OAHU REGIONAL ITS PLAN

INTELLIGENT TRANSPORTATION SYSTEMS ARCHITECTURE & INTEGRATION STRATEGY

An Element of the Oahu Regional Transportation Plan

April 2003

Project Background

Honolulu Fire Department Dispatch Center

Why is OMPO Developing an ITS Plan?

In Denver, Colorado, 55 percent of all congestion is caused by traffic incidents

Growth in the Oahu region has mirrored other areas in the US. There is an increased demand on the island's transportation facilities, especially in the highly urban areas in and around Honolulu. Roadway expansion has not kept pace with growth in vehicle trips, which has led to increased traffic congestion on the island's freeways and arterials. In the future, it is anticipated that growth will continue and almost 160,000 additional people will be living on the island by 2025.

The Oahu Metropolitan Planning Organization (OMPO) recognizes that due to limited funds and environmental constraints, relying solely on highway construction to meet demand would be difficult to achieve. In addition to roadway improvements, investments in transit and demand management strategies, systems that make multi-modal transportation facilities and services more efficient are the kind of proven strategies that will help meet demand at a lower cost to taxpayers.

In the future, investments in Intelligent Transportation Systems (ITS) can also contribute to the efficient use of existing roadway capacity and transit services. This will help reduce the burden placed on the Oahu regional transportation network.

ITS already exists on Oahu. The City & County of Honolulu has deployed systems that monitor and manage arterials through the use of Closed-Circuit Television (CCTV) cameras. The Hawaii Department of Transportation (DOT) has deployed three new freeway vehicle detection and roadway surveillance systems. The Honolulu Fire and Emergency Services Departments have implemented vehicle tracking and computer-aided dispatch systems to more effectively respond to incidents, thereby enhancing public safety and reducing property damage costs. The Honolulu Police Department has staff that assists in incident management as part of the City & County Department of Transportation Services' Traffic Control Center. The Oahu Civil Defense Agency also assists in incident management activities, for major events such as long-term roadway closures.

OMPO is responsible for coordinating transportation planning on Oahu. As part of this effort, it developed the regional ITS architecture and integration strategy that will support and enhance ITS interoperability and joint operations initiatives among Oahu's transportation and emergency response providers.

The architecture and integration strategy will provide a framework for institutional coordination and technical integration of ITS systems on Oahu. This framework will enhance multi-modal transportation operations on the island and lead to traveler safety and mobility improvements and reduced traffic delays and operational costs. The project will also help OMPO meet new federal transportation planning and funding requirements by establishing a regional ITS architecture. This will ensure that federal funds for ITS projects can be secured for the future.

What is ITS?

An Intelligent Transportation System (ITS) is a collection of technologies or systems (e.g., advanced sensors, computers, communication systems, etc.) that enable multiple agencies to work together to collectively manage a transportation network. ITS represents the next step in the evolution of regional transportation systems. As information technologies and advances in electronics continue to revolutionize all aspects of our modern world from our homes and offices to our schools and recreation, they are also being applied to our transportation networks. These technologies include the latest in computers, electronics, and communications and safety systems.

ITS can be applied to a state or region's vast transportation infrastructure of highways, streets, and bridges and to a growing number of vehicles, including cars, buses, and trucks. These information and communications technologies can also be used to better manage and improve how transportation providers (e.g., governments, transit agencies, and truckers) offer services to the public.

The private sector's role in ITS development and operations is perhaps more extensive than in any other element of the surface transportation system. In addition to its role in developing technology, the private sector plays an important role in providing services to the traveling public. Examples include operating and maintaining freeway ITS and providing web-based traveler information systems. On Oahu, opportunities for private sector participation in a regional advanced traveler information system are being explored. The scope of private-sector participation in ITS ventures naturally depends on opportunities for profit.

ITS systems run the gamut of services that impact highways, commercial vehicle operations, transit services, emergency service providers, and others. Among other services, ITS technologies:

- Collect and transmit information on traffic conditions and transit schedules for travelers before and during their trips. When alerted to hazards and delays, travelers can change their plans to minimize inconvenience and additional strain on the system.
- Decrease congestion by reducing the number of traffic incidents, clearing them more quickly when they occur, and rerouting traffic flow around them.
- Improve the productivity of commercial, transit, and public safety fleets by using automated tracking, dispatch and weigh-in-motion systems that speed vehicles through much of the red tape associated with commerce.
- Assist drivers in reaching a desired destination with navigation systems enhanced by pathfinding (route guidance).

