CIVILGRID

From Maps to Apps

How the Evolution of
GIS Lead to SUE

Introduction

JOSH MACKANIC

Founder, CEO

DAVE VEILLEUX

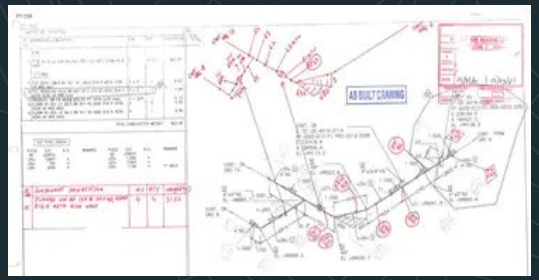
Strategic Account Executive & Head of Municipal Partnerships

From Maps to Apps – Part 1

1970's	→	Emerging Technology
1980's	→	Computational Advancements
1990's	→	Adoption and Refinement of Tools
2000's	→	Business Systems and ASCE 38-02
2010's	→	Accessibility, Security, Persistence

Our Timeline and Adoption Cycles

TECHNOLOGY



Paper as-builts and drafting to keep up with suburbia expansion & maintenance

MICRO SOFT

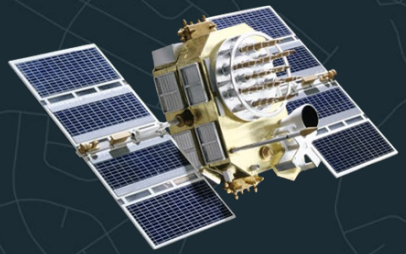
