STATE WATER PROJECTS PLAN

Hawaii Water Plan

VOLUME 1

Statewide Technique Document

For the:

Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii

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ABBREVIATIONS

AWUDP	Agriculture Water Use and Development Plan
BWS	Board of Water Supply
CIP	Capital Improvements Project
Commission	Commission on Water Resource Management
CWRM	Commission on Water Resource Management
DBEDT	Department of Business Economic Development & Tourism
DHHL	Department of Hawaiian Home Lands
DHS	Department of Human Services
DLNR	Department of Land and Natural Resources
DOA	Department of Agriculture
DOH	Department of Health
DOT	Department of Transportation
DPS	Department of Public Safety
DWS	Department of Water
EXSS	Existing State or Private Sources
EXSWS	Existing State Water Systems
gpd	gallons per day
gpm	gallons per minute
HOST	Hawaii Ocean, Science and Technology Park
HRS	Hawaii Revised Statutes
KSBE	Kamehameha Schools Bishop Estate
HWP	Hawaii Water Plan
LHD	Lower Hamakua Ditch
MOU	Memorandum of Understanding
NELHA	Natural Energy Laboratory of Hawaii Authority
NEWSS	New/Planned State Wells
NEWSWS	New State Water Systems
OWMP	Oahu Water Management Plan
PLANPS	Planned Private Sources
SWAP	Source Water Assessment Program
SWPP	State Water Projects Plan
UH	University of Hawaii
UHD	Upper Hamakua Ditch
USEPA	United States Environmental Protection Agency
WIS	Waimea Irrigation System
WQP	Water Quality Plan
WRPP	Water Resource Protection Plan
WUDP	Water Use and Development Plans

EXECUTIVE SUMMARY

INTRODUCTION

The State Water Code, Chapter 174C, HRS, requires that the Commission on Water Resource Management (Commission) implement and utilize comprehensive water resources planning in its regulation and management of our State's water resources. The water code sets forth the requirement for initial development and updating of the Hawaii Water Plan to guide the Commission in executing its general powers, duties, and responsibilities assuring economic development, good municipal services, agricultural stability, and environmental protection.

The Hawaii Water Plan (HWP) is intended to serve as a continuing long-range guide for water resource management. The HWP currently consists of five major components (plans) identified as the: 1) Water Resources Protection Plan (WRPP), 2) Water Quality Plan (WQP), 3) State Water Projects Plan (SWPP), 4) Agricultural Water Use and Development Plan, and 5) County Water Use and Development Plans (WUDP). The water code mandates that these individual plans be prepared and integrated into a comprehensive "master plan" to provide for effective coordination and long-range planning between State and County agencies.

To fulfill this mandate, the components of the HWP must be reviewed and updated on a regular basis. The initial HWP adopted by the Commission in 1990, provided the means in which to address many issues, including but not limited to, estimates of sustainable groundwater yields by island, description of aquifer sectors/aquifer systems, and an initial evaluation of current and projected water needs for the State and the Counties.

A revised and updated HWP is essential to effective coordination and integration of State and County efforts related to sustainable water resource development and will enable the Commission to more effectively implement the statutory objectives of the State Water Code. Regular updating of the Statewide components of the Hawaii Water Plan will facilitate the counties' integration of updated information from the State Water Projects Plan, Agricultural Water Use and Development Plan, Water Resources Protection Plan, and Water Quality Plan into their respective Water Use and Development Plans.

Absence of such information can lead to preparation of inadequate or unrealistic plans for development of existing and alternative water resources, and may result in conflicting objectives for the use and protection of our State's limited water resources. The lack of up-to-date demand-side and supply-side information limits the State and counties' ability to address future water development and resource protection issues.

METHODOLOGY

In updating the HWP components, there is consensus among State and County agencies that a comprehensive water resources planning process is needed to address the problems of supply, demand, and conservation of water. Accordingly, the Commission developed, and in February 2000 adopted, a "Statewide Framework for Updating the Hawaii Water Plan." Under this framework, the updating process calls for refinement of current projections, planning principles, and strategies associated with water resource planning and development. Such efforts will result in: identification and assessment of potential new sources; more realistic demand projections/forecasts; improvements in the operation of existing systems; application of various screening criteria/analyses; more effective integration between demand- and supply-side resource options; and overall improved coordination between State and County water use and development plans.

As one of the key components of the HWP, the major objective of the SWPP is to provide a framework for planning and implementation of water development programs to meet projected demands for State projects. The plan shall be implemented in coordination with the County's WUDP to insure orderly authorization and development and shall provide for:

- An inventory of existing State wells, stream diversions and water systems;
- Identification of proposed State projects/developments;
- Assessment of future water demand projections;
- A Water Development Strategy, strategy implementation and recommendations; and
- Incorporation of the Agricultural Water Use and Development Plan.

The Land Division (Engineering Branch) of the Department of Land and Natural Resources (DLNR) has accountability for State projects and is responsible for preparation of the SWPP in conjunction with the Commission and other State agencies. The following report reflects the efforts of the department to update the SWPP, which was originally adopted by the Commission in 1990.

