California Underground Facilities Safe Excavation Board

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Agenda Item No. 12 (Information Item) – Staff Report

Clarifying the GIS Mapping Statute in Regulations

PRESENTER

Tony Marino, Executive Officer

AUTHOR

Mignon Marks, Policy Specialist

SUMMARY

The California Regional Common Ground Alliance (CARCGA) provided an Idea Register Submission requesting that the Board clarify, through regulation, the requirement found in former Senate Bill 865[1] that operators map new subsurface installations using geographic information systems (GIS).[2] As part of its annual review of Idea Register submissions, the Board's included this suggestion in its 2023 and 2024 *Workplans*. What constitutes "new construction" is well-defined in tax law and accounting standards, which may be useful in developing regulations. The many different types of subsurface installations, however, make it difficult to specify in regulation what information operators must collect and store in their GIS records. Accuracy cannot be addressed in regulations without a better understanding of the economic implications of requiring better map accuracy. Staff recommends that the GIS Mapping committee begin drafting regulatory language and conducting an economic analysis of a map-accuracy requirement.

[1] Senate Bill 865 (Chapter 307 of the Statutes of 2020). Hereinafter referred to as "Senate Bill 865."

[2] Gov. Code § 4216.3 (a)(5).

CONTENTS

STRATEGIC PLAN

2020 Strategic Plan Objective: Improve Accessibility of Buried Infrastructure Location Knowledge and Understanding

2024 Strategic Activity: Determine What New Facilities Need to be Incorporated into Utility Operator Geographic Information Systems

BACKGROUND

Senate Bill 865 added Gov. Code subsection 4216.3(a)(5), which states:

> Commencing January 1, 2023, all new subsurface installations shall be mapped using a geographic information system and maintained as permanent records of the operator.[3]

This requirement is in addition to the statutory requirement for operators to "amend, update, maintain, and preserve all plans and records for its subsurface installations as that information becomes known."[4]

In September 2022, the Underground Safety Board received a request from CARCGA to define "new subsurface installation."[5] CARCGA described the issue as "[f]acility operators aren't sure what is considered a new subsurface installation and if they are to use the GIS for locating or just to keep the records" and that "[t]hey will make decisions regarding technologies and/or processes that will need to be updated or new ones developed." CARCGA also proposed that the Board create a minimum standard. In its annual review of Idea Register submissions for its *2023 Workplan*[6], the Board decided to "look for opportunities to clarify, perhaps through regulation, what constitutes a 'new' subsurface installation pursuant to SB 865." In July 2023, the Board created the GIS Mapping Committee. Also in July 2023, staff presented results of a survey it conducted to understand how operators currently use GIS. Results[7] from 103 survey responses indicated that:

- GIS mapping is in wide use across all facility operator types (except for irrigation system operators), though less prevalent with non-government operators,
- GIS is being used for a variety of purposes, including asset management, infrastructure planning, and responding to 811 tickets,
- Challenges included field data collection, updating and maintaining the information, and integrating GIS with existing systems, and
- Management support for GIS mapping efforts is mixed—and non-government

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[3] Gov. Code § 4216.3 (a)(5) exempts from the GIS mapping requirement oil and gas flowlines three inches or less in diameter that are located within the administrative boundaries of an oil field as designated by the Geologic Energy Management Division.

[4] Gov. Code § 4216.3 (a)(4).

[5] "Item 10: Idea Register Submission September," November 7-8, 2022.

[6] https://energysafety.ca.gov/wp-content/uploads/2023-annual-work-plan_ada.pdf, *Underground Safety Board 2023 Workplan*, April 2023, page 6.

[7] "Item 41: Geographic Information System (GIS) Development Update," Staff Report entitled *Geographic Information System (GIS) Development Update: Outreach Survey Results*," November 13-14, 2023.

respondents especially cited no management support.

In its *2024 Workplan*[8], the Board chose to pursue as an issue determination of what facilities need to be incorporated in an operator's GIS system.

DISCUSSION

CARCGA, in its September 2022 Idea Register submission, proposed the following solution:

Create a minimum standard for the 1/1/2023 requirement as follows:

- *Mapping will occur when a facility is installed where one did not previously exist.*
- *When there are physical additions, changes, rehabilitations, repairs, replacements and/or improvements to existing infrastructure.*
- *Accuracy level of positional data collected not to exceed that of the existing California tolerance zone of 24 inches on either side of the facility. (As per CA 4216 u)*

To assess CARCGA's proposal, and to understand operators' responsibilities under the GIS requirement, staff explored the following questions:

- What work undertaken by the operator would trigger the GIS-mapping requirement?
- What information about a subsurface installation must the operator collect and include in GIS?
- Is a level of accuracy required? If yes, what is it?

What work undertaken by the operator would trigger the GIS mapping requirement?

No California statute or regulation[9] defines "new subsurface installations," although the Dig Safe Act uses similar terminology in two locations:

- A "new underground subsurface installation" is identified as a type of inactive subsurface installation,[10] and

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[8] https://energysafety.ca.gov/wp-content/uploads/2024/03//2024_plan_final.pdf, *Underground Safety Board Workplan 2024*, page 5.

[9] No other titles within California's Code of Regulations define the terms "new subsurface installation," "newly constructed subsurface installation," "new underground subsurface installation," "new underground installation," "new underground facility," "new underground infrastructure," "new subsurface facility" or "new subsurface infrastructure."

[10] Gov. Code § 4216 (k)(2)

- Operators must mark "newly installed subsurface installations in areas with continuing excavation activity."[11]

CARCGA proposed that mapping should occur when a facility is installed "where one did not previously exist" and when "there are physical additions, changes, rehabilitations, repairs, replacements and/or improvements to existing infrastructure." While the words "physical additions," "changes," "rehabilitations," "repairs", "replacements" and "improvements" are not defined pursuant to the Dig Safe Act, they can be found in other areas of state and federal law.

Tax Standards Consider Rehabilitations and Improvements the Same as New

Tax laws, regulations and accounting procedures differentiate between expenditures that are long-lasting, create value, and can thus be accounted for over multiple years, from those that are expenses and don't create asset value.

Rehabilitations (also called "restorations" or "rebuilds") generally prevent continuing deterioration of infrastructure that is in poor physical condition or diminished capacity.[12] Improvements can be rehabilitations or expansions, extensions, or additions of a major component that is expected to increase the productivity, strength, quality, or output of an existing asset.[13] As such, both are accounted for as a new asset would be.

On the other hand, repairs performed as a part of routine maintenance are treated as expenses, which is not the way a new asset would be treated. The term "major," when placed in front "repairs" or "maintenance," however, often indicates a capital expenditure. The following examples show the terms "major repairs" or "major maintenance" in use for describing utility-related capital expenditure work:

- Major repair [program] or replacement,[14]

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[11] Gov. Code § 4216.3 (a)(1)(B)

[12] *Utility Infrastructure Rehabilitation*, prepared by Brown and Caldwell for US Department of Housing and Community Development, November 1984, page 1-1, https://www.huduser.gov/portal/publications/Utility-Infrastructure-Rehabilitation.html

[13] *Capitalization of Tangible Property Audit Technique Guide, Department of Treasury, Internal Revenue Service*, Publication 5712 (9-2022) Catalog Number 93499J, page 5, https://www.irs.gov/pub/irs-pdf/p5712.pdf. Also see Betterments discussion on pages 55-66.

[14] *Repair/Replace Considerations for Pre-Regulation Pipelines*, Final Report 15-019, by J. F. Kiefner and M. Van Auker, for Department of Transportation, Pipeline and Hazardous Materials Safety Administration, https://primis.phmsa.dot.gov/matrix/FilGet.rdm?fil=9427, March 2015, page 169.

- Major repair or modification,[15]
- Major repair, replacement or upgrading activities,[16]
- Major repair or major alteration,17 and
- Capital Improvement and Major Maintenance[18]

Definitions of "major repair" and "major maintenance" are industry specific.[19] The State of Colorado, for example, defined "major repair" of a natural gas pipeline as "any repair, replacement, renewal or upgrade to a pipeline which is originally estimated to cost $50,000 or more."[20]

Examples of how the Internal Revenue Service and State Board of Equalization consider these terms may be found in **Attachment 1**.