VISICALC™

1970

1980

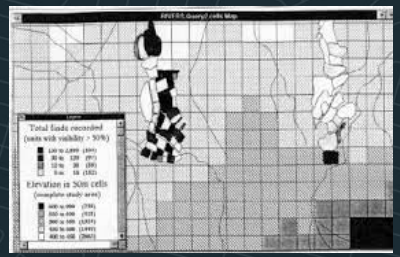
Our Timeline - Innovation

AutoCad and ArcInfo



NAVISTAR Satellite

SO-DEEP ® Inc.
A SAM COMPANY



Mapping in 1990

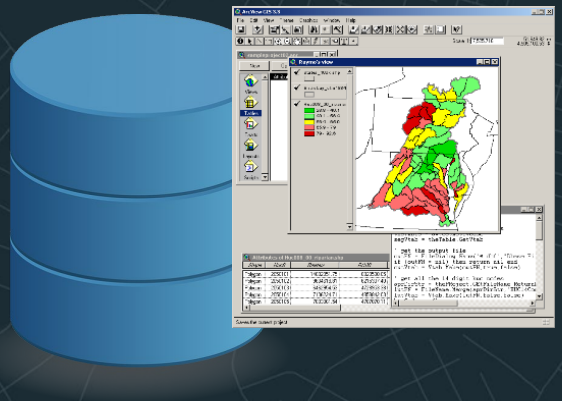
TECHNOLOGY

1970

1980

1990

Our Timeline - Adoption



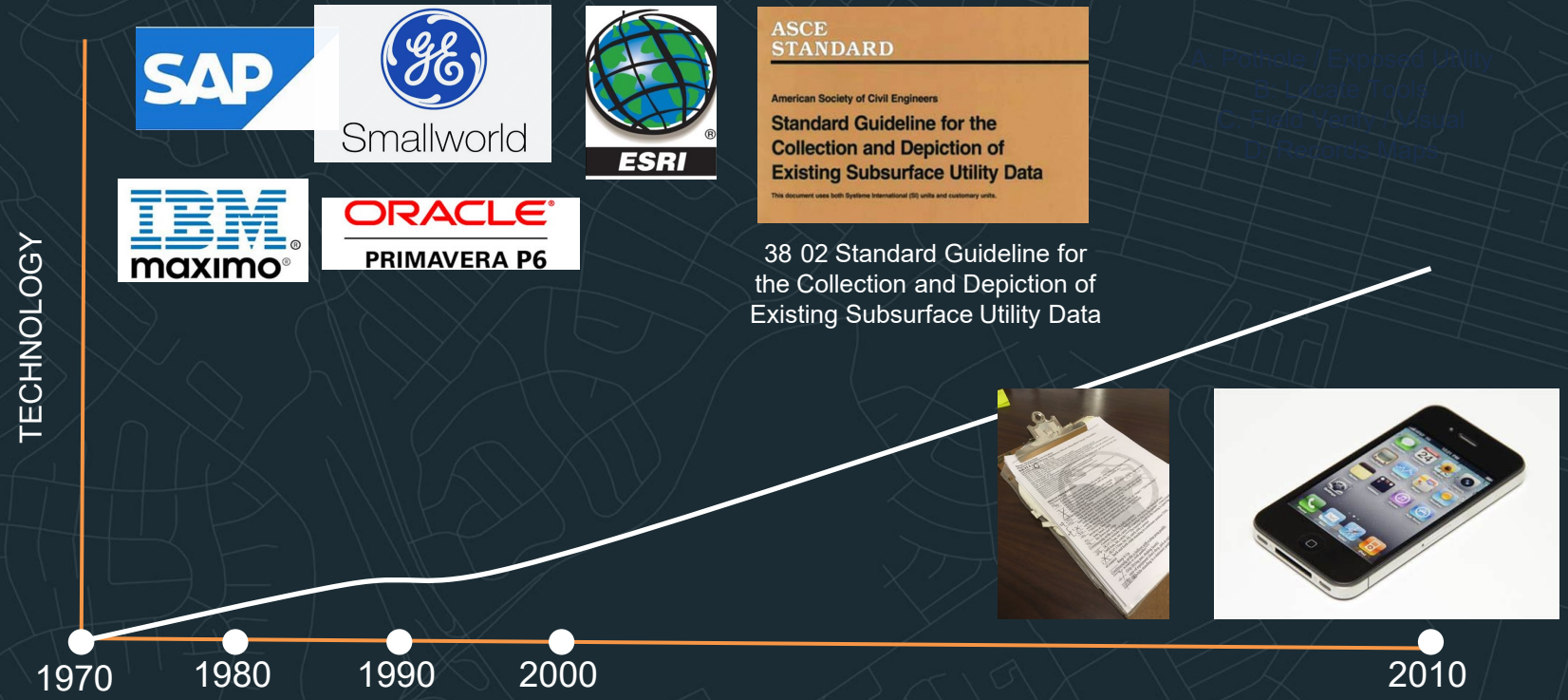
GPS III 1997 2004

TECHNOLOGY

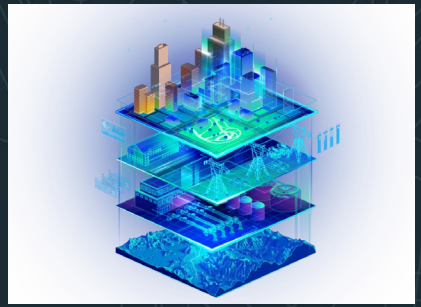
Affordable scanners

1970 1980 1990 2000

Our Timeline - Innovation



Our Timeline - Innovation



Digital Twins

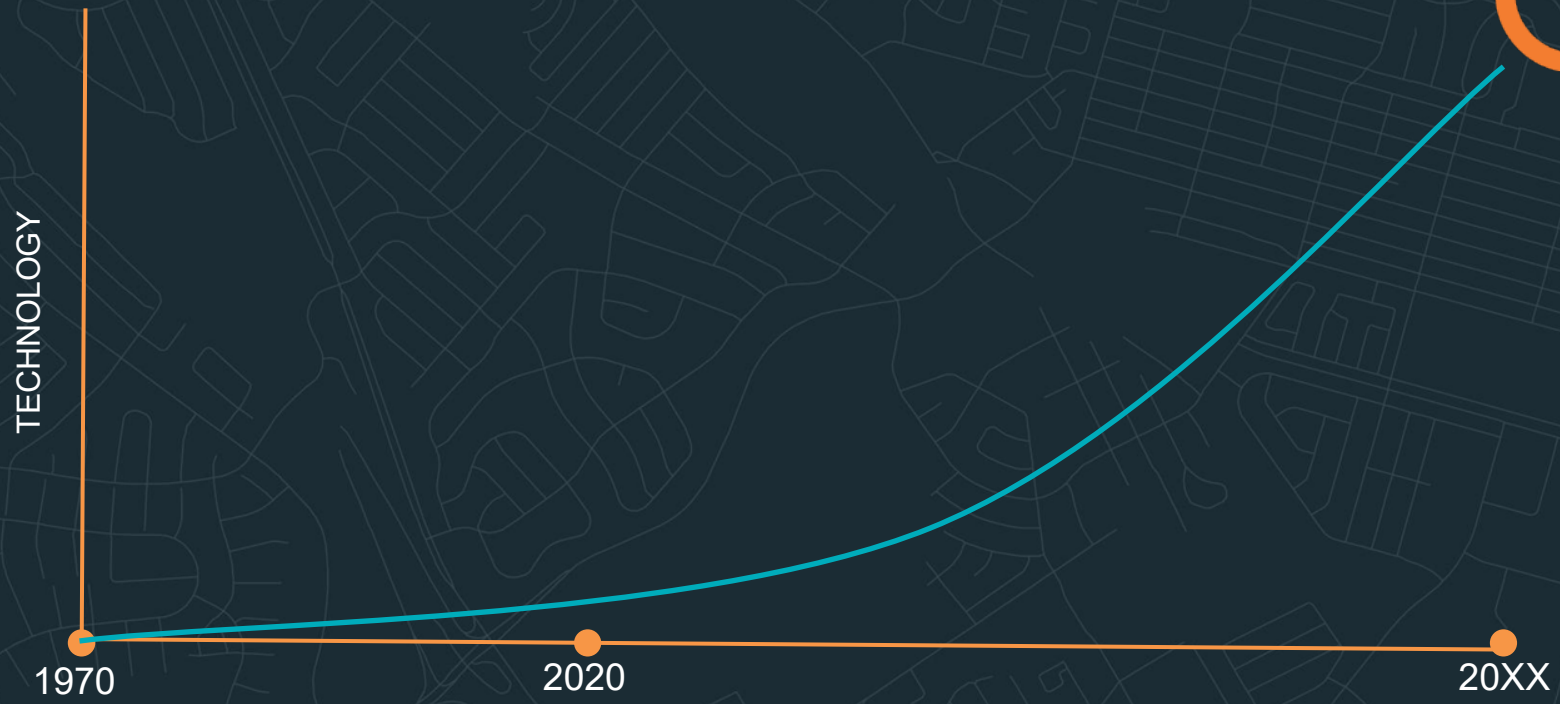
TECHNOLOGY

1970

2010

2020

Our Timeline



What do we still do the old way?