The SWPP has been restructured and organized into five separate volume reports. The five volumes include: SWPP technical document and four individual island SWPP reports. The SWPP technical document contains statewide department project water planning, methodology, procedures, project demand summaries and water development strategies. Individual island SWPP reports focus on island project demands and strategies to meet project demands. The SWPP volume structure includes:

Volume 1: State Water Projects Plan, Technical Document
Volume 2: State Water Projects Plan, Island of Hawaii
Volume 3: State Water Projects Plan, Island of Kauai
Volume 4: State Water Projects Plan, Island of Lanai/Maui/Molokai
Volume 5: State Water Projects Plan, Island of Oahu

The initial phase of the SWPP update, which began in late 1998, involved the compilation of available information on existing State water resources (including wells, stream diversions, and

water systems) and the identification of resources having surplus capacity. DLNR has since conducted an update to SWPP data in late 2002. Next, each State department was surveyed to inventory existing and proposed State sponsored projects and their associated water requirements by island and by hydrologic unit. A standard survey packet was distributed to each State department to facilitate the collection of SWPP data. A 20-year revised planning horizon between 2001 and 2020 was established for the data collection. The survey data was reviewed and verified with department staff to insure the completeness and accuracy of the submitted information. The survey data and information serves as the backbone to the SWPP report and the recommended development strategy.

State project water demand calculations were developed in conformance with County Water System Standards domestic consumption guidelines or other industry guidelines to determine average day water demands for identified State projects. Consistent guidelines and methodology were applied to project data to promote greater consistency of water demand calculations among all State departments.

SWPP RESULTS

The results of the SWPP inventory show that the State currently owns and/or operates 226 wells, 54 stream diversions and 36 water systems (11 public water systems, 7 agricultural irrigation systems and 18 smaller potable or nonpotable water systems).

SWPP project data has been updated in 2002 since the original data was collected from State departments in late 1998. A total of 575 future State projects were reported by the departments requiring water supply and/or service. For the designated 20-year planning horizon, agencies reported that an additional 81 million gallons per day (mgd) would be needed to supply future State projects. Projected State project water demands are summarized below and have been categorized by department and island. For example, the DOA reported the greatest projected water demand, showing a future demand of over 35 mgd by 2020. Other agencies reporting significant water demands by 2020 included the Department of Hawaiian Home Lands and the Department of Business, Economic Development and Tourism, both showing over 14 mgd of future demand. Based on the survey results, the island of Hawaii will continue to be the largest user of water for State projects, with a planned increase of 31 mgd by 2020. Similarly, a forecasted water demand of approximately 25 mgd by 2020 was reported for the island of Oahu.

Total Projected Demands by State Department

	Total Additional Yearly Projected Cumulative Average Day Demand (mgd)							
Department	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
DAGS	0.124	0.606	0.691	0.775	0.775	0.957	0.957	0.997
DOA	7.505	7.755	8.765	8.765	14.765	35.315	35.315	35.470
DBEDT	1.023	2.259	3.676	4.154	4.625	8.075	10.789	13.833
DOD	0.791	0.792	0.793	0.793	0.793	0.793	0.793	0.793
DOE	0.620	0.810	2.227	2.243	2.243	2.598	2.598	2.598
DHHL	0.648	0.660	2.025	2.025	2.025	11.659	15.390	15.815
DOH	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
DHS	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Judiciary	0.000	0.000	0.008	0.008	0.008	0.008	0.008	0.008
DLNR	0.462	0.602	1.121	1.170	1.221	2.251	2.255	2.302
DPS	0.107	0.107	0.107	0.143	0.143	0.143	0.143	0.143
DOT	0.234	0.712	1.330	1.944	1.971	2.030	2.256	2.417
UH	0.669	3.789	4.466	4.554	4.623	5.579	6.038	6.486
State Totals	**12.194**	**18.089**	**25.221**	**26.586**	**33.204**	**69.421**	**76.554**	**80.874**

Total Projected Demands by Island

	Total Additional Yearly Projected Cumulative Average Day Demand (mgd)							
Island	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
Hawaii	3.553	6.477	7.484	7.852	8.128	27.304	29.509	30.855
Kauai	0.261	0.325	0.838	0.937	0.905	1.524	1.584	1.636
Lanai	0.002	0.018	0.018	0.033	0.033	0.534	0.535	0.536
Maui	4.107	4.827	6.379	6.675	12.680	16.716	19.254	19.716
Molokai	1.336	1.336	2.064	2.064	2.064	3.570	3.607	3.608
Oahu	2.936	5.114	8.437	9.026	9.393	19.772	22.064	24.522
State Totals	**12.194**	**18.089**	**25.221**	**26.586**	**33.204**	**69.421**	**76.554**	**80.874**

SWPP WATER DEVELOPMENT STRATEGY

A SWPP Water Development Strategy was developed to identify and evaluate source development options. The water development strategy identified Short-Term (2001-2010) and Long-Term (2011-2020) strategy options to meet projected potable and non-potable water demands. The strategy objective was to provide more effective planning, coordination and development of water resources to meet projected State water demands. The strategy utilized several source development options including, but not limited to, existing and/or planned State water sources/systems, County/private water agreements, and existing master plans, all of which were prioritized and assigned to individual SWPP projects. These strategy options, however, are preliminary in nature and must be further evaluated with regard to scheduling, funding, system reliability, requirements for infrastructure improvements, and other planning considerations.