In summary, CARCGA's proposal for the range of activities where GIS mapping should occur appears to be consistent with tax and accounting standards, except for repairs performed as routine maintenance, which are generally considered expenses, and not expenditures for new capital assets.

While the treatment of what is considered "new" may be consistent across different

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[15] "Notice of proposed revision of memorandum of understanding (MOU) and public meeting," Department of the Interior Minerals Management Service and Department of Transportation Research and Special Projects Administration, Offshore Pipelines, Federal Register Volume 60, Number 100 (Wednesday, May 24, 1995), https://www.govinfo.gov/content/pkg/FR-1995-05-24/html/95-12633.htm.

[16] *Overview of the Design, Construction, and Operation of Interstate Liquid Petroleum Pipelines*, by T. C. Pharris et al. Environmental Science Division of Argonne National Laboratory, Report ANL/EVS/TM/08-1, November 2007, https://corridoreis.anl.gov/documents/docs/technical/apt_60928_evs_tm_08_1.pdf page 83.

[17] Field-constructed aboveground oil storage tank requirements, Title 18 Alaska Administrative Code Section 75.065(e)(1) and 75.065(e)(2), https://www.akleg.gov/basis/folioproxy.asp?url=http://wwwjnu03.akleg.org/cgi-bin/folioisa.dll/aac/query=[JUMP:%2718aac75!2E055%27]/doc/%7B@1%7D?firsthit

[18] *Capital Improvement & Major Maintenance Projects*, City of Avalon, https://www.cityofavalon.com/193/Capital-Improvement-Major-Maintenance-Pr This reference is one example capital improvement plans published by local jurisdictions, which typically include underground utility projects.

[19] The Federal Aviation Administration, for example, defined "Major Repairs" as repairs to … an airframe … involving the strengthening, reinforcing, splicing, and manufacturing of primary structural members or their replacement, when replacement is by fabrication such as riveting or welding…" *Appendix A to Part 43—Major Alterations, Major Repairs, and Preventive Maintenance*, https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-43/appendix-Appendix%20A%20to%20Part%2043

[20] Code of Colorado Regulations, Gas Pipeline Safety, General Provisions, Section 4901. Definitions, Page 78.

authorities, the Board may wish to avoid reference to those statutes and regulations in its regulations. If a goal of the regulation is to provide clarity as to what constitutes a "new subsurface installation," pinning its definition on accounting practice is unlikely to accomplish that goal.

Colorado Standard for Electronic Locatability

Colorado faced a similar question when implementing a new law that stated "[a]ll new underground facilities … must be electronically locatable when installed." Colorado's Underground Damage Prevention Safety Commission determined that the "replacement of utilities, especially planned replacement/rehabilitation, is considered a new installation." The Commission determined, however, that routine "repair work [is] different from new installations."[21]

Subsurface Installations Are Not Limited to Pipe, Wire, or Conduit

Regardless of what is considered a "new subsurface installation," California's Dig Safe Act defines "subsurface installations" broadly as "pipes, conduits, wires and other structures..."[22] Therefore, components such as valves, control wires, vaults, and other structures would be considered a "new subsurface installation."

Existing California Law Requires Updating GIS Records

Existing law requires operators to "amend, update, maintain, and preserve all plans and records for its subsurface installations as that information becomes known."[23] This provision was added by the Dig Safe Act of 2016. As identified in the November staff report entitled, "Geographic Information Systems (GIS) Development Update: Outreach Survey Results,"[24] survey responses indicate that many operators have GIS systems, and some have populated these systems by digitizing their existing maps, rather than through field collection. These maps, or the process of their entry into GIS, may contain inaccuracies. Should an operator find the location of a facility—through exposure or other means—that is more accurate than their existing maps, they need to update their

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[21] Best Practice – Electronically Locatable, Colorado Department of Labor and Employment, Division of Oil and Public Safety, Underground Damage Safety Commission, approved November 14, 2019, https://ops.colorado.gov/sites/ops/files/BestPracticeElectronicallyLocatable.pdf

[22] Gov. Code §4216(s).

[23] Gov. Code§ 4216.3 (a)(4).

[24] Item 41: Geographic Information System (GIS) Development Update. Staff presented *Geographic Information System (GIS) Development Update: Outreach Survey Results as*, at the Board Meeting held on November 13-14, 2023, page 14.

GIS records with the more accurate information. This requirement is independent of the GIS 2020 amendment to the Dig Safe Act and is not restricted to the installation of "new" subsurface facilities.

What information must the operator include in GIS?

Several standards exist for the information that should be included in operator GIS records. **Attachment 2** identifies five GIS standards and a related Common Ground Alliance (CGA) Best Practice. **Attachment 3** outlines from those standards required or recommended components and component characteristics to be included in GIS.

These standards differ by facility type and purpose. For example, data standards for the Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Office of the State Fire Marshal (OSFM) are followed for reporting to regulators and for regulators to map pipeline infrastructure in a common system. Furthermore, they are not limited to "new" subsurface installations but are meant to capture all the operator's natural gas transmission and hazardous liquid pipelines. American Society of Civil Engineering (ASCE) 75-22 *Standard Guideline for Recording and Exchanging Utility Infrastructure Data* is designed to allow for the sharing of information about both aboveground and buried facilities.

Each standard also differs by the names it uses to refer to similar, if not identical, characteristics. Utility types are not always easily defined,[25] and each type of utility network has many components.[26]

To facilitate developing accurate locate-and-mark information for their locators, a utility operator would need to record and make available the following component information:

[25] Many damage-prevention and standard-setting organizations have attempted to create lists identifying all types of utility networks, including:

- The Common Ground Alliance – Facility Identifiers Abbreviations lists 18 types.
- The American Society of Civil Engineers recognized six utility types and 27 utility subtypes. Standard Guideline for Recording and Exchanging Utility Infrastructure Data (ASCE 75-22),
- The Federal Geographic Data Committee listed 12 utility types.

[26] The ASCE 75-22 standard lists more than 150 component parts found in one or more types of utility networks. The Federal Geographic Data Committee attempted to identify all features by type of utility network. GIS software programs also provide operators with extensive component lists (called features) tailored to specific utility types. The Construction Specifications Institute's MasterFormat also provides lists of components by utility type.

- The facility type (to the extent that it falls into the six, uniform color codes[27]),
- The number of facilities located in a bank of subsurface installations,
- Presence of tracer wire or tracer tape and the location of above-ground access points,
- Presence of marker balls, and
- Presence of Radio Frequency Identification (RFID) devices and the frequencies they emit.

The Dig Safe Act does not, however, limit the operator's responsibilities to locate and mark. Operators must inform excavators if the proposed excavation area is within 10 feet of a high priority line and provide them information on how they may verify the location and prevent damage to it.[28] They must inform the excavator if the facility is embedded in pavement.[29] They must identify abandoned lines with an "A" inside a circle.[30] If properly requested by the excavator, operators must also determine whether an excavator may use vacuum excavation in lieu of hand exposure[31] and must assist when soil conditions prevent the excavator's use of approved tools.[32] Excavators must request that an operator assist in determining the exact location of a subsurface installation if the excavator can't find it based on marks alone.[33] The operator therefore should have the following information accessible for facilities associated with a specific location:

- Presence of pipe wrap, warning tape, a coating or insulation,
- Presence of tracer wire or tape,
- Presence of cathodic protection,
- Locations of protruding stubs and fittings,
- Information that could identify the facility as a "high priority" subsurface installation, and
- Whether the facility was directly buried or is contained within a conduit, duct or

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[27] Uniform Color Code, Best Practices Version 2.0, Common Ground Alliance, https://bestpractices.commongroundalliance.com/Appendix-B-Uniform-Color-Code-and-Marking-Guide/Uniform-Color-Code

[28] Gov. Code § 4216.2 (c)

[29] Gov. Code § 4216.3 (f)

[30] Gov. Code § 4216.3 (a)(1)(C)

[31] Gov. Code § 4216.4 (a)(2)

[32] Code of Regulations, Title 19, § 4501 (c).

[33] Gov. Code § 4216.4 (b)

encasement.