1970's	→	Digitize and Use QLD Records
1980's	→	GPS Constellations
1990's	→	Legacy Programs and Models
2000's	→	Data Models, XML, Linux
2010's	→	Legacy Hardware & Digital Twins

Josh Mackanic

FOUNDER, CEO

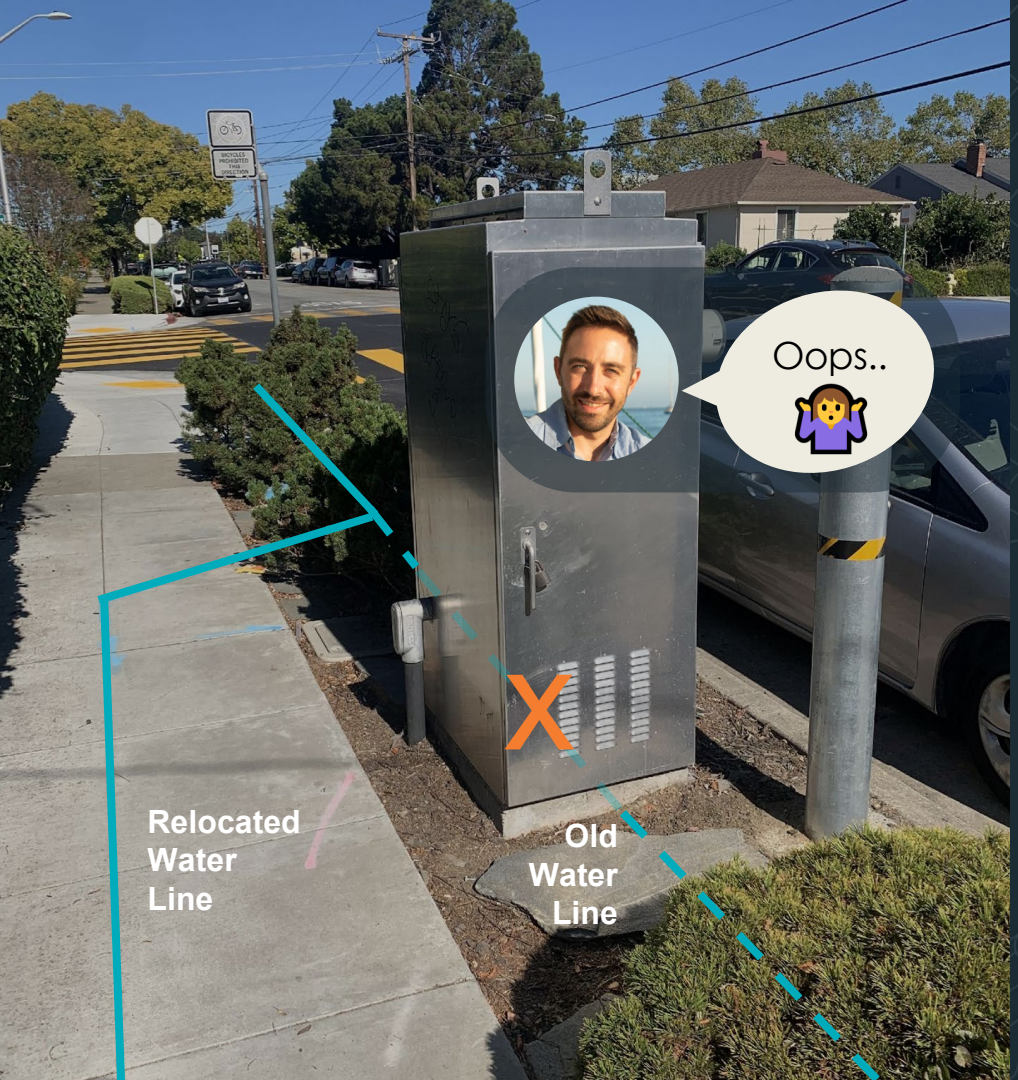
- 15 years in utilities & development
- Managed $500M+ in construction projects
- Founded CivilGrid in 2020

PG&E

CUSHMAN & WAKEFIELD

SUE - ASCE 38-22

Standards	→	What is subsurface utility engineering (SUE)
Alphabet Soup	→	What are SUE quality levels anyway
Swiss Cheese	→	Why a complete SUE process is important



END RESULT

$40,000

Change Order

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2 Week

Delay

What is SUE?

ASCE AMERICAN SOCIETY® OF CIVIL ENGINEERS

SUE: Subsurface Utility Engineering

The specialty practice of civil engineering's Utility Engineering branch that includes investigation, analysis, judgment, and documentation of existing Utility networks

ASCE 38-22
Standard Guideline for Investigating and Documenting Existing Utilities

ASCE 75-22
Standard Guideline for Recording and Exchanging Utility Infrastructure Data

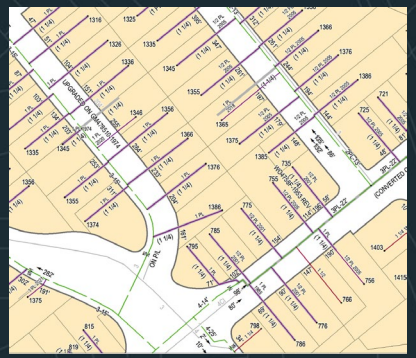
Quality Levels

D
Maps

C
Eyes

B
Tools

A
Pothole



Records Research

Field Verify & Survey

Locating & Scanning

Vac-truck & Hand Excavation

Quality Level D - Maps

QL-D

- Identify utility owners in the project area
- Source utility records
- Consolidate and compare to other sources
- *Field visit optional*

811 + Google Earth

OR

CIVILGRID

Segments and feature QL-D designation must be made by the Professional

Quality Level C - Eyes

QL-C

- Complete SUE level D research
- Perform field visit and identify surface features
- Open vaults and manholes, measuring dimensions and depths
- Utility segments not bookended by features remain quality level D
- Must survey features to within 0.2ft

Segments and feature QL-C designation must be made by the Professional

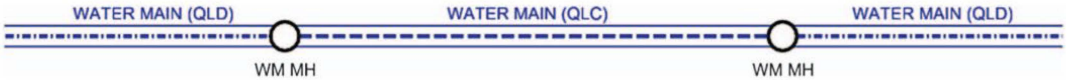


Figure 2-5. Water main between two manholes sufficient to call it QLC.