Notwithstanding these limitations, the strategy did provide for the determination of "remaining" SWPP project water demands, which were not assigned to any specified source option. The following equation represents the water development strategy applied to SWPP projects for each island:

X – (A+B+C+D+E+F+G) = Remaining Balance of Unmet SWPP Project Demands

X = Total SWPP Project Water Demand (Potable and Nonpotable)
A = Project demands accounted for by Existing State Water Systems
B = Project demands accounted for by Existing Master Plans
C = Project demands accounted for by Existing State or Private Sources
D = Project demands accounted for by County and Private Water Agreements
E = Project demands accounted for by New/Planned State Wells
F = Project demands accounted for by New State Water Systems
G = Project demands accounted for by Planned Private Sources

A summary of the remaining balances of unmet water demand and those water demands accounted for by available strategy options are provided in the following table. Development of new State water sources and coordination with County water departments for integration and use of existing County supply/systems are proposed as options to meet remaining project demands. However, additional planning and coordination with the County water departments and DLNR will be required.

Summary of Water Development Strategy Results
Remaining Balance of Unmet SWPP Project Water Requirements

	Remaining Balance of SWPP Water Demands (mgd)							
State Water Demand Status	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
Total SWPP Project Demand Statewide	12.19	18.10	25.22	26.59	33.20	69.42	76.55	80.87
Demand Accounted for by Water Development Strategy	5.99	7.59	10.66	11.26	17.49	39.17	42.07	45.17
Remaining Balance of Unmet Demand								
Island of Hawaii	0.80	3.36	4.06	4.16	4.33	12.89	14.47	14.55
Island of Kauai	0.09	0.13	0.52	0.62	0.59	0.58	0.64	0.69
Island of Lanai	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Island of Maui	4.11	4.83	6.38	6.67	6.68	10.72	13.25	13.72
Island of Molokai	0.02	0.02	0.03	0.03	0.03	0.04	0.07	0.07
Island of Oahu	1.19	2.17	3.58	3.84	4.09	6.03	6.05	6.67
Statewide Remaining Balance Total	**6.20**	**10.51**	**14.56**	**15.33**	**15.72**	**30.25**	**34.48**	**35.71**

CONCLUSION AND RECOMMENDATIONS

The recommended resource development strategy accounted for over 35 mgd of the total 2020 forecasted demand of approximately 81 mgd. New sources and/or additional planning will be needed for all islands, except Lanai. The island of Hawaii shows the largest unmet demand for which new sources will have to be developed to supply about 14.6 mgd of unmet demand with island of Maui close behind requiring 13.7 mgd of unmet demand. The island of Oahu follows with 7 mgd of unmet demand. The islands of Kauai, Lanai and Molokai had less than 1 mgd each of unmet demands. Based on these projections, preliminary cost estimates for new source developments were also developed as part of the SWPP update for future planning and funding considerations. This update has provided valuable insights into the current planning process and has identified areas requiring additional evaluation and coordination. Updating of the SWPP also included specific recommendations setting forth the need to continue close monitoring of project scheduling, periodic reassessment of forecasted water requirements, implementation of master plan recommendations, and accounting of private water agreements. Application of greater water conservation measures and the appropriate use of alternative non-potable sources to meet non-potable demands were also recommended. Agency plans for future source development should continue to be coordinated with DLNR and integrated within the County Water Use and Development Plans. Lastly, provisions should be made to update the SWPP on a regular basis whenever new information or projects arise to keep the plan updated and functional as a short- and long-range planning tool.

PREFACE

The primary objective of the State Water Projects Plan (SWPP) was to provide a starting framework in which to begin more effective planning, coordination, and implementation of water development strategies to meet forecasted state agency water demands. Efforts to update the SWPP involved assessments of state water resources (e.g. wells, diversions, systems), inventorying of state project water demands, and identification of a recommended Water Development Strategy to meet the needs of proposed state projects.

The recommended SWPP "development strategy" identified and evaluated available development options including, but not limited to, existing and/or planned state water sources/systems, county/private water agreements, and existing master plans, all of which were prioritized and assigned to individual projects. These strategy options are, however, preliminary in nature and must be further evaluated with regard to legal precedent, scheduling, funding, system reliability, requirements for infrastructure improvements, and other planning considerations.

One of the guiding legal precedents is the Hawaii Supreme Court's recent ruling in the Waiahole Ditch Case, In the Matter of the Water Use Permit Application Petitions for Interim Instream Flow Standards Amendments, and Petitions for Water Reservations for the Waiahole Ditch Combined Contested Case Hearing, Supreme Court No. 21309 (August 22, 2000). In that case, the Court laid down three important principles that should be considered as important factors in any analysis of the implementation of water development strategies to meet the needs of proposed state projects now and into the future.