While it is important that an operator uses a GIS data content standard[34] for accuracy and data integrity, the Board may not wish to specify which standard to use in regulation. First, many operators may already have in-house GIS data standards,[35] and it could be costly and unnecessary for an operator to change their standard if it is not chosen for the regulation. Second, a regulation specifying the minimum contents of operators' GIS databases would need to be quite detailed to encompass the many types of underground utility systems subject to the GIS-mapping law. Furthermore, significant overlap exists between information stored in GIS and that stored in other construction-, asset-, and maintenance-management systems. Regulations should not specify which of the operator's information management systems store descriptive information about the components of subsurface installations.

Is a level of positional accuracy required? If yes, what is it?

CARCGA proposed that the accuracy of the GIS data should not exceed the existing Gov. Code § 4216(u) tolerance zone definition.[36]

The standards referenced in **Attachment 2** and **Attachment 3** identify what information needs to be collected, including some measure of positional accuracy. A common approach to classify how accuracy location data may be expressed is documented using "Quality Levels of Mapping." ASCE 75-22 incorporated the quality levels published in ASCE's companion standard, ASCE 38-22 *Standard Guideline for Investigating and Documenting Existing Utilities*,[37] a standard supporting subsurface utility engineering. Utility Quality Level A (QLA) a value assigned to that portion of a subsurface utility feature (such as a pipeline segment) that is directly exposed and

[34] A data content standard specifies the names, definitions and domains for utility system components that are geospatially depicted as feature types and their non-geographical attributes.

[35] For example, see "Electric Operations Asset Registry Governance," Utility Standard: TD-9212S, Pacific Gas and Electric Company, publication date September 1, 2022, https://www.pge.com/assets/pge/docs/outages-and-safety/outage-preparedness-and-support/td-9212s-eo.pdf

[36] "Item 10: Idea Register Submission September," CARCGA.

[37] Although ASCE 38-22 is not available for free, an abridged version of its predecessor, ASCE 38-02, is available at https://www.dot.ga.gov/PartnerSmart/utilities/Documents/ASCE%2038-02.pdf. See page 6 of this document for definitions of each quality level.

measured.[38,39]

Operators' as-built specifications for subsurface utilities may contain accuracy-measurement requirements, or they may have procedures to achieve more accurate location data. These procedures may include:

- Requiring use of licensed land surveyors to collect location records and requiring those surveyors or the project engineer to certify their work,[40,41,42]
- Specifying use of the State Plane Coordinate System for horizontal locations and NAVD88 for vertical (depth) locations.[43,44]

Examples of actual measurements as accuracy standards for operator as-built specifications include:

- "… a large electric IOU in California [has] as-built data requirements [for] all utility facilities, including underground and overhead assets…[They] had to be located by GPS within +/-0.2' accuracy during construction."[45]
- "The survey shall be completed with instrumentation that provides accuracy to

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[38] Discussed in "Subsurface Utility Engineering and the Quality Levels of Mapping," by Richard Bracco, Boston Society of Civil Engineers Section, May 23, 2023, https://www.bsces.org/news/org/subsurface-utility-engineering-and-the-quality-levels-of-mapping-4901

[39] "Quick overview of ASCE 75-22 "As-installed" Standard," by Geoff Zeiss, *Between the Poles*, August 22, 2022, https://geospatial.blogs.com/geospatial/2022/08/introduction-to-the-asce-75-22-as-installed-standard.html

[40] "Sussex County Engineering Department Minimum As-Built Survey Requirements," https://sussexcountyde.gov/sites/default/files/PDFs/As-Built%20Requirements%20for%20Private%20Roads.pdf.

[41] As-Built Submittal Requirements, Town of Fuquay-Varina, North Carolina, Page 1, https://www.fuquay-varina.org/DocumentCenter/View/8120/SCM-and-Utility-As-Built-Submission-Requirements-PDF.

[42] "As Built Specifications," Clay County Utility Authority, https://www.clayutility.org/engineering/documents/As-builtSpecificationsStandardsManual.pdf

[43] Indiana-America Water Company, Inc. Minimum Standards for Record Drawings, Digital Requirements for Record Drawing Submittal, March 2019, Page 2, Record Drawing Minimum Standards 2019 .pdf (amwater.com).

[44] Utility Record Drawing Requirements, Volusia County Utilities, page 1, https://www.volusia.org/core/fileparse.php/4670/urlt/UtilityRecordDrawingRequirements.pdf

[45] "How to create high-accuracy digital as-builts," by Imogen Hartmann, *Utility Magazine*, July 29, 2020, https://utilitymagazine.com.au/how-to-create-high-accuracy-digital-as-builts/

hundredths of a foot."[46]

- "Locations shall be shown on the plans with an accuracy of +/- one (1) foot."[47]
- "The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically for water and reclaimed water utilities and 0.01' vertically for sewer utilities."[48]
- The Michigan Department of Transportation set five centimeters (about two inches) as its "survey grade absolute accuracy" standard in its draft GIS Procedural Manual, based on what is achievable by "Real Time Kinematic GPS techniques."[49]
- The California Department of Transportation set a range of eight positional accuracy standards for survey work within State highway rights of way. The accuracy standards most applicable to mapping subsurface installations are:
    - Three feet (one meter) for "locating [surface] features for a GIS database,"
    - 0.3 feet (10 centimetres) for "utility as-builts and two-dimensional locations"
    - 0.2 feet (5 centimeters) for "topographical features such as water valves, high-risk utilities and culverts"[50]

Accuracy is determined in large part by how the data collection occurs and is therefore highly related to the practice of land surveying.

In comments to the Board regarding its *2023 Workplan* Looking Ahead item on GIS mapping, David Woolley, a licensed land surveyor with D. Woolley & Associates, stated

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[46] Green Stormwater Infrastructure As-Build Survey & *GREEN STORMWATER INFRASTRUCTURE AS-BUILT SURVEY & DRAFTING MANUAL*, City of Philadelphia Water Department, June 2015, Page 7, https://water.phila.gov/pool/files/gsi-as-built-survey-and-drafting-manual.pdf

[47] "As-Built Specifications," City of Farmington Hills, Michigan, https://www.fhgov.com/engineering/as-built-specifications/#SanitarySewers. Also, see as-built specifications for storm sewers on this webpage.

[48] "As Built Specifications, Clay County Utility Authority, Page 4, https://www.clayutility.org/engineering/documents/As-builtSpecificationsStandardsManual.pdf

[49] Draft *Geospatial Utility Infrastructure Data Exchange Procedure Manual*, Michigan Department of Transportation, Revised June 2019, Page 15, https://www.michigan.gov/mdot/-/media/Project/Websites/MDOT/Business/Permits/Utility-Coordination/GUIDE-Procedural-Manual-2019-Draft.pdf?rev=e06836eb30294abeb6ea27c373ad9455&hash=7B609607EB88196D68910FF87640411C.

[50] *Surveys Manual*, Chapter 5 Classifications of Accuracy and Standards, Figure 5-1A Positional Accuracy, Page 5-5, April 2015, California Department of Transportation, https://dot.ca.gov/-/media/dot-media/programs/right-of-way/documents/ls-manual/05-surveys-fig-51-a11y.pdf. Also see https://dot.ca.gov/-/media/dot-media/programs/right-of-way/documents/ls-manual/05-surveys-a11y.pdf

that the location of "underground utilities collected with a cell phone are of little value" and that "[i]naccuate GIS systems will be more dangerous for operators and the public than the existing system." Woolley stated that field data accuracy should be addressed in regulations (**Attachment 4**, p. 2 of 4). During public comment at the Board's April 2024 meeting, Mr. Woolley reiterated his request for the Board to set a positional accuracy standard as part of its implementation regulations for the GIS mapping law.