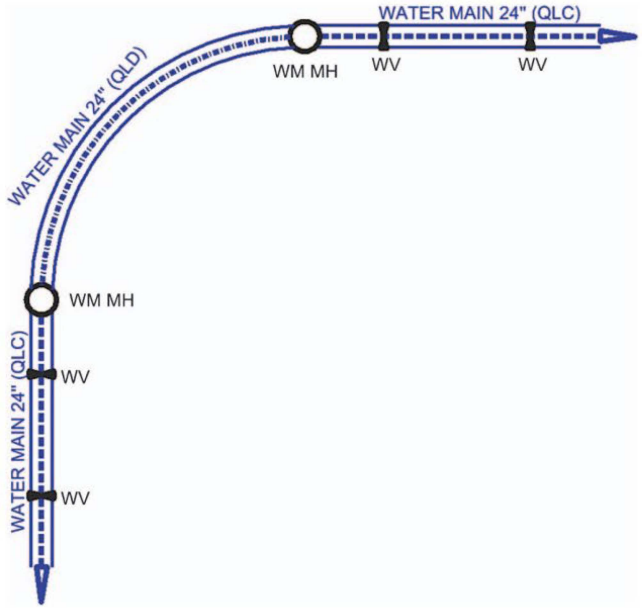


Figure 2-6. Between water manholes, insufficient water valve structures caused a judgment as QLD, given the pipe size and curvature.

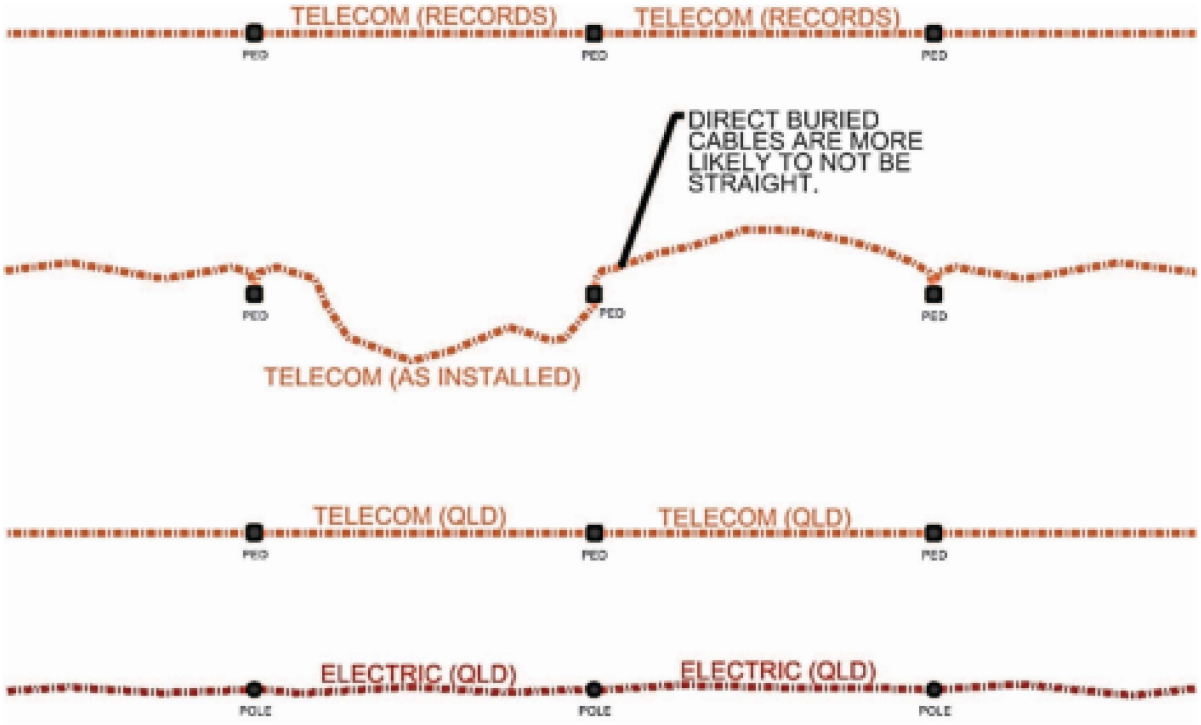


Figure 2-7. The first diagram at the top shows a Telecom record that indicates that the cable runs between the pedestals; actual cable installation (second diagram); resulting utility quality level judgment for Telecom (third diagram); similar judgment for certain electric facilities (fourth diagram).

Quality Level B - Tools

QL-B

- Complete SUE level C research
- Select detection methodology:

- Understand limitation of technology (Issue of compounding error)
- Must survey findings with 0.2ft accuracy

Segments and feature QL-B designation must be made by the Professional

Figure 2-11. Portion of water main not continuously designated, requiring a separate utility segment at a more uncertain utility quality level.

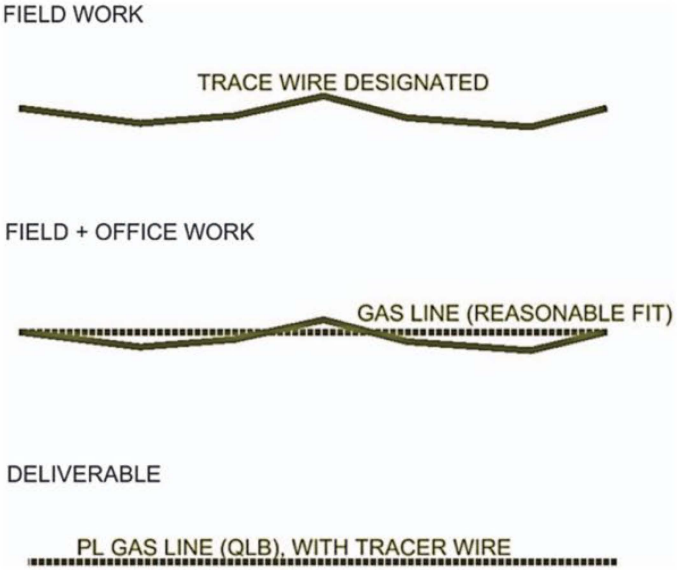
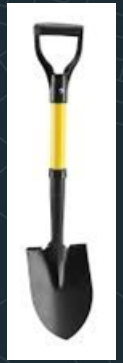


Figure 2-10. Designated trace wire that leads to a judgment of a QLB utility segment of a gas line, with attributes noted.