First, the Court held that the public trust doctrine applies to all waters of the State of Hawaii. The public trust doctrine simply put is the State's obligation to protect, control, and conserve water resources for the benefit of its people. The public trust doctrine is contained in the Hawaii State Constitution. See Article XI, section 1 and 7, Hawaii State Constitution although its origins predate the 1978 constitutional amendments are also set forth in previous case law. Decision at pages 38-40. This doctrine mandates that the State has the "authority and the duty to preserve the rights of present and future generations in the waters of this State." Decision at page 64. "The state also bears an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible." Decision at pages 64-65. However, the public trust doctrine does not preclude offstream uses of surface waters but "merely requires that all uses, offstream or instream, public or private promote the best economic and social interests of the people of the state." Decision at page 65.

Second, the Court held that the public trust doctrine and the Water Code favor "public use, access, and enjoyment" over private uses. Decision at page 67. "In practical terms, this means that the burden ultimately lies with those seeking or approving such uses to justify them in light of the purposes protected by the trust." Decision at page 67. The decision, thus, sets a higher burden of proof for private offstream uses of surface waters. Therefore, any proposed use offstream use of water will have to be analyzed through the prism of the Court's decision and the new higher standard set out by the Court. This analysis must include a careful examination of alternative water sources for any proposed project.

Third, the court ordered the Commission must set quantifiable interim and permanent instream flow standards for Windward streams affected by the decision and by implication, and must set quantifiable instream flow standards for all streams in the State. The Court in its decision ordered that interim flow standards be set with "due haste" and purpose based upon the criteria of best available science, future predictions and generalized assumptions and policy judgments. Decision at page 92. Therefore, any proposed offstream use of water under this plan must consider whether the instream flow standard set by the Commission leaves any waters available for offstream uses.

Finally, it should be noted that the above discussion only highlights in extreme summary form, the major points of the Court's decision and its impact on this plan. It is impossible in this brief discussion to highlight all points of the decision nor does this summary attempt to be a legal interpretation of the decision. For further information, the decision, in its entirety, is available upon request from the Commission. It should also be noted that seven critical issues have been remanded back to the Commission for further proceedings. Those seven issues listed on pages 162 and 163 of the decision and the ultimate decision made by the Commission and by the Hawaii Supreme Court should an appeal be filed on any subsequent decision by the Commission may impact this discussion of the Waiahole case and its impacts on this State water projects plan.

The Commission is proceeding with appropriate care and attention in addressing these and other issues resulting from the Court's decision. Hence, it is imperative to note that development strategy options identified within the updated SWPP are deemed preliminary in nature and are subject to instream flow standards and stream protection and management policies established by the Commission. Refined assessments of available water resources, as they are developed based upon ongoing and new data collection, will be appropriately incorporated in the updated Water Resources Protection Plan.

As noted in the Commission's "Statewide Framework for Updating the Hawaii Water Plan," preparation and updating of the various components of the Hawaii Water Plan (HWP) calls for a dynamic planning process that results in a "living document" approach which will provide county and state decision-makers with well formulated options and strategies for addressing future water resource management and development issues.

The framework also reaffirmed the need to recognize and plan for the water requirements of legally protected water rights under the water code, State Constitution and Hawaii case law, e.g., future DHHL water needs, appurtenant rights, and traditional and customary practices of native Hawaiians.

In that regard, effective planning should provide for consideration of future uncertainties that may play a significant role in determining resource decisions. Using the example of permitting uncertainties, the timing of a particular supply options will be dependent upon the issuance of required permits; therefore agencies must identify alternatives actions which address various permitting outcomes.

The delineation of planning objectives and associated evaluation criteria, the screening of supply-side and demand-side resource options, and definition of future uncertainties together comprise those components needed to develop recommended resource strategies which best achieve planning objectives.

CHAPTER 1
INTRODUCTION

1.1. BACKGROUND

1.1.1. Legislative History

The State Constitution, Article XI Section 7, mandates that the State of Hawaii is responsible to protect, control, and regulate the use of Hawaii's water resources for the benefit of its people. Pursuant to this mandate, Act 45, the Fourteenth Legislature signed the State Water Code, into law on July 1, 1987. The Act is now codified as Chapter 174C, Hawaii Revised Statutes (HRS).

1.1.2. State Water Code

The State Water Code as described in Chapter 174C, HRS, is divided into nine parts. The code outlines administration structure, regulation of water use, water resources planning and water rights. The State Water Code policies insure the maximum beneficial uses of State water for Hawaii residents. The code mandates a program of comprehensive water resource planning to maintain the supply, conservation, and quality of State waters. The State Water Code calls for the establishment of a six member Commission on Water Resource Management (CWRM) to have exclusive jurisdiction and final authority relating to the implementation and administration of the Code. To guide the Commission in executing its general powers, duties, and responsibilities, the Code requires the formulation of a Hawaii Water Plan.

