

The Island of Hawaii's ITS Strategic Plan

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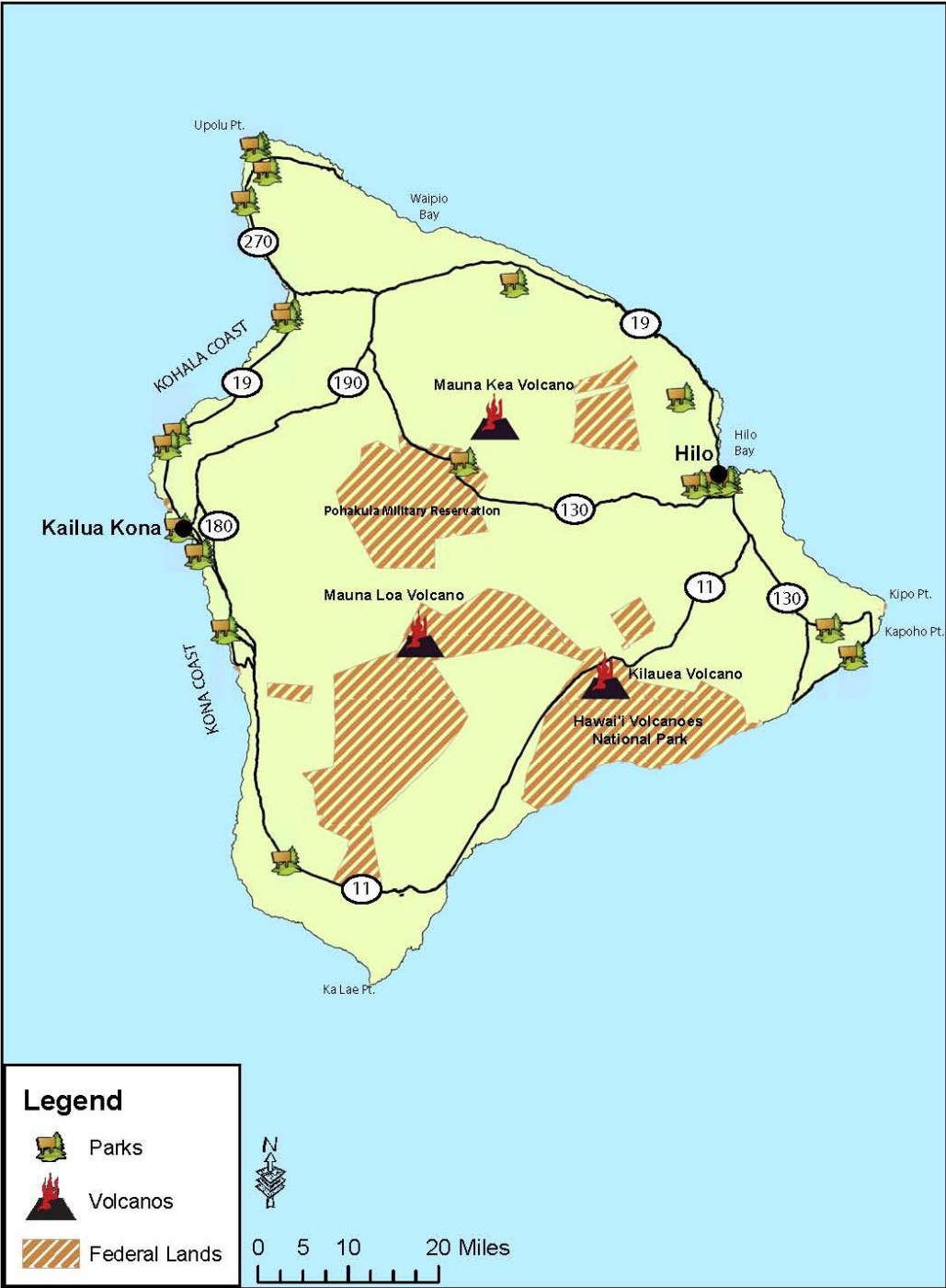
Abstract: This article outlines key aspects of the County of Hawaii Department of Public Works (DPW) ITS Strategic Plan, completed in early 2009. The plan provides a programmatic road map for investments in ITS on the Big Island. Included are the important processes used in developing the plan, and the resulting vision, goals and major recommendations for capital and operations and maintenance expenditures.

