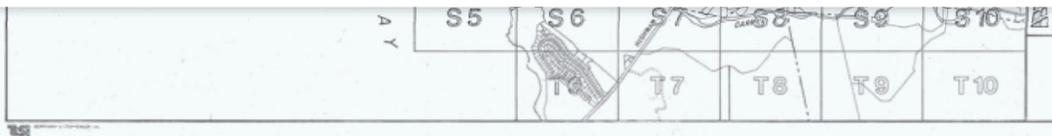# CAWD GIS

Yesterday, Today and Tomorrow... How GIS guides today's decisions and builds tomorrow's infrastructure.

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Over the past several years, the **Carmel Area Wastewater District (CAWD)** has undertaken a significant transformation of its infrastructure management strategy through the implementation and expansion of **Geographic Information Systems (GIS)**. This report outlines the progression from legacy data management methods to a cutting-edge **GIS HUB** that enables real-time monitoring, field integration, spatial analysis, and transparent public engagement. It documents the systematic approach, individual GIS projects, long-term vision, and the measurable benefits both financial and operational of this strategic shift.

CAWD recognized that a smart, integrated **GIS system** could not only modernize internal operations but also save money, increase efficiency, and improve community trust. With this in mind, **CAWD** committed to building a comprehensive GIS program tailored to meet both short-term needs and long-term objectives.

The Evolution of CAWD's GIS Program

More Than a Map: The Power of GIS

Geographic Information Systems (GIS) is much more than just a digital map - it's a powerful tool that connects data to geography. By combining layers of information, GIS helps us understand patterns, relationships, and trends based on location.
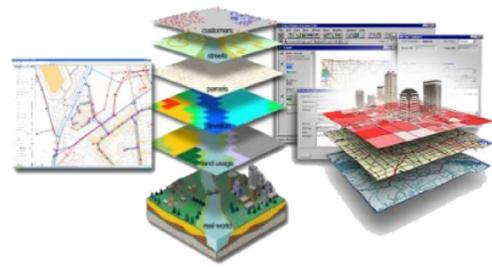

GIS Mapping

Think of it as a **smart, interactive map** that not only shows where things are, but also tells us **what's happening, why it's happening there, and what we should do about it.** From tracking wastewater infrastructure to planning for future growth, GIS empowers communities to make more informed, data-driven decisions.

For the **Carmel Area Wastewater District**, GIS serves as a foundational technology for managing assets, planning maintenance, responding to environmental concerns, and engaging with the public.

1. CAD to GIS Conversion

The first step in the District's GIS journey was to transition from legacy CAD files to GIS-based spatial datasets. CAD drawings - while useful for design- are static and often lack geospatial intelligence. Through an intensive data conversion process, thousands of infrastructure assets (manholes, cleanouts, sewer lines, laterals, pump stations) were georeferenced and attributed in a GIS environment.

CAD to GIS Conversion

This conversion unlocked the ability to perform spatial analysis, overlay environmental data, and integrate with mobile and web tools. It also ensured data consistency across departments, setting a solid foundation for future development.

2. GPS Field Mapping and GIS Accuracy

Once initial GIS layers were created, CAWD undertook a high-accuracy GPS mapping campaign. Field crews used modern GPS and GNSS-enabled devices to verify, locate, and update infrastructure positions on the ground. This ensured sub-meter positional accuracy for critical assets and corrected discrepancies between design documents and field conditions.
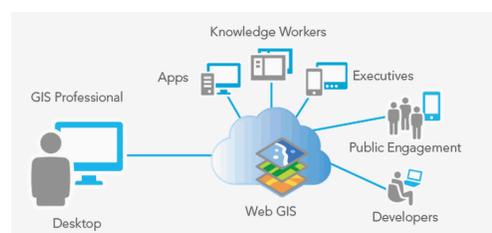

RTK GPS Mapping

Accurate data enables efficient planning, minimizes risk during excavation, and improves emergency response times. GPS validation marked a pivotal transition from estimated to precise infrastructure locations.

3. GIS to Web GIS Transformation

Having built a core GIS dataset, CAWD transitioned to **Web GIS**, allowing GIS data to be shared across the organization via secure web applications. This enabled operations, engineering, and administrative staff

Web GIS Diagram

to access real-time infrastructure maps on any device. Web GIS reduced the burden on GIS professionals by decentralizing access and made spatial data an everyday tool rather than a specialized asset. It also facilitated field-to-office collaboration, as updates could be made in real time.

4. Web Maps and Operational Apps

Next, CAWD developed a suite of **custom web maps and applications** to streamline daily operations. From sewer line cleaning to cleanout hazards, these applications provide intuitive interfaces for inspecting, documenting, and prioritizing work in the field. ArcGIS Dashboards and

ArcGIS Intergration

Experience Builder apps allow for dynamic data display and performance monitoring, all tied to a centralized data repository.