Quality Level A – Test hole / Pothole

QL-A

- Complete SUE level B research
- Select non-destructive excavation methodology:
- Expose utility
- Document key utility features and metadata
- Must survey findings with 0.2ft accuracy



Segments and feature QL-A designation must be made by the Professional

Symbology

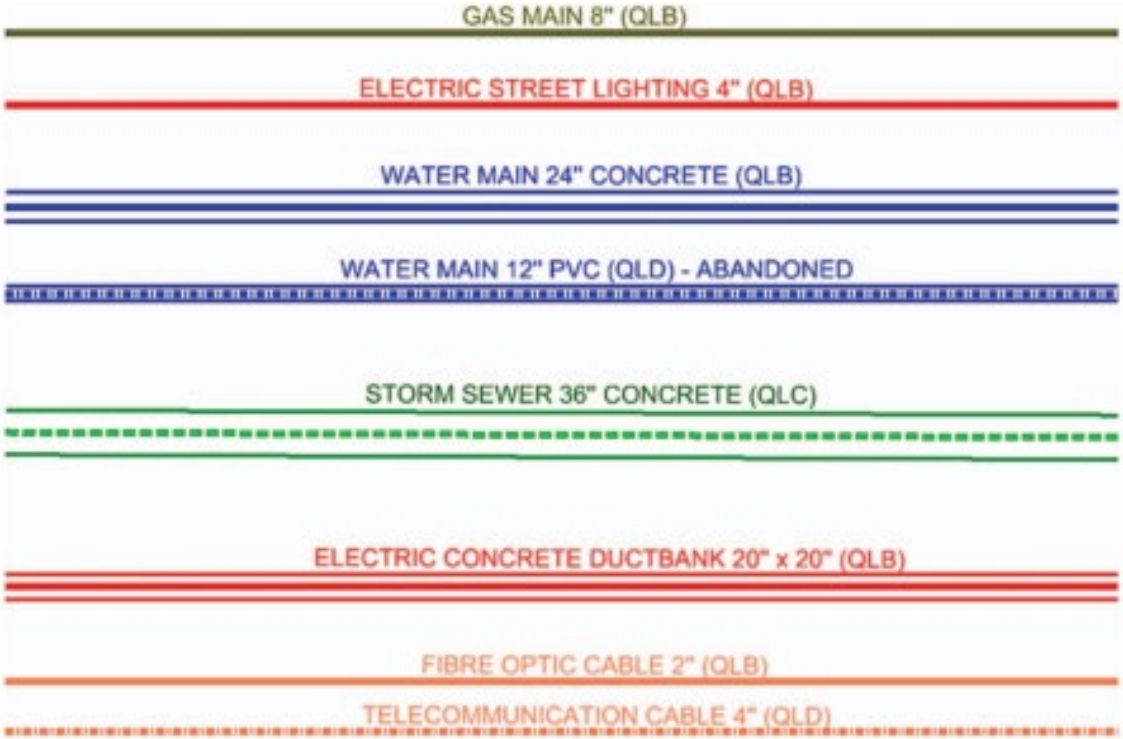
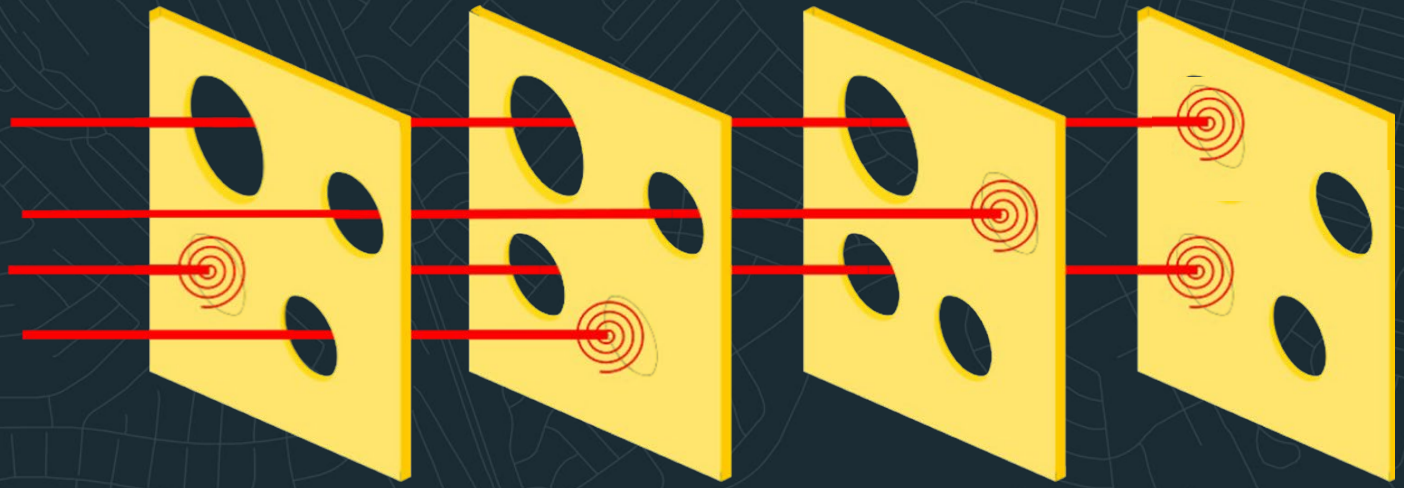


Figure 5-1. Different examples of line weight or type to show width of utilities.

Do I have to do it all?



Quality **D**

Quality **C**

Quality **B**

Quality **A**

NO

FIELD

SURPRISES

When to do what?