Accuracy of GIS Data-Collection Technology

The most common method for field collection of buried facilities' location data is to use a Global Navigation Satellite System (GNSS) receiver. The Global Positioning System (GPS) operated by the federal government, is the GNSS receiver most familiar to casual users in the US. All GNSS receivers require data correction to improve their positional accuracy. Below is a summary of current data-correction approaches:

- *Uncorrected/Unadjusted GNSS Satellite Signals*: Consumer-grade devices, such as smartphones, that use satellite signals alone can be accurate within three to five meters under good conditions but are often much less accurate (ten to 13 meters) where obstacles obstruct signals.[51,52]
- *Assisted GPS*: This method is often used in smartphones and combines satellite and cellular tower position information to improve accuracy.
- *Real-Time Kinematic (RTK) GNSS*: Using signals from one or more reference-deployed RTK stations that communicate with each other can be accurate to one to three centimeters under ideal conditions.[53]
- *Post-Processing or Precise Point Positioning*: Like RTK, post-processing collects satellite signals from two or more GNSS receivers simultaneously, but the collected data is stored until it can be downloaded and processed later. Like RTK, PPP can achieve centimeter-level accuracy.[54]

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[51] High-Precision Positioning with Smartphone Measurements, *Inside GNSS, May 29, 2023,*

[52] Smartphone GPS accuracy study in an urban environment, by Krista Merry and Pete Bettinger, July 18, 2019,

[53] RTK data correction is achieved by using two GNSS receivers positioned near each other, one "base" receiver and one "rover" simultaneously collecting field data. RTK GNSS receivers have built-in antennas and processors capable of calculating RTK data correction on their own without a second base receiver. Many manufacturers of GNSS RTK receivers claim accuracy within one to three centimeters in their specification sheets. RTK correction can also be purchased as a subscription service.

[54] "What is IMU/GNSS post-processing?" January 29, 2024.

Relationship with the Professional Land Surveyors Act

SB 865 added subclause (6) to Gov. Code § 4216.3 (a), which states:

> "Nothing in this section shall be interpreted to preempt the Professional Land Surveyors' Act, as described in Chapter 15 (commencing with Section 8700) of Division 3 of the Business and Professions Code."

The Professional Land Surveyors' Act is enforced by the state's Board for Professional Engineers, Land Surveyors, and Geologists (BPELSG). The Act regulates, among other things, the locating of the alignment or elevation for fixed works.[55] BPELSG has interpreted this to include the interpretation of GPS and ground penetrating radar data and making subsequent recommendations regarding it.[56] Persons who practice land surveying need to be licensed[57] or work subordinate to a licensed person,[58] although the law does have limited exemptions for persons employed by certain Public Utilities Commission-regulated gas, electric, and telephone corporations.[59]

How Accuracy Could be Regulated

An accuracy regulation could take various forms, and could include one or more of the following approaches:

- *Calculated accuracy tolerances*. Requiring that the location data meet an accuracy tolerance. This approach would provide operators flexibility in the method they use to collect location data as long as it falls within a stated accuracy tolerance. Specifying an accuracy tolerance without an independent means of confirming whether that number is correct, however, could create an incentive for operator personnel and their contractors to prioritize recording the "correct" measurement of accuracy rather than the true accuracy.
- *Methods and tools*. Specifying the methods and tool to be used for collecting location data. This approach, for example, might require use of high-accuracy GNSS receivers with RTK data correction. Doing so, however, might lead to regulations which can quickly become out of date as the technology and data-correction software continue to improve.
- *Accuracy Information*. Requiring location data be reported with metadata that

[55] Business and Professions Code § 8726.

[56] Response to the Background Paper for the California Board for Professional Engineers, Land Surveyors, and Geologists, BPELSG, April 2024, p. 12.

[57] Business and Professions Code § 8725.

[58] Business and Professions Code § 8730 (b)(2).

[59] Business and Professions Code § 8730 (c).

documents how, where, and by whom the location data was collected. Another approach would be to require reporting using a ranked accuracy level. This approach would not constrain operators in how they collect the data, including using inexpensive methods, but would ensure that those using the data would understand its initial degree of accuracy.

- *Continual improvement*. Rather than requiring GIS location data meet some measure or level of accuracy, the Board could remind operators of existing legal requirements to update their records continuously as more accurate information becomes available. Timely updating has been the law since January 1, 2017.[60]

Economic Impact of Accuracy

In his letter, Mr. Woolley noted that creating and maintaining a GIS system may be expensive.

> "The operators of an existing GIS have a spectrum of quality ranging from detailed and accurate to nearly worthless systems. Creating and maintaining a GIS system is a heavy lift -requiring the hiring of technical staff and the allocation of large capital expenditures for software platforms and global positioning systems (GPS). Compliance with SB865 will require many operators to contract with land surveyors and Certified GIS Professionals (GISP) to build and maintain the operators' GIS system. A hybrid system, with licensed professionals and operator staff, will be the likely business model. The hybrid model will require extensive training of the operators' staff." (citations omitted) (**Attachment 4**, p. 2 of 4).

Individuals responding to the staff's GIS survey also raised questions and concerns about the cost of complying with the GIS mapping law.[61]

The Administrative Procedures Act (APA), which governs the development and adoption of regulations, requires that each agency undertaking a regulation conduct an economic analysis.[62] The agency must avoid "the imposition of unnecessary or unreasonable regulations or reporting, recordkeeping, or compliance requirements." Regulations that have an economic impact in the state (whether a cost or a benefit) of greater than $50 million require Standardized Regulatory Impact Analysis (SRIA), which

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[60] Gov. Code 4216.3(a)(4)

[61] See "Item 41: Geographic Information System (GIS) Development Update," Staff Report entitled *Geographic Information System (GIS) Development Update: Outreach Survey Results*," page 18.

[62] Gov. Code § 11346.3.

requires significant macroeconomic analysis.[63] Since the SRIA went into effect, the vast majority of regulations have not exceeded the $50 million threshold.[64]

Note that the economic analysis is specific to the regulation. Costs imposed independently by statute are not required in the analysis.

Given the potential high costs of regulations that would impose an accuracy requirement (expressed as a physical measurement) or that would prescribe methods and tools for location-coordinate data collection, the Board would need to be confident on both the necessity of an accuracy requirement and the economic impact before advancing such a regulation.

RECOMMENDATIONS

Staff recommends that the Board direct the GIS Mapping Committee and staff to address the three questions posed in this report:

1. *What work undertaken by an operator would trigger the GIS mapping requirement?* Develop draft regulatory language that identifies new subsurface installations similar to the language proposed by CARCGA but excluding routine repair work.
2. *What subsurface installation attributes must the operator include in GIS?* Review the differences and overlap between GIS, asset inventory, asset management and maintenance management systems. Develop draft regulatory language that identifies what information about a component – other than its geospatial coordinates – must be collected and stored by operators.
3. *Is a level of accuracy required? If yes, what is it?* Identify the magnitude of financial costs and benefits associated with different regulatory approaches to improving map accuracy.

[63] Gov. Code 11346.3(c) and California Code of Regulations, tit. 1, §2000 - 2004, https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I86082A604C6611EC93A8000D3A7C4BC3&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default) se - California Code of Regulations (westlaw.com)

[64] Guidelines for Conducting California Standardized Regulatory Impact Assessments, by David Metz, Benjamin M. Miller, Melissa Kay Diliberti, Weilong Kong, RAND Corporation, 2024, RAND Corporation, 2024. p. 4-6, showing 77 SRIAs were produced during 2014- 2022. https://www.rand.org/content/dam/rand/pubs/research_reports/RRA1300/RRA1386-1/RAND_RRA1386-1.pdf

Staff also recommends that the Board direct the GIS Mapping Committee and staff to identify what GIS mapping considerations are not appropriate for regulation but may be appropriate for non-regulatory safety standards.

ATTACHMENTS

Attachment 1: Tax Agency Treatment of Work Types

Attachment 2: Description of Facility Data Standards from Selected Organizations

Attachment 3: List of Required or Recommended Facility Characteristics for Information Records of Underground Utility Installations from Selected Organizations

Attachment 4: Letter from David Woolley RE: 2023 Workplan – Operator Geographic Information System, January 9, 2023.