The County of Hawaii Department of Public Works (DPW) completed a five-year ITS Strategic Plan in early 2009. This plan provides a programmatic road map for investments in ITS on the Big Island.

About the Big Island

The island of Hawaii is the largest island in the State of Hawaii, with a population of close to 150,000 residents, as of the 2000 Census. It has an area of approximately 4,000 square miles and is slowly growing due to the active volcano, Kilauea. Figure 1 shows the population centers, and major roads on the island. The island contains a network of 1,393 miles of public roads. Of these, more than 63% are County roads, with the remainder being part of the State highway system, falling under the jurisdiction of the Hawaii Department of Transportation (HDOT). In addition, there are somewhere between 500 and 800 miles of "homestead roads", the majority of which are sub-standard not meet current design standards. Travel between the two main population centers – Hilo and Kona – takes 2 ½ hours in uncongested conditions, and many residents make the drive daily for work.

Figure 1: Map of the Island of Hawaii



The COH DPW's Traffic Division is responsible for operating a current total of 95 traffic signals on the Big Island, including the signals owned by HDOT on State roadways. Of the 95 signals, 20 are accessible by dial-up (phone) modem from the East Hawaii Traffic Division Facility in Hilo. Closely spaced signals are operated in a coordinated

fashion using closed-loop systems with local masters, where communications has been installed. All other signals (more than 70) are operated as isolated intersections.

The Traffic Division also has implemented the following:

- Four CCTV cameras connected to the Traffic Division using leased DSL lines.
- Test deployment of cellular communications (3G network) to traffic signals to include data collection from loop amplifiers
- Smart signs, which gather counts and speeds, then displays the speeds to drivers, are currently being installed at 30 locations island wide.

The strategic plan assessed these assets, as well as other County assets that could be used as part of the ITS program including:

- Portable dynamic message signs (DMS)
- County web site
- County telephony systems
- County fiberoptic communications

Why do an ITS Strategic Plan?

The October 2006 earthquake, caused County leadership to focus on providing information to the public during emergencies. The still ongoing eruption episode of Kilauea at Halemaumau, which began in July 2007, reinvigorated County staff and leadership. Their desire to improve the public's access to information on emergencies focused on using key advanced technologies (e.g. the internet, automated phone information system, and dynamic message signs) that are now considered mainstream in the US.

Also in 2007, the County and HDOT were beginning several major road improvement projects with the potential to disrupt traffic both locally and cross-island. The likelihood of major delays and other impacts was a concern to County staff. The DPW Deputy Director at the time wanted to explore new methods for public information provision and outreach. His review of options included implementing an Advanced Traveler Information System (ATIS) so the residents would have automated, real-time information on traffic conditions during construction, and a place to automatically log comments, questions and concerns about construction progress. The County requested a study of an ATIS. During discussions of the ATIS study concept, the connection between the Traffic Division's operations, assets, and staff and the success of an ATIS became clear. The scope of the study was expanded to comprehensively address overall questions of ITS implementation, operations and maintenance, including the deployment of an ATIS.

The ITS Strategic Plan included all electronic systems under Traffic Division management, as well as the Traffic Operations group staffing and capabilities in implementation, operations and maintenance.

Important Aspects of the Plan and the Plan Process

The ITS Strategic Plan includes the following features:

The plan is comprehensive and focused on outcomes. In the approach to the plan, the work focused on defining the desired outcomes in tangible terms, and asked what “inputs” (equipment, operations and maintenance functions and staff) were needed to produce those outcomes. The resulting plan addresses not only capital needs, but ongoing maintenance and operations staffing and funding needs.