1.1.3. Hawaii Water Plan

The Hawaii Water Plan serves as a continuing long-range guide for water resource management. The plan consists of five component parts:

1) Water Resources Protection Plan (WRPP)
2) Water Quality Plan (WQP)
3) State Water Projects Plan (SWPP)
4) State Agriculture Water Use and Development Plan (AWUDP) (Per modification of Section174-31, HRS, Act 101)
5) Water Use and Development Plans (WUDP) for each County

The Hawaii Water Plan objectives include:

1) The attainment of maximum reasonable-beneficial use of water of the State;
2) The proper conservation and development of the waters of the State;
3) The control of the waters of the State for such purposes as navigation, drainage, sanitation, and flood control;
4) The attainment of adequate water quality as expressed in the State Water Resources Protection Plan and Water Quality Plan;
5) The implementation of water resource policies of the State Water Code, as expressed in section 174C-2.

By statute, Section 174C-32, HRS, the Hawaii Water Plan was completed and adopted by the commission in 1990. The maintenance and coordination of current water related information requires the CWRM to periodically update components of the plan. The status and schedules for the individual plans are shown on **Table 1.1**.

Table 1.1
Scheduled Updates to the Hawaii Water Plan

Hawaii Water Plan	Scheduled Completion Date	Comments
State Water Projects Plan	2003	SWPP Update Complete
State Water Master Plan for Oahu	2004	In Progress
Water Resources Protection Plan	2004	In Progress
Water Quality Plan	No Date Scheduled	Plan Update not Scheduled
Water Use and Development Plan - Maui	No Date Provided	Plan Update Scheduled
Water Use and Development Plan - Kauai	No Date Scheduled	Plan Update not Scheduled
Water Use and Development Plan - Hawaii	No Date Scheduled	Plan Update not Scheduled
Oahu Water Management Plan – Oahu	No Date Provided	Plan Update Scheduled
State Agriculture Water Use and Development Plan	2004	In Progress

1.1.3.1. Water Resources Protection Plan

The Commission on Water Resource Management is responsible for the general administration of the water code and has final authority in all matters relating to the code. Among the various duties of the commission, CWRM is specifically responsible for the preparation and updating of the Water Resources Protection Plan.

In general, the recommended plan elements for the Water Resources Protection Plan include:

1) Declaration of CWRM Goals, Objectives, and Policies
2) Nature and Occurrence of Resources
3) Resource Management and Protection
4) Resource Conservation and Augmentation

The primary objective of the WRPP, as defined by the State Water Code is "to protect and sustain statewide ground/surface water resources, watersheds and natural stream environments. Such protection shall be established through a comprehensive study of

occurrence, sustainability, conservation, augmentation and other resource management measures."

The Water Resources Protection Plan includes the following activities, as described in the "Statewide Framework for Updating the Hawaii Water Plan, 1999":

1) Review and contemplated needs and uses of water including State and County land use plans and policies and study their effect on the environment, procreation of fish and wildlife, and water quality;
2) Study the quantity and quality of water needed for existing and contemplated uses, including irrigation, power development, geothermal power, and municipal uses;
3) Identify rivers and streams, or a portion of a river or stream, which appropriately may be placed within a wild and scenic rivers system, to be preserved and protected as part of the public trust;
4) Study other related matters as drainage, reclamation, flood hazards, floodplain zoning, dam safety, and selection of reservoir sites, as they relate to the protection, conservation, quantity, and quality of water;
5) Existing and contemplated uses of water, identified in the water use and development plans of the State and the Counties, their impact on the resource, and their consistency with objectives and policies established in the Plan;
6) The designation of hydrologic units statewide and their hydrologic characteristics;
7) A master inventory describing the nature and location of water resources in the state by hydrologic units, current water uses statewide, and water quality data as provided by the Department of Health's Water Quality Plan;
8) Requirements for beneficial instream uses and environmental protection, desirable uses worthy of preservation by permit, and undesirable uses for which permits may be denied;
9) Programs to conserve, augment, and protect water resources throughout the State; and
10) Evaluation of the means and methods of conserving and augmenting the State's water resources.

1.1.3.2. Water Quality Plan

The Department of Health (DOH) is responsible for the State's water quality control programs. The State Water Quality Plan for all existing and potential sources of drinking water is prepared by DOH. The Water Quality Plan should set forth the water quality criteria to be used in designation of water management areas.

In general, the recommended plan elements for the Water Quality Plan include:

1) Source Water Assessment Program (SWAP);
2) Developing Effective Linkages Between Inter-Agency Programs; and
3) Recommended WQP Guidelines.

The primary objective of the WQP, as defined by the State Water Code is "to protect the public health and sensitive ecological systems by preserving, protecting, restoring and

enhancing the quality of ground and surface water throughout the State of Hawaii."

The Water Quality Plan shall provide the following, as described in the "Statewide Framework for Updating the Hawaii Water Plan, 1999":

1) Federal/State/County goals, objectives, and policies related to water quality;
2) Water quality criteria for designation of water management areas;
3) Water quality standards, monitoring requirements and enforcement provisions; and
4) Water quality management programs and recommended strategies.