5. Field Mapping with the ESRI Suite & CAWD GIS Hub

Using ESRI's mobile apps - **Field Maps, Survey123, and Collector** - field staff now conduct inspections, maintenance reporting, and data collection digitally. All updates sync back to the central GIS database. The launch of the **CAWD GIS Hub** formalized the District's geospatial ecosystem, consolidating internal operations, consultant access, and public-facing tools into a single, unified platform.
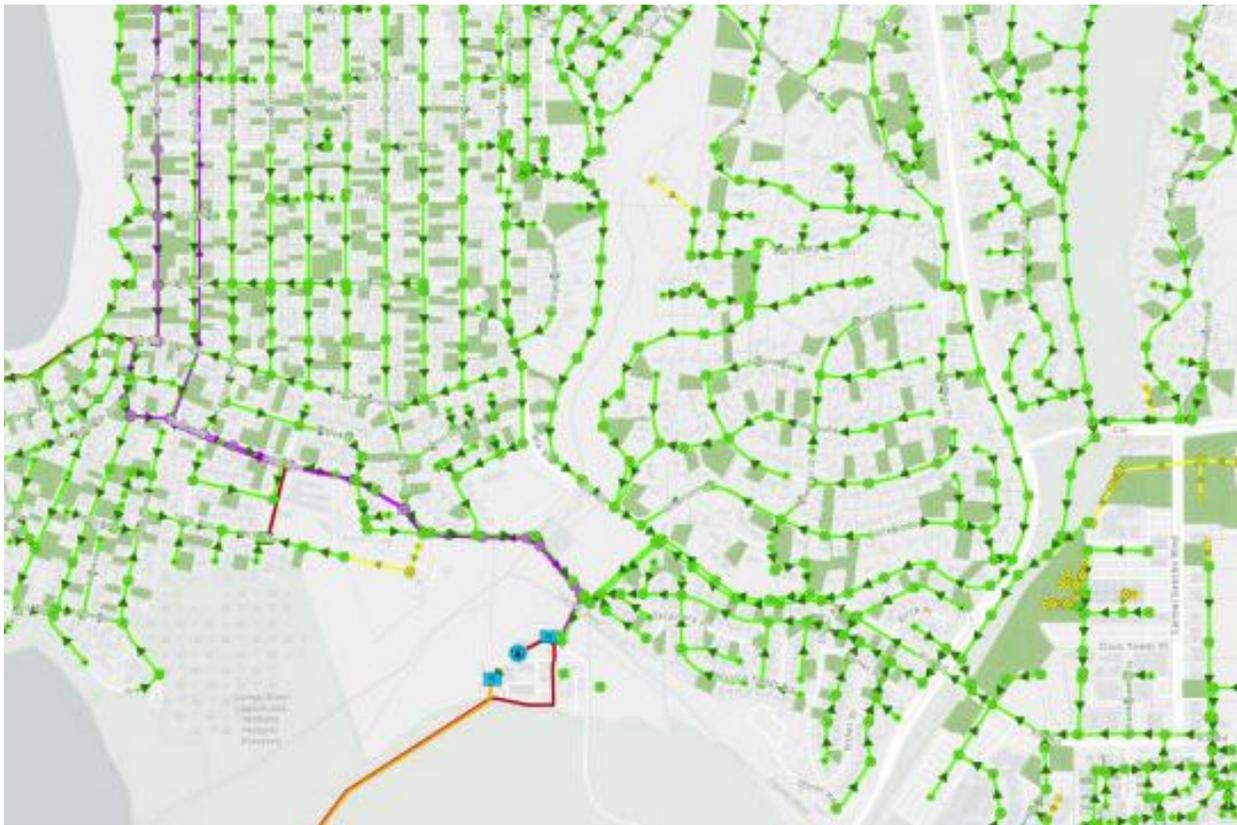

ESRI Mobile Apps

Line Cleaning Report:

The Line Cleaning Report logs both ongoing and scheduled sewer line cleanings. This data allows CAWD to proactively manage maintenance cycles, reduce blockages, and extend the life of infrastructure. Daily access to this report helps crews prioritize areas needing attention, track completion status, and coordinate with other field activities. For long-term planning, the data identifies trends in buildup or recurring problem zones, aiding decisions on whether repairs, upgrades, or redesigns are necessary.

Private Lateral Certificates:

These certificates ensure that private sewer laterals comply with inspection and maintenance standards. CAWD uses this data to track compliance across properties, enforce ordinances, and coordinate with property owners during property sales or renovations. This system helps protect the public sewer system from private-side defects and reduces inflow and infiltration, making it vital for both regulatory oversight and infrastructure longevity.