These are just a few of the technologies being deployed. The complete list is lengthy and growing every day.

Regions all over the US have experienced the benefits of ITS in many ways. For instance, in San Antonio, Texas, the region deployed incident management systems and achieved reductions in emergency service provider response time by 20%. Crashes were reduced by 35% and cost savings of over $1.6 million per year were achieved.

In the Cincinnati metropolitan area, 99% of the travelers surveyed reported that their travel experience improved by having real-time traveler information provided by the region's Advanced Regional Traffic Interactive Management and Information System (ARTIMIS). ARTIMIS provided information that allowed travelers to avoid congestion areas, which saved time, reduced frustration and made getting around more reliable.

In Palm Beach County, Florida, a traffic signal preemption system for its emergency service vehicles achieved up to a 20% reduction in response time to emergencies. This helped save more lives and reduced the severity of injuries and property damage.

Closed Circuit Television Camera

In Brooklyn, New York, a freeway incident detection system with an extensive network of closed-circuit television cameras helped reduce incident clearance times from an average of 1½ hours to 31 minutes

Project Process

City & County of Honolulu Department of Transportation Services

The First Step in an Ongoing Process

In a heavily traveled urban arterial in Seattle, Washington, a transit signal priority system achieved an 8% improvement in bus travel time savings, a 34% reduction in bus delay and queuing (as shown above), and no change in overall intersection level of service

The Oahu ITS Architecture Project involved the participation of a number of partner agencies providing transportation and emergency response services in the area. Because the essence of ITS is information exchange, it is imperative that planning, development, implementation and operations be done in a cooperative and coordinated environment.

The first step in the process involved the examination of existing systems to determine what was in place today and what are Oahu's future needs. The basis of this needs assessment was a series of interviews with partner agency staff. Key to the interviews was the identification of the day-to-day information needs of staff to do their jobs and where that information resides. This helped to define new or enhanced agency-to-agency information exchange opportunities.

The next step in the process was to develop an ITS architecture that meets Oahu's regional needs and conforms with the National ITS Architecture. The architecture functionally defines the pieces of the ITS system and the information that is exchanged among various pieces of the system. An architecture is functionally oriented and not technology specific, which allows the architecture to remain effective over time. The architecture defines "what" must be done, not "how" it will be done.

The next step was to develop what is referred to as an Operational Concept. The Operational Concept is important in that it provides a description of specific regional operation objectives and defines roles and responsibilities of key transportation and emergency management agencies operating on the island. Based on this concept, the region can more effectively plan for and implement more effective capital and operational improvements.

Based on the Operational Concept, an Integration Strategy was developed to bring together a systematic plan for coordinating and implementing ITS investments. In addition to a candidate list of ITS projects and project cost estimates, the Integration Strategy identifies opportunities for regional integration of ITS services and functions, potential regional policies that help enhance regional integration, and potential procurement strategies and funding sources for projects.

Finally, a memorandum of understanding was developed for Oahu partner agencies to continue coordinated and cooperative planning, development, implementation and operations of ITS systems and services onin the Oahu metro area.

The development of the OMPO ITS Plan is now complete and the framework for implementation of more effective ITS strategies and practices are in place. The region is in an excellent position to experience improved system performance at lower cost to the taxpayers through more accurate data, better information exchange among partner agencies, and broader deployment of proven multi-modal ITS technologies.

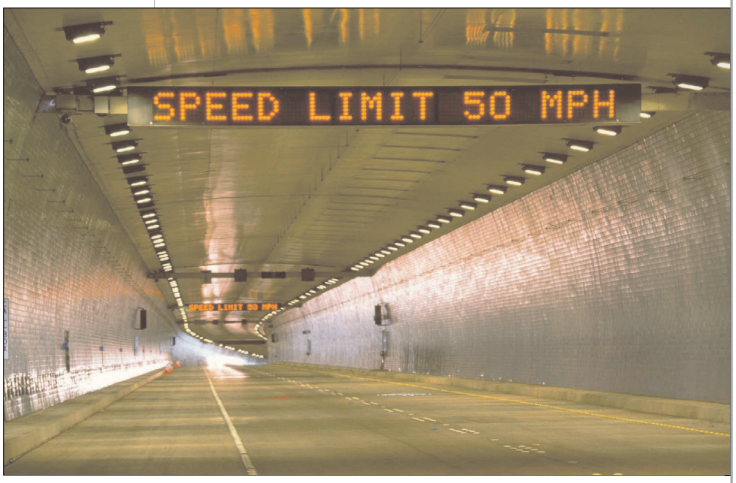
Who are the Partner Agencies?
Participation from agencies that provide, manage or support ITS systems was essential in developing the Regional ITS Plan. The transportation and emergency response providers who participated included:

City & County of Honolulu
- Department of Design and Construction
- Department of Information Technology
- Department of Transportation Services
- Honolulu Emergency Services Department
- Honolulu Fire Department
- Honolulu Police Department
- Oahu Civil Defense Agency

Hawaii Department of Transportation

Oahu Metropolitan Planning Organization

ITS Policies



H-3 Freeway Tunnel Dynamic Message Sign

Integrating ITS across agency boundaries requires agencies to share a common set of goals and perspectives on the purpose of implementing integrated systems. The following policies have been developed in consultation with Oahu partner agencies in support of deploying an integrated, multi-modal ITS based on the Oahu Integration Strategy.

1. ITS data from multiple agencies will be used in a regional data archive that will be deployed in a cost-effective manner. Today, few agencies on Oahu have data archives, and those that do have developed them to support their internal operating needs. This policy supports the development of individual agency data archives in a coordinated manner to ensure that individual archives can be merged at a future date into a useful regional data archive.

2. ITS will be used to support a coordinated, multi-agency approach to managing transportation assets to improve incident and emergency operations. This policy addresses the development of alternate route plans to mitigate incidents that occur on freeways or critical arterials. The plans also need to include guidelines on dynamic message sign messaging, public information, and signal timing plans to support alternate routes.

3. The operation of the regional, multi-modal transportation network will be optimized using ITS. This policy emphasizes Oahu's commitment to getting the most out of their ITS investments. It also suggests that the regional surface transportation network should be viewed as a single asset, and operational approaches should be implemented that maximize the entire network's efficiency.

4. Video images gathered from Closed-Circuit Television cameras deployed in ITS systems will be shared among all agencies that would benefit, within parameters established by the ITS partner agencies. This policy promotes sharing video images among agencies for their mutual benefit.

5. The region will establish a method for maintaining the ITS architecture. This policy establishes that Oahu agencies shall develop and implement procedures and responsibilities for maintaining the regional ITS architecture as needs evolve over time. Maintenance of the regional architecture is required by federal statute.

6. A single, multi-agency regional traveler information system will be deployed. This policy supports the development of a single access point for traveler information, which will enhance customer service and usage of the system.

7. Procurement rules, policies and laws will be implemented that facilitate cost-effective deployment of high technology ITS software, hardware and systems. This policy supports the development of procurement rules, policies and laws that encourage flexibility in procurement in order to respond to rapid changes in the technology industry.

8. To ensure that investment in ITS produces the expected benefits, a commitment to the ongoing maintenance and management of ITS will be supported. This policy on asset preservation supports the proper stewardship of valuable ITS assets through ongoing maintenance and management.

9. ITS assets will be viewed as regional assets and will be accessible to all regional ITS partners, based on certain criteria agreed upon by the ITS partner agencies. This policy encourages agencies to share use of each other's ITS infrastructure in an effort to enhance regional operations and fully maximize ITS benefits.

One year after a work zone management system was installed for an interstate freeway reconstruction project in Albuquerque, New Mexico, traffic incident clearance time was 20 minutes faster than the historical average clearance time of 45 minutes, and no fatalities were reported

ITS Initiatives

This section summarizes the regional ITS initiatives to be implemented on Oahu over the next seven years. These initiatives are presented by the time period anticipated for implementation. Initiatives were identified through consultation between OMPO and its partner agencies. Rough-order-of-magnitude costs follow the list of initiatives. Costs and initiative definition will continue to be refined as projects evolve toward implementation.