1.1.3.3. State Water Projects Plan

The Department of Land and Natural Resources (DLNR) is responsible for the preparation of the State Water Projects Plan.

The State Water Projects Plan report elements include:

1) Inventory of Existing Water Resources
2) Inventory of Proposed State Projects
3) Assessment of Future Water Requirements
4) State Water Projects Plan Water Development Strategy

The primary objective of the SWPP, as defined by the State Water Code is "to provide a framework for planning and implementation of water development programs to meet projected water demands for State projects. The plan shall be implemented in coordination with County's Water Use and Development Plans to insure orderly

The State Water Projects Plan, as specified in the State Water Code, shall include:

1) Inventory of existing State resources including: State wells, systems and streams diversions;
2) Survey of proposed State projects and developments and their existing water use requirements for domestic, industry, agriculture, aquaculture, hydropower, water reclamation, and recharge;
3) Assessment of future water demand projections;
4) Statewide plans and strategies for water development including recommended and alternative plans, costs, adequacy of plans, and relationship to the Water Resources Protection Plan, Water Quality Plan and County Water Use and Development Plans.

1.1.3.4. State Agricultural Water Use and Development Plan

The Department of Agriculture is responsible to prepare and update the State Agricultural Water Use and Development Plan for agricultural uses in the State. Upon completion, the AWUDP shall be incorporated into the SWPP.

In general, the recommended plan elements for the AWUDP include:

1) Consistency with the WRPP;
2) Current and Future Demand Forecasts of State Agricultural Programs and Projects;
3) Water Demand-Forecasting Techniques Used by the DOA;
4) Integrated Resource Planning Elements: Demand Forecast, Water System Profiles, Resource Development Options and Source Development Plan;
5) Resource Strategies; and
6) Strategies to Account for Future Uncertainties.

The primary objective of the AWUDP, as specified in the State Water Code is "to develop a long-range management plan that assesses State and private agricultural water use, supply an irrigation water systems. The plan shall address projected water demands and prioritized rehabilitation of existing agricultural water systems."

The plan should account for statewide agricultural water use and include a master irrigation inventory, which shall:

1) Inventory the irrigation water systems;
2) Identify the extent of rehabilitation needed for each system;
3) Establish criteria to prioritize a 5-year program for rehabilitation of systems; and
4) Set up a long-range plan to manage the systems.

1.1.3.5. County Water Use and Development Plan

Each of the four counties is responsible for preparing and adopting by ordinance a Water Use and Development Plan. The WUDP should generally set forth the allocation of water to land use in each respective county.

In general, the recommended plan elements of the WUDP of each county include:

1) Consistency with WRPP and SWPP;
2) Description of county resources and economy;
3) Inventory of current water usage and developments;
4) Future plans for land use and associated water needs;
5) Program of water developments to meet future needs;
6) Water System Profiles;
7) Resource and Facility Options;
8) Strategies Development and Evaluation to Meet County Water Needs; and
9) Implementation Plan and Establishment of WUDP Schedule.

The primary objective of the WUDP's is "to insure the future water needs of the County

Water Use and Development Plans should be consistent with the following conditions:

Each WUDP should be consistent with the Water Resources Protection Plan and the Water Quality Plan and coordinate with State Water Projects Plan:

1) Each WUDP should set forth the allocation of water with the respective county land use plans and policies, including the general plan, regional development plans, and zoning ordinance as determined by each respective county;
2) Each county WUDP should also be consistent with the State land use classification and policies;
3) Recognize the current and future development needs of the Department of Hawaiian Home Lands;
4) Prepare regional plans for water development; and
5) The cost of updating and maintaining and WUDP's should be borne by the counties; State water capital improvement funds appropriated to the counties should be deemed to satisfy Article VIII, Section 5 of the State Constitution.

1.2. OBJECTIVE OF THE SWPP

The primary objective of the SWPP is to provide a framework for the planning and implementation of Water Development Strategy for future State projects. Other objectives include:

1) Inventory State water resources including State wells, stream diversions, and State water systems;
2) Inventory State Projects and their water requirements. The State project demands to be incorporated within respective County Water Use and Development Plans for comprehensive water planning. State projects on Oahu to be used to justify source development and water use permits or water reservations from CRWM;
3) Inventory State department water conservation programs;
4) Develop a Water Development Strategy to meet the needs of proposed State projects;
5) Incorporation of the Agricultural Water Use and Development Plans; and
6) Consistency with the Water Resources Protection Plan and the Water Quality Plan, and coordination with the Counties' Water Use and Development Plans.

1.3. SWPP DOCUMENT FORMAT

The SWPP has been organized into five separate volume reports. The five volumes include: SWPP technical document and four individual County/Island SWPP reports. The SWPP technical document contains statewide department project water planning, methodology, procedures, project demand summaries and water development strategies. Individual island SWPP reports focus on island project demands, inventory of existing State resources and strategies to meet project demands. The SWPP volume structure includes:

Volume 1: State Water Projects Plan, Technical Document
Volume 2: State Water Projects Plan, Island of Hawaii
Volume 3: State Water Projects Plan, Island of Kauai
Volume 4: State Water Projects Plan, Island of Lanai/Maui/Molokai
Volume 5: State Water Projects Plan, Island of Oahu

1.4. ELEMENTS OF STUDY – Volume 1 SWPP: Technical Document

1.4.1. Inventory of Existing Water Resources

The initial phase of the SWPP involved the compilation of available information of existing State wells, stream diversions and water systems owned and/or operated by the State of Hawaii. An inventory of existing State water resources were taken to assess the extent of the State's current water-related operations.