Manhole Inspections:

This dataset contains inspection records and metrics for nearly 2,000 manholes. It is essential for monitoring structural integrity, identifying access issues, and planning rehabilitation. CAWD uses this data daily to dispatch maintenance crews efficiently and to prioritize repairs based on condition scores or historical trends. Over time, this helps optimize capital improvement planning and ensure public safety.

Cleanout Inspections & Hazards:

Tracking cleanouts and associated hazards ensures they remain accessible and functional, especially during emergencies. CAWD uses this information to verify that properties meet inspection standards and that there are no safety concerns, such as trip hazards or blocked access. It also helps with emergency response, allowing crews to locate and use cleanouts without delay.

ROW and Easement Research:

This public-facing app offers access to right-of-way and easement records, facilitating coordination with property owners, developers, and contractors. Internally, CAWD uses it to confirm legal access for inspections, maintenance, or capital projects. It ensures compliance with legal boundaries and speeds up decision-making during project planning and permitting.

Carmel River Watch:

Providing real-time data on river flow, water quality, and environmental conditions, this system supports CAWD's environmental monitoring and emergency preparedness. The data helps predict storm impacts, prevent overflows, and ensure regulatory compliance with watershed protections. Daily monitoring supports operational adjustments, such as flow diversions or alerts during high-risk weather events.

Annexations Dashboard:

This dashboard tracks annexed zones and analyzes their impact on service areas, infrastructure needs, and revenue projections. CAWD uses it to evaluate how newly incorporated areas affect system capacity and maintenance obligations. For strategic planning, it aids in forecasting future infrastructure investments and setting service priorities.
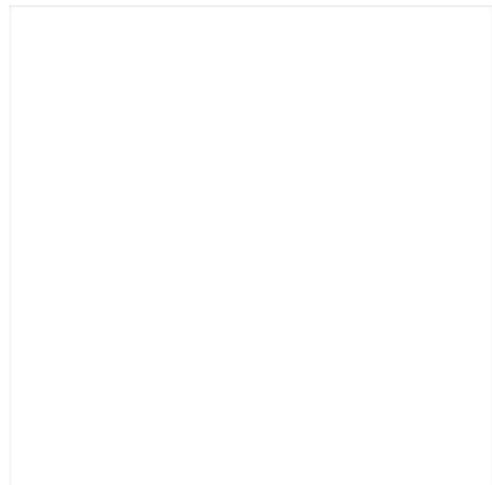
Flow Basins Map:

CAWD uses the Flow Basins Map to analyze flow patterns, identify cross-connections, and optimize sewer system design. It is especially useful in assessing impacts from development or annexation and in prioritizing basin-specific maintenance or upgrades.

How GIS Saves Time

Working Smarter Today: Short–Term Time Savings with GIS

- **Centralized Data Access:** With GIS, all infrastructure data—manholes, pipelines, inspections—is accessible in one digital platform.
  - ◆ **Short-Term Benefit:** This eliminates time wasted tracking down paper maps or spreadsheets and reduces **redundant fieldwork** by ensuring crews always see the latest updates.

- **Real-Time Data Collection & Visualization:** Field staff can use mobile devices to collect and sync data live from the field. Whether they're marking a repaired pipe or logging a maintenance check, the updates are instant and visible district wide.
    - ◆ **Short-Term Benefit:** This supports **faster inspections**, reduces reporting delays, and avoids miscommunication between departments.
- **Improved Scheduling with Dashboards:** GIS dashboards provide real-time views of ongoing work, asset status, and areas needing attention.
    - ◆ **Short-Term Benefit:** Work orders can be **prioritized more effectively**, meaning the right jobs are tackled first—boosting operational efficiency.
- **Automation:** Automating tasks like routing, reporting, or inspection alerts keeps work flowing without constant oversight.
    - ◆ **Short-Term Benefit:** Staff can **focus on higher-level tasks** while GIS handles the repetitive work in the background.

How GIS Saves Money

Planning for the Future: Long–Term Cost Savings with GIS

- **Operational Efficiency:** GIS-based routing reduces time on the road and fuel usage, and centralized data means fewer return trips due to missing information.
    - ◆ **Short-Term:** Less time in the field = less cost today.
    - ◆ **Long-Term: Asset lifespan is extended** with better maintenance scheduling, reducing replacement costs over time.
- **Preventive Maintenance & Risk Mitigation:** GIS highlights problem areas before they become emergencies, using spatial analysis of inspection history and environmental risks.
    - ◆ **Long-Term Benefit:** Enables **early detection** of issues—avoiding costly fines, service disruptions, and emergency repair bills.
    - ◆ **Emergency Preparedness:** GIS supports **faster, more**