Short Term (0-3 Years)

Emergency Agency Computer-Aided Dispatch (CAD) Integration ▸ This initiative supports the ongoing integration of appropriate Honolulu Police Department CAD data with the Hawaii DOT and the City & County Departments of Transportation Services and Information Technology. Expected benefits include improved emergency response, improved inter-agency coordination, improved incident management activities, reduced incident-related delays, and quicker dissemination of information to the traveling public.

Traffic Volume Archive and Data Sharing ▸ This initiative creates a traffic volume data archive between the Hawaii DOT and the City & County Department of Transportation Services. Expected benefits include enhanced agency operations and improved inter-agency coordination.

Video Integration with Emergency Response Agencies ▸ This initiative provides video images, streaming video, and/or control of the Hawaii DOT CCTV cameras to emergency response agencies to enhance emergency response operations. Expected benefits include enhanced incident detection and verification, improved incident and emergency response, and reduction in incident related traffic delay.

Individual Agency Information Service Provider Integration ▸ This initiative enhances existing and planned agency Information Service Provider (ISP) functions, including integration and/or linkage of independent traveler information sources. Expected benefits include enhanced trip planning capabilities, inter-agency information integration, and enhanced integration/linkage of regional traveler information.

Short-and Mid-Term (0-7 years)

Transit Vehicle Signal Priority Implementation ▸ This initiative implements bus signal priority systems at traffic signals and on buses to reduce delay, maintain bus schedules, and promote transit use. Expected benefits include enhanced transit operations, improved transit schedule adherence, improved customer satisfaction, and promotion of transit use.

Emergency Vehicle Signal Pre-emption Expansion ▸ This initiative expands the emergency vehicle signal pre-emption systems to include additional signalized intersections and enhance regional emergency response. Expected benefits include improved emergency response time.

Freeway Management System Software Integration for Partner Agencies ▸ This initiative installs freeway management system "client" software that allows partner agencies to monitor the Hawaii DOT's Freeway Management System. Expected benefits include enhanced coordinated operations among multiple agencies.

ITS Architecture Expansion ▸ This initiative supports the phased expansion of the regional ITS architecture. Its near-term focus is on incorporating commercial vehicle information system network and transportation security initiatives. Expected benefits include expansion of ITS infrastructure and integration initiatives, and maintenance of framework for planning and implementing Oahu ITS.

Regional Operations Center Implementation ▸ This initiative supports the planning, design, construction, operation, and maintenance of a Regional Operations Center. Expected benefits include enhanced agency coordination and cooperation in the following areas: traffic operations, incident management, traveler and media information, and emergency operations.

Regional Telecommunications Assessment ▸ This initiative primarily assesses inter-agency center-to-center communications needs, and includes assessment of relevant (common) center to roadside and roadside to vehicle communications. Expected benefits include overall communication improvements and development of regional communication standards.

Mid-Term (3-7 years)

Emergency Agency CAD Integration ▸ This initiative integrates emergency agency CAD systems in an effort to improve operations. Expected benefits include enhanced emergency operations and improved use of available CAD data.

Congestion Data Integration with Emergency Agencies ▸ This initiative provides traffic congestion data from Oahu's traffic management agencies for integration with emergency agency CAD systems. Expected benefits include enhanced emergency agency operations and improved emergency vehicle routing.

Data Fusion for Dissemination ▸ This initiative will integrate data from the Hawaii DOT and the City & County Department of Transportation Services into a single traveler information source for broad public and private dissemination. Expected benefits include a comprehensive, easy-to-use source for obtaining pre-trip traveler information. Expected benefits include improved public traveler preparedness and reduced traffic delays through quick public notification.

Regional Archive Data Implementation ▸ This initiative establishes a State and City & County transportation data archive. Expected benefits include improved inter-agency collaboration and data sharing, reduced operations costs for individual agencies, and less data redundancy.

Traffic Signal System Integration ▸ This initiative provides partner agencies with a remote interface to the traffic signal system control. Expected benefits include quicker identification and verification of in-the-field traffic signal operations from a remote location, and enhanced traffic signal coordination for major events (planned and unplanned).