ATTACHMENT 1: TAX AGENCY TREATMENT OF WORK TYPES

Federal and California tax agencies include rehabilitations to a unit of property (UOP) in their definition of "new construction," but add the following qualifiers:

- The Internal Revenue Service (IRS) – using the terms "restorations" or "rebuilds" instead of "rehabilitations" – added that to qualify for cost capitalization, these projects must occur after UOP has reached the end of its class life.[65] and,
- California's Board of Equalization advised local tax assessors that new construction includes "rehabilitation, renovation, or modernization that converts …[a] fixture to the substantial equivalent of a new … fixture."[66,67]

The following are examples from the IRS of improvement projects (called "betterments"). Work performed upon a UOP within an operator's utility network is regarded as a betterment if it:

- "Ameliorates a material condition or defect that either existed prior to the taxpayer's acquisition of the UOP or arose during its production, whether or not the taxpayer was aware of the condition or defect at the time of acquisition or production,
- Is for a material addition to the UOP, including a physical enlargement, expansion, extension, or addition of a major component or a material increase in its capacity, including additional cubic or linear space, or
- Is reasonably expected to materially increase the productivity, efficiency, strength, quality, or output of the UOP."[68]

Note that the IRS includes capacity expansions, enlargements, extensions and additions among its examples of betterment projects.

The IRS treats routine repairs, on the other hand, as expenses, which:[69]

- Keep property in efficient operating condition,
- Protect the underlying property through routine maintenance, and
- Restore the property to its previous condition.

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[65] Internal Revenue Service, "Capitalization of Tangible Property Audit Technique Guide: Treas. Reg. § 1.263(a) and related regulations," Publication 5712 (9-2022), Page 73, https://www.irs.gov/pub/irs-pdf/p5712.pdf

[66] *Assessment of Newly Constructed Property, Assessors' Handbook Section 410*, California State Board of Equalization, Reprinted January 2015, Page 28, https://www.boe.ca.gov/proptaxes/pdf/ah410.pdf

[67] Revenue and Taxation Code, Chapter 3, New Construction, § 70,

[68] IRS Pub. 5712, supra FN 1, at 56.

[69] Code of Federal Regulations, Title 26, §§ 1.263(a)-0 through 1.263(a)-6.

Routine repairs "are actions taken to restore a system or piece of equipment to its original capacity, efficiency, or capability. Routine repairs…are not intended to increase significantly the capacity of the item involved."[70]

[70] National Research Council. 1996. *Budgeting for Facilities Maintenance and Repair Activities: Report Number 131*. Washington, DC: The National Academies Press, page 14, https://doi.org/10.17226/9226.

ATTACHMENT 2: DATA STANDARDS FROM SELECTED ORGANIZATIONS

Common Ground Alliance	**Michigan Department of Transportation (MDOT)**	**American Society of Civil Engineering (ASCE)**	**Pipeline and Hazardous Materials Safety Administration (PHMSA) - National Pipeline Mapping System**	**Canadian Standards Association**	**CAL FIRE – Office of the State Fire Marshal (OSFM)**
Data standard applies to owners of underground utilities who install underground electronic utility markers to locate new and (exposed) existing subsurface installations. The standard applies to the facility data that is carried by a signal emitted from utility marker. **Source:** CGA Best Practices - Appendix B, Guidelines for Underground Electronic Utility Marker Technology https://bestpractices.commongroundalliance.com/2-Planning-and-Design/219-Underground-Electronic-Utility-Markers https://bestpractices.commongroundalliance.com/Appendix-B-Uniform-Color-Code-and-Marking-Guide/Guidelines-for-Underground-Electronic-Utility-Marker-Technology#mainContentAnchor	Data standard applies to permittees installing underground utilities within MDOT's right-of-way. All permittees' GIS records are uploaded into a MDOT-maintained database. Licensed surveyors must collect GPS and component-characteristic data in the field. Resulting GIS maps would be 3D. **Source**: MDOT Geospatial Utility Infrastructure Data Exchange (GUIDE) https://www.michigan.gov/mdot/-/media/Project/Websites/MDOT/Business/Permits/Utility-Coordination/GUIDE-Procedural-Manual-2019-Draft.pdf?rev=e06836eb30294abeb6ea27c373ad9455&hash=7B609607EB88196D68910FF87640411C	Data standard applies to owners of both above-ground and subsurface utilities. GIS data collected for both newly installed and newly exposed existing facilities. Stakeholders would exchange GIS files during any phase of a construction project. Resulting GIS maps would be three dimensional. **Source:** ASCE 75-22, Standard Guideline for Recording and Exchanging Utility Infrastructure Data https://sp360.asce.org/personifyebusiness/Merchandise/Product-Details/productId/28099 4612 (not available for free download)	Data standard applies to owners of three types of pipeline systems. (Listed below.) Owners submit annual updates to PHMSA, which uses the information for regulatory purposes and to publish GIS maps for public viewing. **Source:** https://www.npms.phmsa.dot.gov/Documents/Operator_Standards.pdf	Data standard applies to owners of underground utility infrastructure, all of which are obliged to provide accurate and retrievable as-built locations of their infrastructure upon request. This data standard also addresses digital records management and how types of utility features should be graphically represented on digital maps. **Source:** CSA S250:20 Mapping of Underground Utility Infrastructure https://www.csagroup.org/store/product/CSA%20S250:20/ (not available for free download)	Data standard applies to owners of hazardous intrastate pipeline systems. Its purpose is to map all OSFM-jurisdictional pipelines. GIS data mapped on PHMSA's website. Based on PHMSA's data standard, but this standard has additional, required facility information. **Source:** Pipeline and Breakout Tank Submission Standards for State Pipeline Mapping System https://34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/pipeline-safety-and-hazardous-materials/geographic-information-systems/spms_standards-2022.pdf?rev=39c4281228254578b0f6b9629cc2c09b

Data Integration Factors Additional factors are related to storing and labeling of data tagged to an underground utility marker via Radio Frequency ID (RFID) technology, including: · Information to be stored with the unique identifier · Metadata template definition and creation to promote data collection consistency and underground utility marker operation across varying technology solutions Sample data elements to collect may include [not required]: asset type, asset material, asset class, asset owner, burial depth, latitude/longitude, electronic marker (EM) manufacturer, and emergency contact information. Underground utility marker with RFID tagging integration into routine, Quality Level A	Required characteristics: · Surveyors Unique Line Segment ID during field coding · Utility Company (Name from MISS DIG Design Ticket Database) · Installation Method · Surveyors Professional License Number · Name of Company Data Collected By · Surveyor Initials · Method of Location Technology Installed on Utility · Feature Type · Utility Type · Date of Utility Installation · Utility Material · Shape of the Installed Utility · Utility Diameter · Quantity of Same Size Utility Installed · Encasement (Yes or No) · Equivalent Quality Level · Encasement Material · Encasement Diameter	Required characteristics: · ID · Owner · Utility Type · Feature Type · Component · Delivery Classification (Conveyance Function) · Operational Status · Horizontal Spatial Reference · Vertical Spatial Reference · Horizontal Accuracy · Vertical Accuracy · XYZ Centroid (a calculated position for components whose centers cannot be measured directly) Contents of this standard disclosed at: https://youtu.be/DyV_g7Mlh1s?t=1384	Required characteristics: · Unique Link ID · Operator Number · Operator Name · System Name · Pipeline ID · Diameter reported in Nominal Pipe Size (NPS) · Commodity category · Interstate designation (Y/N) · Low stress (liquid pipelines in service only) · Pipeline status code · Data quality code · Revision code	Required characteristics applicable to all utility types: · Horizontal and vertical position, including accuracy levels Required characteristics by type of underground utility system are: Water systems - - Cross-section size - External material type · Wastewater - - Cross-section size - External material type · Electrical - - Number, size and material type of conduit or - Number of direct cables if not in a duct bank - Cross-section size of duct bank structures and cable trenches · Liquid Petroleum and Gas - - Cross section of pipe - Material type of pipe or pipeline - Material of casings - Pipeline coating - Cathodic	Required characteristics: Pipeline Start/End · Age · Category · Commodity · Diameter Required facility characteristics: · Pipeline ID (or CSFM ID) · Start measure value · End measure value Other required facility characteristics are as follows Pipeline feature class: · Operator name · System name · Pipeline Start/End Point characteristics: - Point type Facility's age-related characteristics: · Age (year built) · Age status (built or replacement) Pipeline category characteristics: · Pipeline category (9 codes for location, function and/or operating status)

investigations must label the location and burial distance of the exposed pipe.				protection equipment such as ground beds, rectifiers, and anodes including extents - Telecom - Number, size and material type of conduit or Number of direct cables if not in a duct bank Cross-section size of duct bank structures and cable trenches	Commodity characteristics: • Commodity (17 codes for type of primary commodity carried by pipeline system) Diameter-related characteristics: • CSFM Line ID • Diameter (inches)