Quality Level	Cost
D	Low
C	Medium
B	Medium
A	High

	Project Type	
Quality Level	**Simple Infrastructure**	**Complex Infrastructure**
D	10% Design	10% Design
C	30% Design	30% Design
B	30% or Mob	
A	Mobilization	

What is SUE?

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The specialty practice of civil engineering's Utility Engineering branch that includes investigation, analysis, judgment, and documentation of existing Utility networks

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ASCE 75-22

Standard Guideline for Recording and Exchanging Utility Infrastructure Data

Overview

Use recommendations of ASCE 75-22

Standardize data capture	→	Accuracy, Intervals and Attributes
Facilitate data exchange	→	Feature Types, Geometry, Attributes
Be compatible with design platforms	→	**CAD**, BIM, **GIS**, JSON, **XML**
Maintain Records	→	Consistent, Complete, Validated

Data Capture Best Practices

- Know your accuracy in the field
- Capture everything. Mob cost is high
- Elevations for every shot!
- Simple data dictionaries
- Consistent data dictionaries

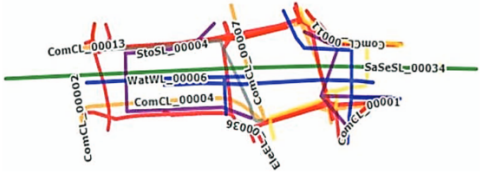


Figure A-1. Installation of an 8 in. diameter sanitary sewer force main (SaSeSl_00034).

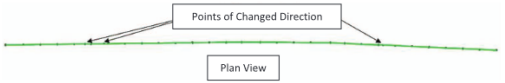


Figure A-2. Plan view of an 8 in. diameter sanitary sewer force main installation recorded observation points.

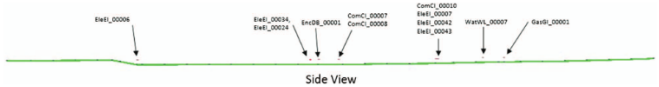


Figure A-3. Profile view of an 8 in. diameter sanitary sewer force main installation showing survey observations of exposed utility installations.

Data Model Best Practices

Table A-3. *X-Y-Z* Observed Positional Data of Utilities Crossed and Exposed During Installation of an 8 in. Diameter Sanitary Sewer Force Main.

Point number	Latitude (*Y*)		Longitude (*X*)	Elevation (*Z*)	Feature code	Positional Accuracy Level	Survey note
858	47.0581813	–	122.7622991	205.91	CTH_00001	2	Communication, top
859	47.0584807	–	122.7623087	205.51	CTH_00003	2	Communication, top
860	47.0584815	–	122.7623091	205.60	CTH_00004	2	Communication, top
861	47.0585430	–	122.7623091	205.18	CTH_00008	2	Communication, top
1221	47.0581767	–	122.7622993	205.85	ETH_00001	2	Electricity, top
1222	47.0581778	–	122.7622995	205.90	ETH_00002	2	Electricity, top
1223	47.0585688	–	122.7623111	205.09	ETH_00003	2	Electricity, top
1224	47.0585699	–	122.7623110	205.10	ETH_00004	2	Electricity, top
1225	47.0591000	–	122.7623435	204.93	ETH_00007	2	Electricity, top
1226	47.0581755	–	122.7622993	205.88	ETH_00009	2	Electricity, top
1279	47.0579722	–	122.7623024	207.24	GTH_00001	2	Gas, top
1405	47.0580377	–	122.7623006	206.86	WTH_00001	2	Water, top

Important Takeaways

- Capture Z data
- CAD & GIS compatible (geometry, attributes and metadata)
- Document capture process and accuracy in detail
- ASCE 75 is a framework, adapt the principals
- Completeness and consistency is key

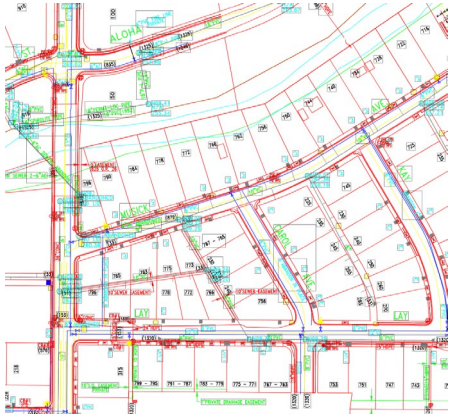
FAQs

- Do I capture 3rd party facilities when I find them?
- What if I don't have Survey Grade GPS equipment?
- How do I determine Accuracy Standards & Attribute Domains?
- How compatible does my data need to be?
- What is the difference between SB 865 in CA and ASCE 75?

Where to we go from here?

- Current State Summary
- Outstanding Challenges
- Exciting Opportunities

The Present



Digitized Utility Maps

GPS Enabled Locating

Basic Subsurface Scanning

We still have work to do…

TIME CONSUMING RESEARCH

FIELD SURPRISES

500,000 DIG INS

Why are utilities still such a problem?

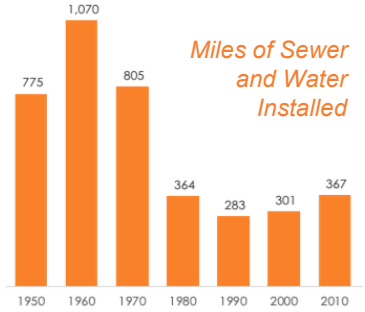
Application of Best Practices

- SUE not known or applied
- No quality levels in GIS
- New facilities aren't GPS-ed

ASCE

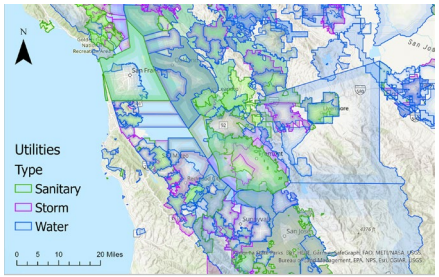
Recordless or Abandoned Facilities

- Legacy infrastructure
- Records not retained when facilities abandoned



Data Fragmentation and Loss

- Data spread across operators
- Data boxed after every job



The Future

Laws, Standards & Training

SB 865

CA Law requiring all new or exposed subsurface installation to be maintained in GIS