The plan development process included discussions with all levels of staff and affected Departments. The ITS plan introduced systems and functions that are not traditionally part of the Traffic Division. The plan includes telecommunications for traffic signals and other ITS, and an ATIS system that would include web site development and hosting, and telephony. These assets could be leveraged across the County. However, these assets are normally managed by the County Department of Data Systems (DS). Discussions with DS leadership were held that introduced the concepts and requirements of an ATIS, and the island-wide telecommunications needs and potential approaches. The discussions led to an evolution in thought about management of what was once considered “specialized” assets, and needing separate Departmental management - but are now becoming core assets for the Traffic Division.

Meetings were also held with DPW Public Information Officer, with Police, Fire and Civil Defense (operators of the County Emergency Operations Center). These meetings were informational and intended to gauge if any support from or synergies with these other agencies could emerge.

The plan focuses on a five-year horizon. Because technology changes rapidly, the plan focused on what was reasonable for implementation in a five-year horizon. Beyond five years, projects and needs are presented as well, but with less detail. Within the five-year plan, the projects with the greatest return on investment are addressed first. With estimated returns of up to 40:1, traffic signal operations emerged as the first area to be addressed.

The implementation strategy deploys the communications infrastructure and other technologies required to improve traffic signal operations, such as upgrading traffic detection at intersections and deploying CCTV cameras. This investment, managed by the Traffic Division, becomes the basis of ATIS, where information can be disseminated

to the public through the implementation of web-based, and potentially phone-based, traveler information systems.

Key Needs Identified in the Baseline Assessment

The project began with an assessment of all aspects of the County relative to ITS. The key findings from that assessment were:

- Approaches to reduce travel by operations and maintenance staff to assess operations and malfunctions are needed. These would include providing continuous communications to all traffic signals, implementing CCTV so that images can be sent to central operations and maintenance personnel, and supporting a maintenance station in Kona, on the western side of the island, to supplement the Hilo's headquarters operation, located on the eastern side of the island.
- Overall, the majority of the Division's traffic signal activities over the past several years have been forward-thinking and in keeping with or exceeding best practices for traffic signal operations. This includes improving traffic signal detection and retiming traffic signals approximately every two years.
- The County web and phone systems are not currently able to handle the bandwidth or volume expected from an ATIS deployment, and other options would need to be considered including off-site hosting.
- The Traffic Division space needs to be expanded to support expanded bench space for electronics test and repair, added personnel, and to implement a Traffic Control Center.
- Hawaii County's DPW is one of the few agencies in the US that performs regular and complete preventative maintenance of traffic signals, which is a credit to the department. They are adequately staffed to maintain existing infrastructure, but additional infrastructure will require more staff.

Addressing the lack of communications infrastructure is the major focus of the plan. The key step is to provide communications to every traffic signal so they can be managed from a central location (a traffic control center) or two locations (Hilo and Kona). With the traffic signal communications in place, CCTV can be deployed, with the images being brought back to central over the same communications media. With data and video images being brought back to a central location, the provision of a traveler information phone and web site system can be accomplished.

ITS Program Vision

The core mission of the Traffic Signal and Streetlight Section (Traffic Section) of the DPW Traffic Division is the safe and efficient operation of traffic signals during all

conditions, including disasters and normal operations. The ITS Strategic Plan's Vision is based on that core function.

The ITS Program vision is to implement and sustain technologies that:

- *Enhance traveler safety and convenience,*
- *Improve traffic flow, and*
- *Support response to emergencies, including Civil Defense operations*

in a way that encompasses the environmental, cultural, and quality-of-life values of the Island of Hawaii.

ITS Program Goals

To support the vision, the following ITS Program Goals were developed. Each goal is followed by a short description of ITS applications that support the goal.

- Enhance the safety and efficiency of traffic signal operations.

While the County is providing safe and efficient traffic signal operations, the addition of a central traffic signal control platform connected to all traffic signals across the island will enhance the provision of these services and enable improved response to outages and malfunctions.

- Improve the capability to inform the public in real-time of traffic/travel conditions.

Implementing an automated web and phone-based system that includes traveler, emergency, and construction advisories, camera images of traffic conditions, and other information will greatly increase public access to information.

- Improve the capability to support local emergency response.

With communications connections to all traffic signals, staff will be able to quickly implement special traffic signal timing plans to support closures and diversions. CCTV images can be shared with emergency managers and responders to support assessment and response.