ATTACHMENT 3: LIST OF REQUIRED OR RECOMMENDED FACILITY CHARACTERISTICS OR PROPERTIES TO INCLUDE IN RECORDS OF UNDERGROUND UTILITY INSTALLATIONS FROM SELECTED ORGANIZATIONS

GIS Terms and Definitions	CGA Best Practices	MDOT GUIDE	ASCE 75-22	National Pipeline Mapping System	Canadian Standards Association (CSA) S250:20	CAL FIRE – Office of the State Fire Marshal (CSFM)
ID	"Unique identifier"	"Surveyors Unique Line Segment ID during Field coding"	Alphanumeric utility feature identifier	"Unique Link ID" defined as "Link between the geospatial elements (pipeline segments) and their respective attribute records." Required characteristic "Pipeline ID" defined as "Assigned by the operator. A unique identifier for a specific section of pipeline within a pipeline system." Required characteristic: "Interstate Designation" (Yes or No).	Required characteristic is "Company Feature ID"	"Pipeline ID" is a unique numeric identifier for a specific pipeline assigned by the State Fire Marshal.

Type of "subsurface installation" **[Note: The term "Subsurface installation" is not used in any GIS data standard reviewed.]**	"Asset Type"	**"Utility Type"** Term not defined, but one is implied by the following list of utility types: brine, chilled water, communications, electric, gas, pipeline, propane, sanitary sewer, steam, storm sewer, watermain and other (industrial and other). [Note: "pipeline" refers to "crude oil, refined oil, or all other types of oil pipeline transmission..."] This list is repeated below under the required characteristic, "feature type", because MDOT switches use of "utility type" with "feature type" later in the document. MDOT also uses the terms "underground utility	**"Utility Type"** Defined as one of the following six "types of utility service that a utility feature carry." • Communication • Electric • Nonpotable water • Petroleum and gaseous materials • Potable water • Wastewater and stormwater	Data standards are specific to **pipeline systems, liquified natural gas plants and breakout tanks**. Each type has its own characteristic tables. The following characteristic definitions are for pipeline systems only. Defines "pipeline system" as a "transmission pipeline or hazardous liquid pipeline though which gas or hazardous liquid is transported." Wants GIS data on three types of pipeline systems: natural gas transmission lines, hazardous liquid trunk lines, and regulated rural hazardous liquid gathering lines. Required characteristic:	"Underground" defined as "beneath the ground surface or submerged, including where exposed by temporary excavation." "Utility Infrastructure" defined as "a cable, line, pipe or structure used to gather, store or convey products or services." Utility systems listed are: • Water systems • Wastewater systems • Electrical systems • Liquid petroleum and gas systems • Telecom systems	Pipelines and Breakout Tanks

		infrastructure" and "underground utility installations."		Operator's "System Name" for a specific pipeline system. Characteristic defined as "a functional grouping of pipelines." Optional characteristic for "Subsystem Name"		

Utility Subtype			"Utility Subtype" means "type of utility service at a finer level of disaggregation of utility type." Options: • Alarm • Alternating current • Cable Television • Chemical • Combined sewer • Compressed air • Cooling and heating • Crude Oil • Direct Current • Fiber optic • Gasoline • Hybrid power • Irrigation • Natural gas • Other petroleum • Raw water • Reclaimed water • Recycled water • Salt water • Sanitary sewer	"Commodity Category" is a required characteristic defined as the primary commodity carried by the pipeline system. Liquid Commodity types: crude oil, non-highly volatile liquid (HVL) product, anhydrous ammonia, liquefied petroleum gas, natural gas liquids, other HVLs, carbon dioxide, fuel grade ethanol, and abandoned pipelines that previously transported a liquid. Gas Commodity types: natural gas, propane gas, synthetic gas, hydrogen gas, other gas, and empty (gas).	Liquid Petroleum and Gas systems have a "Media Type" required characteristic. Options are: • Gas • Oil • Steam • Petroleum • Other Gaseous Material	A required characteristic is "Commodity." (See options below.)

			• Slurry • Storm sewer • Street lighting • Telephone •Traffic system communication •Traffic system power			

Owner		"Utility Company Name" Characteristic table uses a pull-down menu listing all Michigan 811 members Also refers to "owners/operators of utilities" in GUIDE, but not as a characteristic.	"Owner" defined as "the name of the entity that owns the utility feature." Standard includes definitions for "Project owner" - "person or entity with financial responsibility for a project." "Utility owner" - owner of a utility infrastructure asset."		"Asset Owner" or "Owner" defined as the proprietor of the underground utility infrastructure, including contractors, agents or other persons acting on behalf of the owner.	This standard incorporates the term "Operator Name" to create names for data files.
Operator			In definition section: "Utility operator" means "person or entity that operates utility infrastructure. The operator may be the utility owner, an agent acting on behalf of the owner or an operator that is leasing the facility from the owner." In feature table: Name of the entity or entities that operate the utility feature	Required information is "Operator Number" defined as Unique tracking number assigned by PHMSA to the company that physically operates the pipeline system. Required information is "Operator Name" defined as "the company name that physically operates the pipeline system."		Required information is "Operator Name" defined as "The company name that physically operates the pipeline system."

Terms for the facilities and components being mapped	"Asset Class"	"Feature Type" is one of 12 types of utility systems: brine, chilled water, communications, electric, gas, pipeline, propane, sanitary sewer, steam, storm sewer, watermain and other (industrial and other). [Note: "pipeline facilities" refers to "crude oil, refined oil, or all other types of oil pipeline transmission..."] "Utility type" means a finer level of disaggregation of "feature type." Five "utility type" options are: transmission, distribution, service, collection and not disclosed or not applicable. Also see definition for "Method of Location Technology Installed on Utility"	"Feature Type" is defined as "A category of utility feature based on feature function and configuration. Function refers to the main purpose of the utility feature. Configuration refers to the geometric and structural characteristics of the utility feature." "Utility feature" means a "uniquely identifiable component of a utility system used to gather, store, convey or distribute utility products and services." Table 2-4, entitled "Feature Attributes," uses the following headings as examples of feature types: "[pipe] segment," "device," "access point," "support structure," "containing structure," "secured utility	Required characteristic for liquid pipeline segments: "Low stress."	Standard lists of features to be mapped for each type of utility system. Water systems: Water mains, Hydrants, Valves, Valve Chambers, Pump Stations, Fittings Wastewater systems: Mains, Laterals, Maintenance Holes, Catch Basins, Valves, Chambers, Lift Stations Electrical: Cable/Service Wire, Conduit/Duct Structure/Trench, Poles, Maintenance Holes, Guys and Anchors, Enclosures/Equip-ment Cases/Vaults/Hand Holds/Grounding, Pad-mounted Transformers, Towers Liquid Petroleum and Gas: Pipelines,	"Point features represent the start and end point of each [pipe]line feature." The "Length" is measured in feet between these two points. There can be multiple records for one pipeline ID. "Category" is required. Options are: . Rural Gathering Line . Rural Low Stress . Offshore Pipeline/State Waters . Out-of-Services (Idle, Purged of Hazardous Liquid) . Urban Gathering Line . Non Rural Low Stress . Pipeline, Pipeline Segment or Pipeline System . Abandoned . Non Jurisdictional "Commodity" is required and

			area,' "encasement," "marker [ball]," and "tracer [wire or tape]." "Utility features include linear features (such as pipes, cables and ducts) and structures that connect linear utility features, such as devices, access points, and support structures." (The term "utility feature" is also used to report information about the presence of encasements and location methods.) "Component" means "an element of a utility system which corresponds to the lowest level of utility feature disaggregation…" Options: (more than 150 listed)		Fittings, Valves, Stations Telecom: Cable wire/Multi Cable/Cable and Duct, Conduit/Structure, Poles, Maintenance Holes, Anchors, Enclosures/Pedestal Equipment Cases/ Chambers/ Vaults/ Hand Holds/Hand Wells/Cad Wells/Grounding	defined as "the primary commodity carried by the pipeline system." Options are: . Crude Oil . Refined Products (non-HVL); Jet Fuel (only) . Natural Gasoline . Liquified Petroleum Gas . Natural Gas Liquids . Carbon Dioxide . Anhydrous Ammonia . Highly Volatile Liquid, Butane or Propane . Fuel Grade Ethanol . Biodiesel Blend . Abandoned pipelines that previously transported a liquid . Nitrogen . Natural Gas . Air