1.4.2. Inventory of Proposed State Projects

Each State department was surveyed to inventory future water requirements associated with proposed State sponsored projects. Using a 20-year planning horizon, future State projects were identified by State departments for the period between 2001 and 2020 based on estimated construction schedules. Water demand requirements were tabulated for 2001 and in one-year increments to 2005, then in five-year increments until the year 2020.

1.4.3. Assessment of Future Water Requirements

Upon completion of the State project inventory, an assessment of the future water requirements was performed. Estimated water demands were determined using the best available information. It should be noted that these demands are based on the projected future water requirements and the values derived herein should be reevaluated as the specific projects become better defined.

1.4.4. SWPP Water Development Strategy

The SWPP Water Development Strategy was developed to identify, evaluate and recommend source development options to meet the forecasted State project water demands. Strategy options and recommendations were organized into two periods: Short-term (2001 to 2010) and the Long-term (2011 to 2020). The strategy objective was to provide more effective planning, coordination and development of water resources to meet projected State water demands. The strategy utilized several source development options including, but not limited to, existing and/or planned State water sources/systems, county/private water agreements, and existing master plans, all of which were prioritized and assigned to individual SWPP projects. These strategy options, however, are preliminary in nature and must be further evaluated with regard to scheduling, funding, system reliability, requirements for infrastructure improvements, and other planning considerations. DLNR will initiate discussions with County Water Departments on the availability and feasibility of County water systems accommodating SWPP project demands. In the event County water systems are unable to supply SWPP project demands, DLNR will assist to develop additional source or system capacity.

1.5. SWPP PROJECT DATA COLLECTION

1.5.1. Survey of State Departments

A standard survey packet was developed in cooperation with the DLNR and CWRM, and distributed to all State departments to facilitate the collection of information for the elements discussed above. The survey consisted of seven parts to address various areas of concerns for this study listed below. The information gathered from this survey was then input into a database to allow for systematic sorting and extraction of data. The SWPP database will be managed and maintained by the DLNR, Land Division, Engineering Branch and updated regularly. Departments will submit any supplemental project information or new State projects to DLNR for inclusion into the database. The survey forms are provided in **Appendix A**.

The SWPP Survey sections were:

1) State Water Systems (Part 1A)
2) State Wells (Part 1B)
3) State Diversions (Part 1C)
4) Water Conservation Programs (Part 2)
5) Projected Water Demand for State Projects (Part 3)
6) Primary Water Source Development Plans for Proposed State Projects (Part 4A)
7) Alternative Water Source Development Plans for Proposed State Projects (Part 4B)

1.5.2. Update of SWPP Data

An updated of the original SWPP project data (dated December 1999) was conducted by DLNR in August 2002. DLNR contacted each State department to submit updated SWPP project information including: projected water demands, project construction dates, type of water needed and of source water supply for project. The updated SWPP project data represents the current status of projected water requirements for future State projects.

1.5.3. Verification of Project Data

The verification of SWPP project information was performed through extensive coordination with each department's staff to insure the completeness and accuracy of the project data. The SWPP project data was returned and distributed back to State departments for their review and verification. Other sources used to verify submitted State projects information included: the DLNR Capital Improvement Projects (CIP) list and the Department of Budget and Finance CIP list.

1.5.4. Evaluation of Project Data

Submitted project data was evaluated to obtain the most current and complete project information available. Project data was evaluated to insure that the methodology used to develop water demand forecasts followed standard engineering practices and that the project data conforms to State and County standards. The SWPP project water demand calculations were reviewed and modified to conform to County Water System Standards methodology to provide for consistency with other parts of the Hawaii Water Plan. However, some projects did not fall within standard categories of water use. Therefore, more site specific or project specific planning criteria were used which are discussed later in Section 3.2, Evaluation and Methodology of SWPP Water Demand.

CHAPTER 2
EXISTING STATE WATER RESOURCES

2.1. GENERAL

The vast majority of existing State facilities including schools, office buildings, airports, harbors, housing projects and institutions are served by water systems owned and operated by the respective Counties. The County water departments are specifically organized to manage, maintain and operate water systems and are usually more capable of efficiently providing water service. However, in areas where the Counties do not have distribution systems, other purveyors, including State, Federal or private agencies, must provide water service to their respective facilities.

An inventory of existing State owned and operated water systems was conducted to assess the extent of the State's current water-related operations, and are discussed in Section 2.4 below. Information on existing water uses and sources registered by the State were also compiled and are presented herein.

