent, Gary. (2019). Professional Surveyors and Utility Locators. dp-PRO.
- 29 Ebke, Laura. (2019). Should Utility Locators be Licensed? dp-PRO.
- 30 Fisher, Innes. (2019). ROI On Making Underground Facilities Locatable. dp-PRO.
- 32 Iadanza, Mike & Moorehead, Robert. (2018). Cost of a Public & Private Locate. dp-PRO.
- Kerr, Khrysanne. (2018). Revamped Common Ground Alliance DIRT Report Estimates Damage to Buried Utilities Has Increased on Pace with Excavation Activity between 2015 and 2017. dp-PRO.
- Dahlberg, Eric. (2018). In Search of Pipelines. dp-PRO.
- 36 Proszek, James J. (2018). Defending Your Locate: Keys to Minimizing Potential Liability. dp-PRO.
- 38 Gray, Allen S. (2017). Gold Shovel Standard: More Important Now than Ever Before. dp-PRO.
- 39 Unknown. (2017). 2016 DIRT Report Estimates that Damage to Buried Utilities Cost Society at Least \$1.5 Billion Last Year. dp-PRO.
- 40 Zabinski, Kate. (2017). Training Certification. dp-PRO.
- 41 McLaughlin, Matthew D. (2017). How RFID and GPS Technologies are Enhancing Damage Prevention. dp-PRO.
- Wyman, Eben M. (2017). Does Gold Shovel Standard Support "Shared Responsibility" in Damage Prevention? dp-PRO.
- 44 Unknown. (2018). Gold Shovel Standard Overview. GSS.
- 45 Unknown. (2018). Gold Shovel Standard Metrics and Report System. GSS.
- 46q CGA's Data Reporting & Evaluation Committee. (2021). DIRT 2020 Analysis and Recommendations. CGA.

311 EMERGENCY

\$61 Billion Lost in System to Protect Underground Utilities

- 47 Unknown. (2020). CGA Best Practices. CGA.
- 49 Unknown. (2019). CGA 2019 Technology Report. CGA.
- 50 Stolarczyk, Larry G., et.al. (2019). Next Generation Locating Tool. 811 Magazines.
- 51 Reames, Virginia. (2019). Insurance Liability. 811 Magazines.
- 52 Reames, Virginia. (2017). Wanna Really Get Sick? 811 Magazines.
- 53 Scott, C. Paul. (2017). Inspect What You Expect. dp-PRO.
- 54 Kelly, Christina. (2015). Invest Training Dollars for Compliance or Competency? dp-PRO.
- Nightingale, David F. (2015). Contractors Beware: Having a Homeowner Contact 811 on Your Behalf Doesn't End Your 55 Liability for a Facility Strike. dp-PRO.
- 56 Twohig, Michael. (2015). Defining the Standard of Care for Subsurface Utility Mapping. dp-PRO.
- 57 Unknown. (2014). Chaos to Common Ground: 40-year History of the Evolution of the One Call System. dp-PRO.
- 61 Pestov, Alexandre. (2018). Enhanced utility management with integration of GIS and augmented reality. Geospatial
- 62 Nichols, Steve. (2019). The Value of a Professional Locator. digDifferent.
- 63 Vine, Kevin. (2020). Empowering Safe Construction and Sound Design: Components of a Successful Subsurface Utility Engineering (SUE) Program. Pipeline Awareness.
- 64 Peterson, Ron. (2020). Nulca Best Practices. Pipeline Awareness.
- 66 Unknown. (2020). Common Ground Alliance Excavation Best Practices 16.0. Pipeline Awareness.
- 67 Reams, Jennifer. (2020). Changes to the Laws in Your State. Pipeline Awareness.
- Unknown. (2020). One Call and State Law Directory. Pipeline Awareness. 68
- 72 Crossbore Safety Association, Inc. (2020). Leading Practices for Cross Bore Risk Reduction. Crossbore Safety Association, Inc..
- 73 Associated General Contractors of America. (n.d.). Elements of an Effective Underground Utility Excavation Safety and Damage Prevention Program. Associated General Contractors of America.
- 74 Unknown. (2020). 811 Awareness Study 2020 Data Sheet National and State Trends and Takeaways. CGA & 811.
- 75 The Alliance for Innovation and Infrastructure (AII). (2020). Damage Prevention Report Card 2020. Alliance for Innovation & Infrastructure.
- The Alliance for Innovation and Infrastructure (AII). (2020). 811: One-Call Before You Dig The Development and 76 Future of Damage Prevention Efforts. Alliance for Innovation & Infrastructure.
- 77 The Alliance for Innovation and Infrastructure (AII). (n.d.H84). DATA DISPLAYS. Alliance for Innovation & Infrastructure.
- 78 The Alliance for Innovation and Infrastructure (AII). (2018). Best Practices to Achieve Excavation Safety. Alliance for Innovation & Infrastructure.
- 79 Skelton, Shane. (2018). Letter to CGA Recommending Best Practices for Damage Prevention. Alliance for Innovation & Infrastructure.
- 83 Magruder Lyle, Sarah K. (2018). Excavator Submissions To DIRT Improve Damage Prevention. UC.
- The Alliance for Innovation and Infrastructure (AII). (2020). Improving Upon Our Dig Laws: Proactive Steps to Combat 85 Five Years of Rising Excavation Damage. Alliance for Innovation & Infrastructure.
- 87 The Alliance for Innovation and Infrastructure (AII). (2019). Improving Upon Our Dig Laws: Excavations Damage, Data, and Trends for Industry and Policymaker Analysis (2018 Data). Alliance for Innovation & Infrastructure.
- 88 The Alliance for Innovation and Infrastructure (AII). (2016). Improving Upon Our Dig Laws: How State Legislatures Can Help Us Dig Safer. Alliance for Innovation & Infrastructure.
- 89 The Alliance for Innovation and Infrastructure (AII). (2020). Reportable Pipeline Incidents Caused by Excavation Damage, 2010 Through May 4, 2020. Alliance for Innovation & Infrastructure.
- 90 McCown, Brigham A. (2016). BEFORE THE PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION. Alliance for Innovation & Infrastructure.
- 91 Skelton, Shane. (2015). Letter to Chairman Shuster and Ranking Member DeFazio. Alliance for Innovation &
- 400 National Transportation Safety Board. (1997). Protecting Public Safety Through Excavation Damage Prevention. NTSB.

- Committee on Commerce House of Representatives. (1996). Oversight Hearing on the One-Call Notification Program. US Government Printing Office.
- Committee on Commerce, Science, and Transportation United States Senate. (1997). S. 1115, The Comprehensive One-Call Notification Act of 1997. US Government Printing Office.
- McCown, Brigham & Skelton, Shane. (2015). IX. The Role of Improved Communication & Technology in Enhancing Damage Prevention Practices: Why use 20th Century Technology to combat 21st Century Safety Challenges? The ICER Chronicle, Edition 4.
- 405 PHMSA. (2010). 2009 One Call Report Analysis & Recommendations. PHMSA.
- 406 Chao, Elaine. (2017). A Study on Improving Damage Prevention Technology. PHMSA.
- 408 Zeiss, Geoff & Shinoaki, Sakura. (n.d.). Reducing Damage to Underground Utility Infrastructure during Excavation. Geospatial Information & Technology Association.

All the documents in this bibliography can be found by number under the Research tab at www.ipcweb.org.