Operational status			"Operational Status" means "The operational status of the utility feature." Provides eight options: proposed, under construction, in service, out of service, backup, abandoned in place, removed and unknown. Also uses "intended permanence" as a characteristic which means "intended longevity of the utility feature." Options are permanent and temporary.	Required characteristic "Pipeline Status Code" is defined as "the status of the pipeline segment as of the reporting year (i.e., December 31 of the previous year). Status reporting options are: • In service • Idle • Retired (All subcategories of an active pipeline as defined by PHMSA.) • Permanently abandoned.	Standard applies to proposed, [under construction], existing (where exposed by temporary excavation), abandoned in place, retired, and reserved for future use. Required characteristic is "Lifecycle Status." Options are either "existing" or "abandoned."	"Category" characteristics include: . "Abandoned" and . "Out-of-Service (Idle, Purged of Hazardous Liquid)" The "Commodity" characteristic includes "Abandoned Pipelines that Previously Transported a Liquid."

Delivery Classification /Conveyance Function			"Delivery Classification/Con-veyance Function" means "the primary category or purpose of service of the utility feature. Included in each category is the supporting infrastructure, such as alarm and ventilations, needed to provide the corresponding utility service." Options are: distribution, gathering, service, transmission and other. "Conveyance method" means "method to move or convey matter through the utility feature." Options are: gravity, pressurized, high pressure and low pressure.			

Diameter		"Utility Diameter" means "the maximum outside diameter of facility being installed. For elliptical or rectangular facilities, this will be the largest dimension of the height or width in inches. For round facilities, this will be the dimension of the diameter in inches. Always denote the size of the non-round facility (H x W) in the notes field." "Encasement diameter" means "the maximum outside diameter of the encasement…" "Facility Shape" means shape of the utility facility being installed. Options: round, square, rectangular and elliptical.	Uses the terms "inside [height and width]" and "outside [height and width]." Defines inside height as "maximum inside height of a cross-sectional shape." (same for width) Defines outside height as "maximum outside height of a cross-sectional shape." (same for width) Also has the characteristic "wall thickness" which means "maximum wall thickness." Also has a "facility shape" characteristic. Options: round, rectangular, square and elliptical.	Required characteristic "Diameter" defined as "Nominal pipe size (NPS) of the pipeline segment; identifies the diameter with a dimensionless value (e.g., 8.625" outside diameter pipe is reported as NPS 8; 5" outside diameter pipe is NPS 4.5). Decimals are only accepted when less than NPS 5."	"Cross-section size" is a required characteristic for: Water systems, Wastewater, Electrical (of duct bank structures and cable trenches), Liquid Petroleum and Gas, and Telecommunications (of duct bank structures and cable trenches) "Feature Dimension" is a required characteristic defined as Width X Height X Diameter. "Cross-section size" is required for: Electrical (of duct bank structures and cable trenches) and Telecom (of duct bank structures and cable trenches)	A required characteristic table is "Diameter." Diameter is defined as "Nominal diameter of the pipeline segment, in inches (three decimal places if applicable, ##.###)." Also, "Length" in feet is a required characteristic.

Material	"Asset Material"	"Utility Material" is material of the utility being installed. If communication system is within a conduit, MDOT wants this characteristic field to be the conduit material type. If communication system is direct buried, MDOT wants this characteristic field to be "fiber optic" or "copper."	"Predominant material of which the utility feature is constructed. For features that transmit a signal or electrical power, 'material' refers to the conductor material." "Interstitial fill material" (a characteristic for encasements) means "material used to fill the space between a utility feature and its encasement or an out-of-service feature"		List of abbreviations provided for specifying the following types of materials: Acrylonitrile-Betadiene-Styrene, Aluminum, Asbestos Cement, Brick, Cast Iron, Composite, Concrete, Concrete Encased, Concrete Encased Poly, Concrete Encased Steel, Copper, Corrugated Steel Pipe, Ductile Iron, High Density Polyethylene, Lead Metals, Other, Plastic, Polyethylene, Steel, Unknown, Vitrified Clay, Wood For Liquid Petroleum and Gas systems, "pipeline coating" is a required characteristic.	

Quantity of Same Size Utility Installed		"Quantity of Same Size Utility Installed" is a required characteristic defined as "The number of similar-sized conduits or pipes being installed together in parallel in the same excavation, trench, or bore shot. Specifically, when multiple conduits are bound together for installation, [only] [t]he top/center conduit must be surveyed, and the number of parallel pipes or conduits selected." When multiple conduits are bound together, it means "the number of conduits of similar size."	"Number of conduits" means the number of conduits within a pipe or duct bank.		For Electrical systems, mapping record must include "Number, size and material type of conduit" or "Number of direct cables if not in a duct bank" For Telecom systems, mapping record must include "the number of direct-buried cables if not in a duct bank."	
Installation depth		"Z location" represents the elevation of the top of the pipe or conduit.			Z locations [must] be measured in the field.	

Installation date		"Date of Utility Installation" defined as "the installation date of the utility"		Required characteristic called "Revision Code" explains why the geospatial and other data about the pipeline segment is being submitted to the NPMS database. Options: • addition to the NPMS unrelated to new construction or changes that subject the pipeline to NPMS submission requirements, • addition due to construction that adds mileage or is a re-route, • addition due to mileage which is newly subject to NPMS submission requirements, • spatial modification of the existing NPMS feature, • characteristic modification of the existing NPMS feature, • both a spatial and	Required characteristic is "Year Placed or Revised"	A required characteristic is "Age." It is defined as "Year the section of pipeline was built or replaced." "Age Status" applies to each section of the pipeline. Options for this required characteristic are: "Built" or "Replaced."

				characteristic modification of the existing NPMS feature, or • no change to the existing		

Installation Method		Standard provides detailed definitions of each of the following types of installation methods: HDD (Horizontal Directional Drilling), Open Cut, Plowed, Jacking, Boring, Micro Tunneling, Insertion, or Discovered			"If installation was achieved by trenchless …methods…the owner shall expose the … facility by daylighting [for] accurate measure[ment] of its precise location…"	
Date of GIS record creation and **Date of last GIS record update**		Standard requires licensed surveyors to collect all facility information while in the field. Required information: • surveyor's license number • surveyor's initials • surveyor's employer (company).	"Date data collected" means "date when a utility feature was surveyed in the field."	NPMS feature. Refer to Section 3.3 for a more detailed description of each code.		
Is encased?		Yes/No	Indicator of the presence of an encasement to insulate or protect the utility feature			
Material type of conduit or encasement		"Encasement Material" is material of the encasement. GUIDE provided no list of options.			If Liquid Petroleum and Gas is encased, "material of casings" is a required attribute.	

Latitude (Lat)/Longitude (Long) /Elevation **(XYZ coordinates) also known as geospatial data**	Lat/Long "Burial depth"	"The MDOT GUIDE program requires permit applicants to capture the geospatial location [data] of … underground utility installations … within the MDOT right of way." GUIDE creates an organized … approach to data collection, management, and dissemination of 3D geospatial data on underground utility infrastructure by capturing accurate XYZ information at the time of installation and organizes it in a [geo]spatial database ..."	"Horizontal spatial reference," a required attribute, defined as "coordinate system, datum, datum tag, and epoch date (if applicable) associated with the X and Y coordinates." "Vertical spatial reference," a required attribute defined as "Datum, goid model (if applicable) for the Z coordinate (for example, when determining orthometric heights using GNSS equipment) 75-22 uses the term "X-Y-Z" defined as "coordinates that define the horizontal and vertical location of a utility feature relative to a preestablished datum." "XYZ coordinates observed" means XYZ coordinates of the utility feature as measured in the		"The location …shall be recorded …in accordance with a commonly used reference system (for example, coordinates of latitude and longitude are most suited to accommodate GIS…) A common projection or coordinate system shall be used and communicated along with horizontal and vertical datums and epochs so that position data can be unambiguously shared with others." "Depth of Cover" is a required characteristic for multiple feature types and is defined as "the soil measured from the top of the pipeline, or other appurtenances, to the surface"	"Geospatial data represents pipeline systems (linear) and start/end data (point) elements." "Use NAD 1983 California (Teale) Albers (US FEET)."

			field. Related terms in the standard include: "Observation point," which means the "point that is directly observed using a recognized method for establishing the positioning or from which direct measurements are made to define location of a utility feature," and "XYZ Centroid" is defined as "XYZ coordinates of a utility feature (typically calculated) that define the horizontal and vertical location of the geometric center of a 3D utility feature relative to a preestablished datum."			