ASCE

38-22 & 75-22

Better Detection & Digitization Technology

exodigo

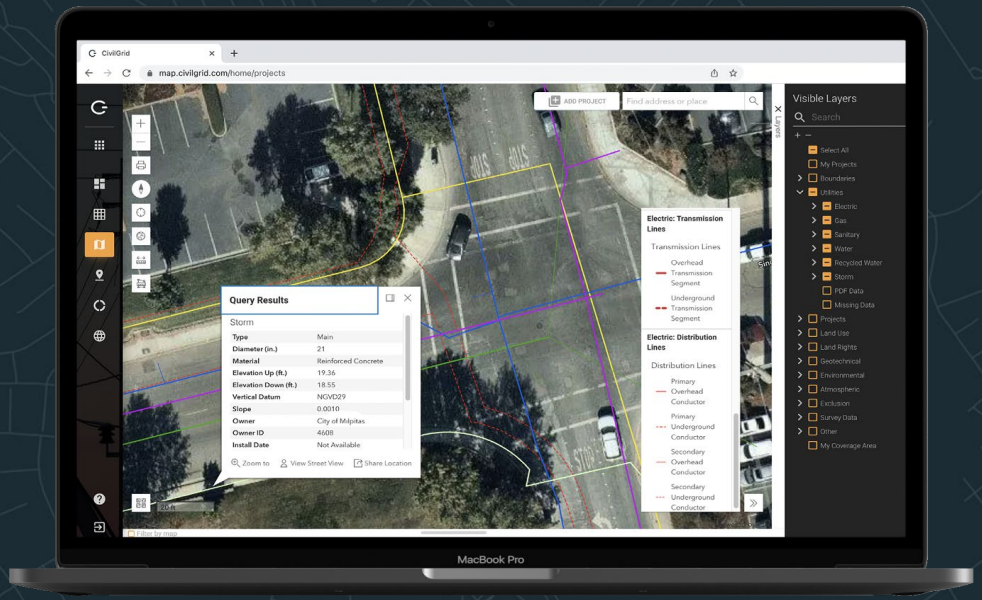
LOCUSVIEW

Secure Shared Single Source of Truth

CIVILGRID

CIVILGRID

SECURE, SHARED, SINGLE SOURCE OF TRUTH



Utility lines

Environmental

Imagery

Land Rights

Paving & Moratoriums

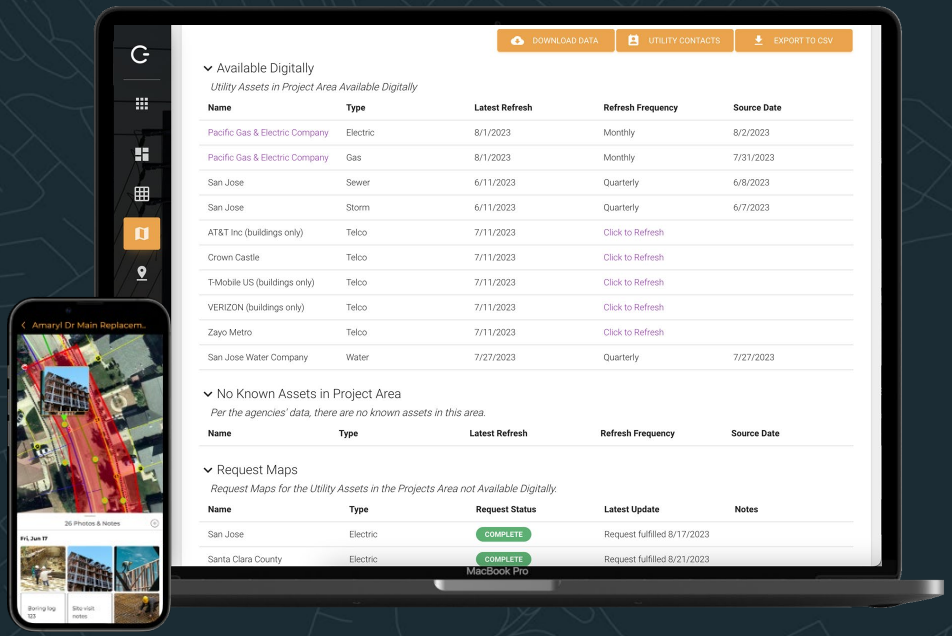
Historical Survey

Hazardous Materials

Historical Geotech

Capabilities

ACCESS CONSOLIDATED DATA IN REAL TIME & COLLABORATIVELY PLAN



- Source utility list relevant to your project
- Submit and manage utility requests
- Plan potholing and document on mobile
- Auto-generate CAD plan view drawings

Challenges Addressed by CIVILGRID

- Secure & seamless inter-agency data flows
- Reduce quality D research & drafting time
- Identify source data quality where available
- Reduce data loss at project close

Conclusion & Takeaways

- Become a SUE ambassador
- Robust GIS systems are essential to a better SUE future
- New technology is here, but it won’t have an impact without you