- Manage the investment in ITS.

Managing the investment involves supporting the current level of maintenance; implementing technologies that are cost-effective or result in cost and staff time efficiencies; and ensuring ongoing support for operations and maintenance.

These ITS Program goals directly support the County’s overall transportation goals.

Plan Summary

As noted earlier, the first and foundational step of the Plan is to provide communications to every traffic signal so each can be managed from a central location. With the traffic signal communications in place, that infrastructure can be leveraged to install closed-circuit television (CCTV) cameras, with the images being brought back to central over the same communications network. With data and video images being brought back to a central location, the video images can be shared with the public, emergency responders, and with the media. A web site for public use would post the images, and could include information on road closures, construction and major incidents affecting travel on island.

The ITS Strategic Plan addresses other technologies that support safe and efficient traffic operations. The *total* cost of implementing all of the projects proposed in the Plan would range from \$7.5M to over \$60M. The significant difference in cost is due solely to the type of communications network implemented. The lower cost option includes leased fiber and cellular wireless connections. The table, below, provides costs for the core pieces of the Plan.

	Short-Term (0-2 Years)	Mid-Term (3-5 Years)	Long-Term (5 - 10 Years)
Telecommunications	OPTION 1:	OPTION 1:	OPTION 1:
OPTION 1: Install County-Owned Fiber (Islandwide network)	\$200,000	\$5,000,000	\$50,000,000
OPTION 2: Lease Private Wireless and Fiber Communications	\$200,000	\$300,000	\$1,000,000
Traffic Control Center Equipment	\$200,000	\$300,000	\$0
CCTV Expansion	\$150,000	\$100,000	\$100,000
Website	\$125,000	\$50,000	\$150,000
Website O&M (includes hosting fees)	\$0	\$300,000	\$500,000

These new initiatives represent an estimated \$2.8M in capital costs over the first five years of the plan. This represents a 60% increase in the Traffic Division’s capital expenditures. The Plan also includes a 10% increase in O&M per year (in years 3 to 5) over current Traffic Division expenditures. Among the many benefits, implementing the Plan projects will:

- Improve responsiveness to traffic signal malfunctions;
- Reduce staff travel time and cost;

- Improve traffic signal operations and traffic flow;
- Provide a connection to the public via the Internet for viewing cameras; and
- Has the potential for improved emergency response operations.

Was it worth it?

Since the plan was completed, revenues have dropped severely, and a new administration was installed after the 2009 elections. No action has been taken on the plan.

However, the following is the current legacy of the ITS Strategic Plan:

- **Experimental, vendor-supported detection deployment.** Bringing in mainland expertise and consultants with exposure to the latest and greatest in technology, including rural applications, introduced the County to technologies and vendors that they would not have otherwise been exposed to. This connected DPW's Traffic Division with a wireless magnetometer detection solution that could be of great advantage for installing advanced detection. Loop installation is expensive on Hawaii – particularly in locations where conduit must be trenched. All trenching on Hawaii involves rock trenching, so solutions that minimize trenching are highly desirable.
- **Applications for State SPR funds, and ready to apply for Federal Funds via the STIP process.** The Traffic Division had never applied for State SPR funds. The information in the plan enabled the County to submit an SPR application to further the ITS planning process. The purpose of additional planning is to meet FHWA requirements for ITS Consistency to qualify for future Federal Funding. The application was approved, but not funded for the current year due to resource constraints. However, the County is hopeful that the funds will be provided next year.
- **Confirmation of the current situation and needs.** Being objectively evaluated across all functions against national and peer standards and measures was a welcome experience. It confirmed and reinforced the approaches the Traffic Division was taking to improve traffic operations on the island both within the Division and to the County leadership.
- **Ammunition for the next turn-around in the economy or the next County administration change.** The unfortunate economy has had a major impact on Hawaii County, as it would on other locations where the tourism and government sectors are the main revenue generators. The plan process has provided presentations, facts, and cost estimates that are at the ready for the next upswing in the economy, or change in County spending priorities.

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