Positional Accuracy		Required records: "Equivalent SUE Quality Level" refers to levels defined in ASCE 38-22, *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*. Although four levels exist, MDOT only allows the highest two quality levels: • Quality Level A: Denotes the facility was surveyed by direct observation • Quality Level B: Denotes the facility was surveyed by indirect observation	Required records: "Horizontal Accuracy" and "Vertical Accuracy" defined as "error of [horizontal/vertical] coordinates at the 95% confidence level, where 95% of positional accuracies are equal to or smaller than the reported accuracy value. It considers the combined effect of all [XY/Z] errors."	Required characteristic "Data Quality Code" "identifies the positional accuracy of the submitted pipeline segment." • Excellent: within 50 feet, • Very Good: 50–300 feet, • Good: 301–500 feet, • Poor: 501–1000 feet • Unknown.	Accuracy levels apply to individual line segments and all features shown as dots on a map. "The precise horizontal and vertical location of underground utilities shall be measured and recorded to an accepted geodetic datum with a 95% confidence level by a competent individual." "To ensure spatial accuracy to the tolerance levels specified for …accuracy levels [1 through 4], precise measurements shall be taken during construction." Level 1 is ± 25 mm, Level 2 is ± 100 mm, Level 3 is ± -300 mm, Level 4 is ± 1000 mm.	"The standards have a positional accuracy *goal* of ±100 feet." "Accuracy standards will be enforced for both spatial and attribute data."

Location Method	Standard provided these examples: Ultra-high frequency (UHF) RFID subsurface tags, high frequency (HF) subsurface markers, UHF RFID magnets, active UHF RFID subsurface tags, marker balls, disk markers, near surface markers, full range markers, mini markers, box markers, tap tee markers, duct markers, and RFID tags	"Method of Location Technology" defined as "The type of utility-locating technology that has been installed on the utility to facilitate future locating." . Facility's inherent characteristics . Tracer Wire . Tracer Tape: tracer tape . RFID (radio frequency identification technology) . Marker Ball . Magnetic: The facility has a magnetic field that can be located due to its inherent material properties . Geospatial: "Select if facility may be located using the 3D geospatial data"				

ATTACHMENT 4: LETTER FROM DAVID WOOLLEY, JANUARY 9, 2023

D. Woolley & Associates
LAND SURVEYING AND MAPPING

January 9, 2023

Sent Via Email Delivery

Chair Amparo Munoz; and
Honorable Board Members
Office of Energy Infrastructure Safety
1516 9th Street,
Sacramento, CA 95814
tony.marino@energysafety.ca.gov
(916) 767-3370

Re: 2023 Workplan – Operator Geographic Information Systems

Honorable Board Members:

I am a professional land surveyor with over thirty years of experience in the industry. My experience includes heavy construction work with underground utilities, geographic information systems, and other related experience. I have served as the Legislative Chairman for the Orange County Chapter of the California Land Surveyors Association (CLSA) since 1998 and as a Director for CLSA since 2004. The majority of my experience is related to public works projects.

The Law and GIS Systems

Senate Bill 865 (Chapter 307, Statutes 2020) (SB865) requires utility operators to enter location data for newly installed subsurface installations into a geographical information system (GIS) beginning January 1, 2023.

There is a wide range of GIS software systems that organize digital information. The GIS systems contain the meta data, including the utility type, horizontal and vertical location, material, and owner. The amount of information and organization of data is practically limitless.

SB865 is silent as to the organization of the data. These technical aspects should be addressed in the rule making process resulting in detailed regulations.

The Operators

There are no exemptions in SB865 for any operators. We will find that many operators will not have an existing GIS system. The operators an existing GIS have a spectrum of quality ranging from detailed and accurate to nearly worthless systems. Creating and maintaining a GIS system is a heavy lift - requiring the hiring of technical staff and the allocation of large capital expenditures for software platforms and global positioning systems (GPS). Compliance with SB865 will require many operators to contract with land surveyors and Certified GIS Professionals (GISP) to build and maintain the operators' GIS system. A hybrid system, with licensed professionals[1] and operator staff, will be the likely business model. The hybrid model will require extensive training of the operators' staff.

SB865 is silent regarding penalties for the GIS and field collection noncompliance.

Field Data Collection

The operators will typically use GPS to collect the underground infrastructure. The GPS quality and capabilities vary greatly. For example, the GPS on a cellular phone is accurate within approximately 5 meters (16.5 feet). The GPS used by land surveyor's is accurate within 2cm (1 inch).

Generally, underground utilities do not need to be located within one inch of accuracy. However, underground utilities collected with a cell phone are of little value. The combination of a GIS and the GPS gives a user the modern data through technology a false sense of the accuracy of the information. Inaccurate GIS systems will be more dangerous for operators and the public than the existing system.

SB865 is silent as to the accuracy of the field data process. These technical aspects should be addressed in the rule-making process resulting in detailed regulations.

SB865 Qualified Person

Government Code 4216 (P) defines a "qualified person" as:

> "Qualified person" means a person who completes a training program in accordance with the requirements of Section 1509 of Title 8 of the California Code of Regulations Injury and Illness Prevention Program, that meets the minimum locators training guidelines and practices published in the most recent version of the Best Practices guide of the Common Ground Alliance.

[1] The California Business and Professions Code requires that various aspects of the work described is performed by licensed professionals.

2832 Walnut Avenue, Suite A | Tustin, California 92780
Phone: 714-734-8462 | Fax: 714-508-7521 | Website: www.dwoolley.com

A sampling of the certified members of the National Utility Locating Contractors Association (NULCA) – the training model as a qualified person - indicates there are very few "qualified person[s]" available in California.

SB865 is unclear as to the required use of qualified persons for the collection of the newly constructed underground utilities.

Additionally, as a separate issue, there needs to be a system of verifying the qualifications of a qualified person and penalties for not using a qualified person as prescribed by California Government Code 4216.

A Solution for Uniform Development of the GIS

The American Society of Civil Engineers (ASCE) published the ASCE Standard ASCE/UESI/CI 75-22 *Standard Guideline for Recording and Exchanging Utility Infrastructure Data* in August of 2022. See **Exhibit A** attached.

The guideline is a national standard documentating of underground utilities into a GIS system. The standards took several years to write and were subject to professional peer review and public comment. The standards were written for the orderly implementation of documenting underground utilities.

I am asking the Underground Safety Board to consider adopting the ASCE Standard ASCE/UESI/CI 75-22 *Standard Guideline for Recording and Exchanging Utility Infrastructure Data* for the uniform development and implementation of SB865. Adopting this standard would save years in developing and writing of our own standards.

Please feel free to contact me at your convenience if you have any questions. I can be reached at my office at (714) 734-8462 or by email at dwoolley@dwoolley.com.

Sincerely,
D. Woolley & Associates, Inc.

[Original Signed]

David E. Woolley, PLS 7304

Enclosures: Exhibit A

2832 Walnut Avenue, Suite A | Tustin, California 92780
Phone: 714-734-8462 | Fax: 714-508-7521 | Website: www.dwoolley.com

Exhibit A

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This comment contained a complete copy of ASCE Standard 75-22, *Standard Guideline for Recording and Exchanging Utility Infrastructure Data*, which is proprietary and copyrighted. This portion of the comment has not been posted.