Detroit, Michigan achieved a 30 percent reduction in stops due to improved traffic signal integration

Strategic Costs

Initiative	Cost
Emergency Agency CAD Integration	$100-$350k
Traffic Volume Archive and Data Sharing	$300-$600k
Video Integration with Emergency Response Agencies	$300-$600k
Individual Agency Information Service Provider Integration	$600k
Transit Vehi cle Signal Priority Implementation	$1.5m
Emergency Vehicle Signal Pre-emption Expansion	$1m
Freeway Management System Software Integration for Partner Agencies	$100-$250k
ITS Architecture Expansion	$250k
Regional Telecommunications Assessment	$300k
Emergency Agency CAD Integration	$300k-$1.2m
Congestion Data Integration with Emergency Agencies	$300-$900k
Data Fusion for Dissemination	$2.5-$3.5m
Regional Archive Data Implementation	$750k-$1.5m
Traffic Signal System Integration	$200-$500k
Total Cost Estimate	$8.6 To $13m

For every dollar spent on the Hoosier Helper freeway service patrol program, operating in northwest Indiana, the region experienced five dollars in benefits (reductions in nonrecurring delay, secondary crash reduction, and vehicle operating cost savings)

What's Next?

Oahu partner agencies that provide transportation and other related services to the public can use the Oahu ITS Plan to deploy and integrate ITS components in an efficient, cost-effective manner.

Maintenance of the Oahu ITS Plan and the Oahu Regional ITS Architecture and Operational Concept will be critical to the success of ITS technology implemented or planned throughout the island.

Action items have been developed to ensure ITS effectiveness. They will include, but will not be limited to the following:

- **Establish** a working group to identify common approaches to handle ITS-generated data.
- **Develop** a set of requirements that each agency will follow when using regional data.
- **Identify** agencies that will be responsible for funding, managing, and maintaining the regional data.
- **Establish** a working group to address ITS processes that provide for more efficient responses to emergencies.
- **Examine** and update standard operating procedures to improve performance. To report ITS benefits, develop regional performance measures for individual agencies.
- **Establish** guidelines that dictate when ITS infrastructure can be shared and who can assume control.
- **Establish** a working group to lead regional ITS architecture maintenance activities.
- **Identify** funding sources that may be used to fund regional ITS architecture maintenance activities.
- **Establish** a working group to define the parameters of the regional Advanced Traveler Information System (ATIS) and identify an approach that will lead to successful implementation of the regional ATIS.
- **Develop** operations and maintenance plans to achieve performance goals.

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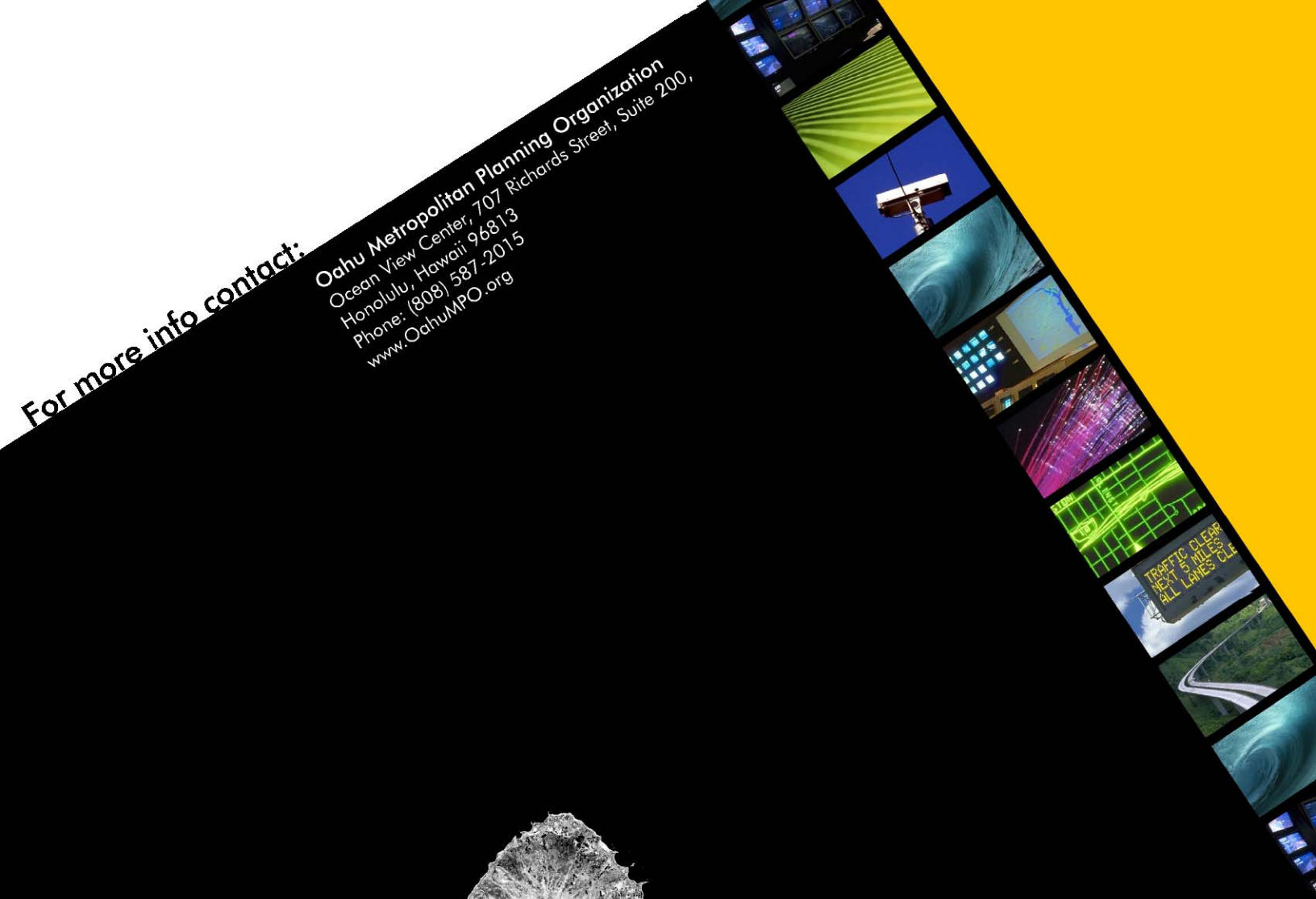