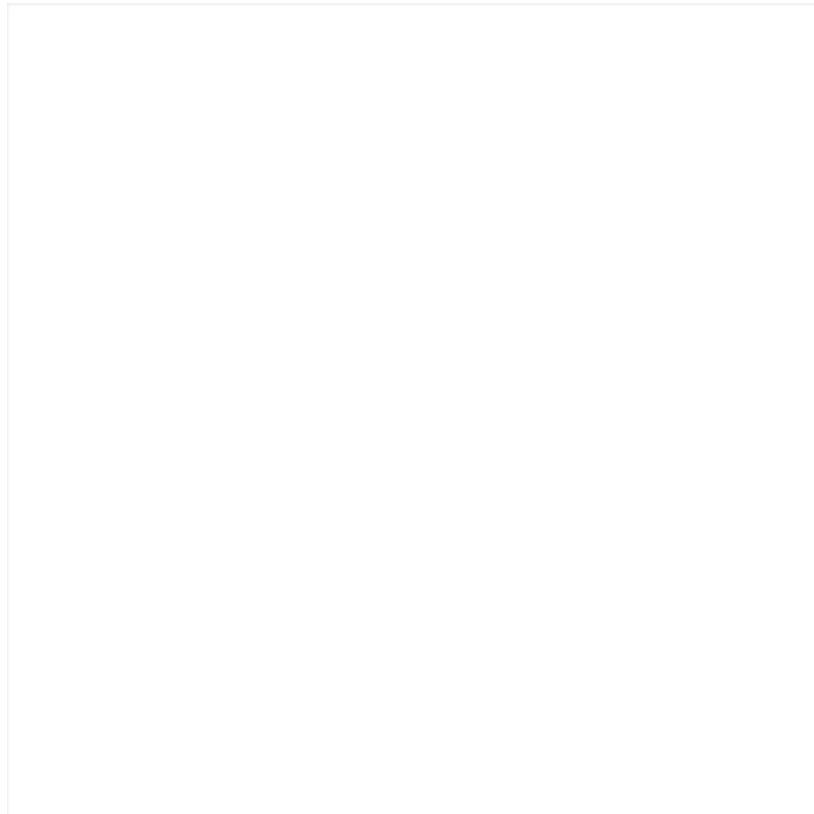**effective response** during events like floods or earthquakes.

• **Resource Allocation:** GIS helps assign the right crews, equipment, and funding where they're needed most—no more guesswork.
   ◆ **Long-Term Benefit:** Supports **strategic capital planning** by identifying infrastructure most in need of investment and **avoids wasteful spending**.

• **Data-Driven Grants & Historical Records:** Maps and visualizations from GIS strengthen funding applications and regulatory reporting. Plus, every inspection, repair, or replacement is digitally archived.
   ◆ **Long-Term Benefit:** You build a **permanent digital history** of infrastructure performance—essential for audits, asset valuation, and future planning.

A Smarter Future with GIS

The integration of GIS into CAWD's operations marks a strategic shift toward smarter, more resilient wastewater

management. More than a map, GIS is now a foundation for sustainable growth, regulatory compliance, and exceptional service.

As CAWD's GIS Hub evolves, it will support emerging technologies—like real-time sensors, AI-based risk modeling, and climate resilience planning—positioning the District to meet future challenges head-on.

Key Contributions of GIS Today:

- **Smart Planning:** Supports zoning, infrastructure upgrades, and long-term development with data-driven insights.
- **Emergency Readiness:** Enables flood mapping, evacuation planning, and risk mitigation.
- **Environmental Stewardship:** Tracks land use, protects habitats, and supports conservation efforts.
- **Public Health & Equity:** Identifies service gaps and ensures resources are distributed fairly.
- **Utility Management:** Monitors underground infrastructure, schedules maintenance, and extends asset life.
- **Community Engagement:** Interactive maps and dashboards make complex data accessible to the public.

GIS is more than a tool—it's a strategic asset guiding CAWD into a smarter, more connected future.

CAWD GIS HUB   Public Web Map

GIS: Powering CAWD's Commitment to Service and Sustainability

GIS is more than just mapping – it's how CAWD plans smarter, responds faster, and serves the community better.

By turning data into action, GIS reduces waste, improves efficiency, and supports responsible use of both natural and financial resources. It empowers the District to make

informed decisions—not just for today, but for the long-term health and sustainability of our region.

With GIS, CAWD is not just managing infrastructure - it's shaping a more resilient and connected future.

The next phase of the CAWD GIS is with 3D Scenes

Carmel Area Wastewater District (CAWD)

Geographic Information Systems (GIS)

ESRI Story Maps   Green Infrastructure
Design