If you have questions

COME VISIT US

Josh Mackanic

Founder, CEO

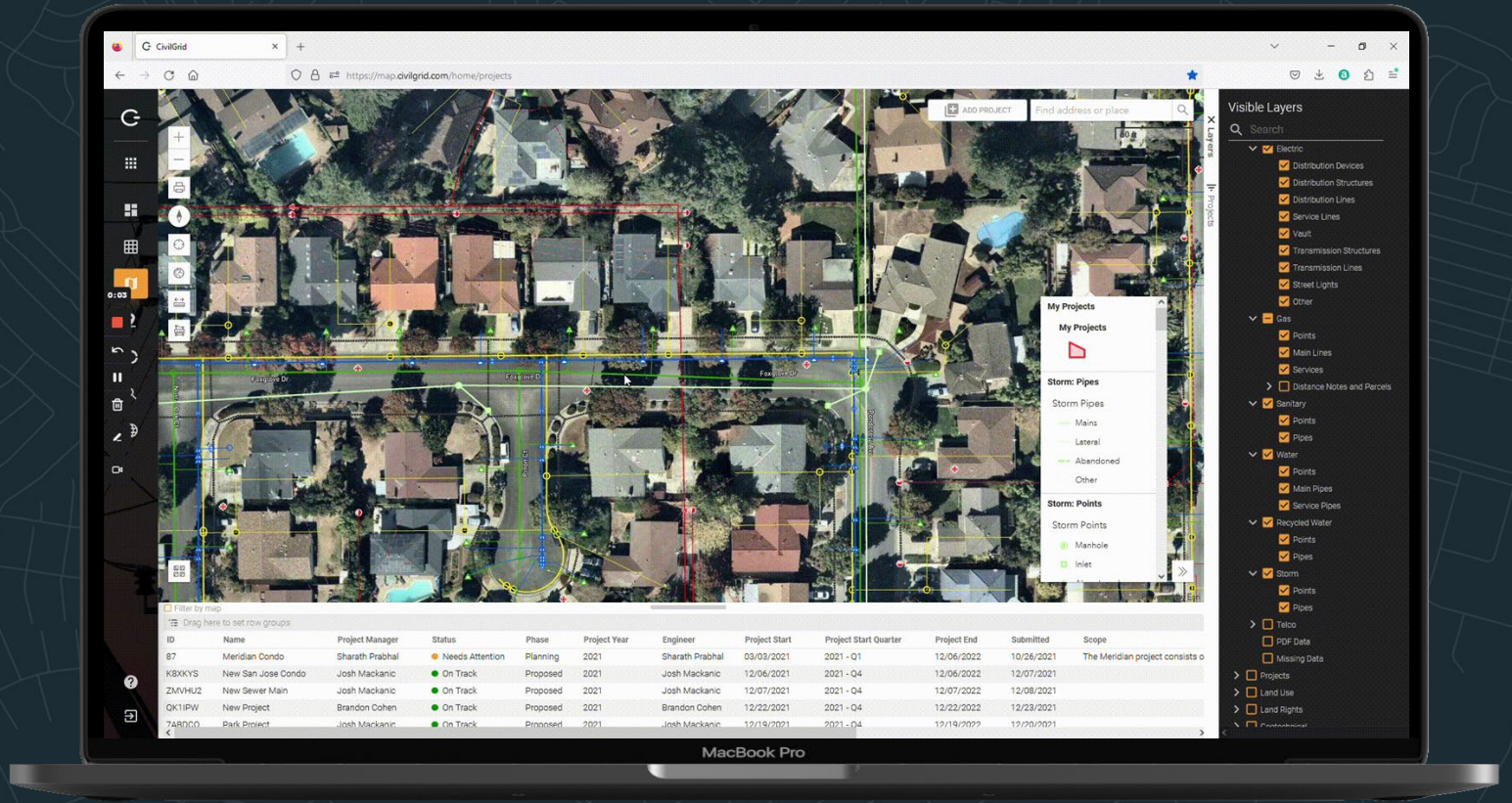
josh@civilgrid.com

Dave Veilleux

Strategic Account Executive

dave@civilgrid.com

Questions?


CivilGrid
https://map.civilgrid.com/home/projects
ADD PROJECT
Find address or place
Visible Layers
Search
Electric
Distribution Devices
Distribution Structures
Distribution Lines
Service Lines
Vault
Transmission Structures
Transmission Lines
Street Lights
Other
Gas
Points
Main Lines
Services
Distance Notes and Parcels
Sanitary
Points
Pipes
Water
Points
Main Pipes
Service Pipes
Recycled Water
Points
Pipes
Storm
Points
Pipes
Telco
PDF Data
Missing Data
Projects
Land Use
Land Rights
My Projects
My Projects
Storm: Pipes
Storm Pipes
Mains
Lateral
Abandoned
Other
Storm: Points
Storm Points
Manhole
Inlet
Filter by map
Drag here to set row groups
ID
Name
Project Manager
Status
Phase
Project Year
Engineer
Project Start
Project Start Quarter
Project End
Submitted
Scope
87
Meridian Condo
Sharath Prabhal
Needs Attention
Planning
2021
Sharath Prabhal
03/03/2021
2021 - Q1
12/06/2022
10/26/2021
The Meridian project consists o
K8XKYS
New San Jose Condo
Josh Mackanic
On Track
Proposed
2021
Josh Mackanic
12/06/2021
2021 - Q4
12/06/2022
12/07/2021
ZMVHU2
New Sewer Main
Josh Mackanic
On Track
Proposed
2021
Josh Mackanic
12/07/2021
2021 - Q4
12/07/2022
12/08/2021
QK1IPW
New Project
Brandon Cohen
On Track
Proposed
2021
Brandon Cohen
12/22/2021
2021 - Q4
12/22/2022
12/23/2021
MacBook Pro

CIVILGRID

SECURE, SHARED, SINGLE SOURCE OF TRUTH

PG&E

CONTRA COSTA WATER DISTRICT

Fremont

SAN JOSE WATER

CITY OF FAIRFIELD CALIFORNIA

EBMUD

EDISON INTERNATIONAL

CITY OF SAN MATEO CALIFORNIA

Davis CALIFORNIA

CITY OF BERKELEY

ANTIOCH CALIFORNIA

150+ UTILITY OPERATORS

- Utility lines
- Environmental
- Imagery
- Land Rights
- Paving & Moratoriums
- Historical Survey
- Hazardous Materials
- Historical Geotech