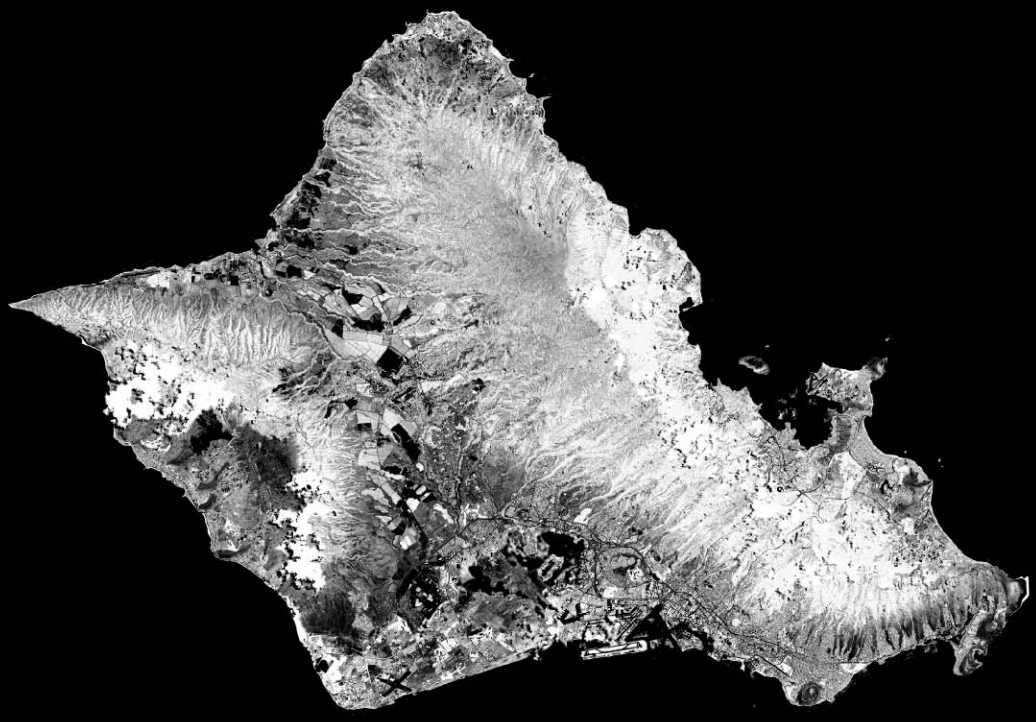

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