2.2. STATE WATER RESOURCES

2.2.1. Wells

A "Well" is defined as "any excavation or opening in the ground, or an artificial enlargement of a natural opening drilled, tunneled, dug, or otherwise constructed for the location, exploration, development, injection, or recharge of ground water and by which ground water is drawn or is capable of being withdrawn or made to flow." The State currently owns 226 existing wells. The locations of the registered State wells are shown in **Figures 2.1 through 2.5**. A listing of the State owned wells is included in **Appendix B**. State well data and location was referenced from CWRM databases.

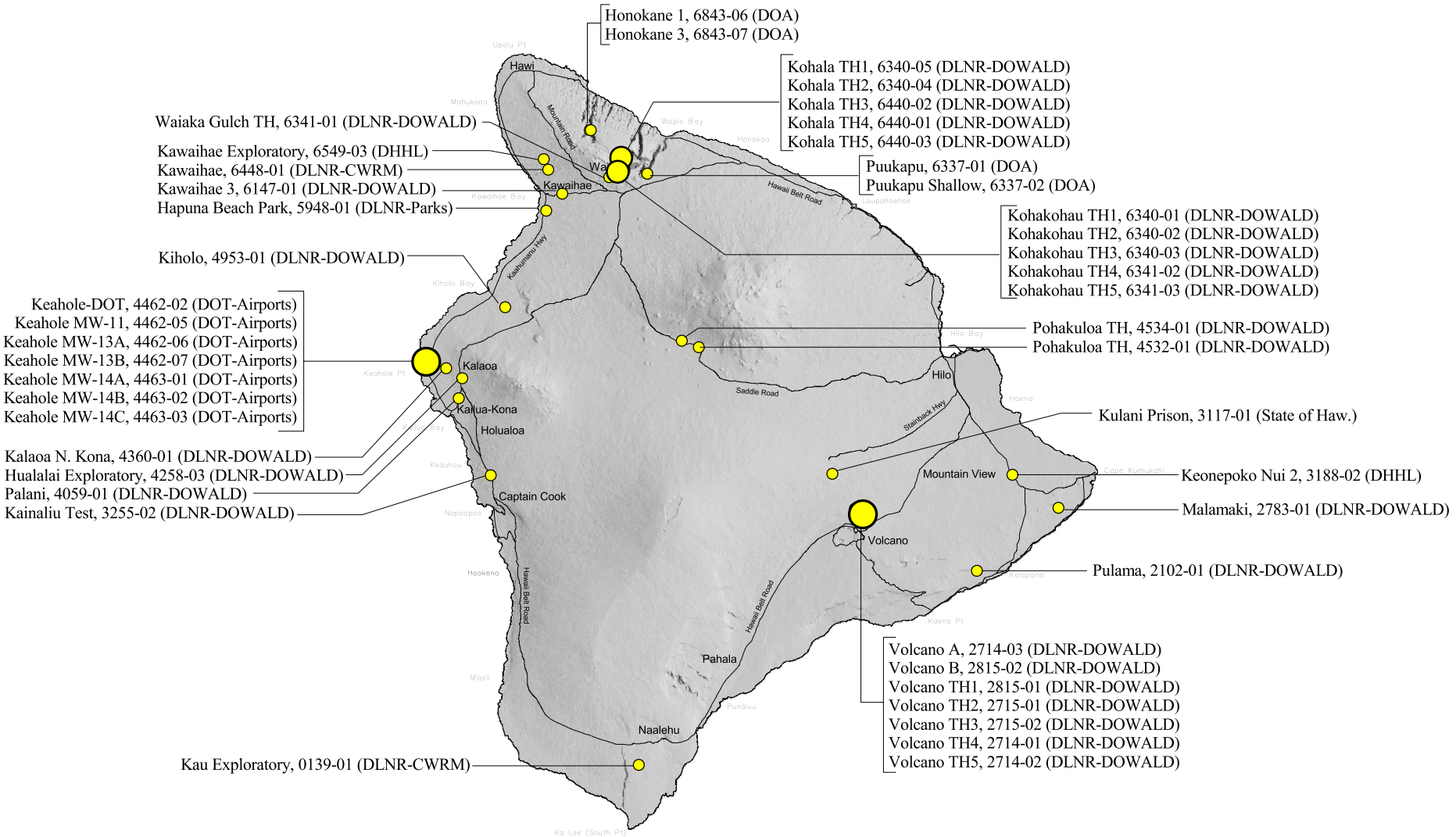
Water from the State wells is used for various applications. Principal uses include potable water supply and irrigation. Miscellaneous uses include cooling water, landscaping, aquaculture, and wetland maintenance.

2.2.2. Stream Diversions

A "Stream Diversion" is defined as "the act of diverting, pumping or otherwise removing water from a stream into a channel, ditch, pipeline, or other conduit." Based on registered stream diversion records with CWRM, the State of Hawaii currently owns and/or operates 54 stream diversions. The locations of the various stream diversions are shown in **Figures 2.6 through 2.10**. A listing of the State owned/operated diversions is included in **Appendix B**. The water collected from existing State diversion works is used primarily for agricultural operations. Other uses include potable water supply, generally for remote areas, e.g. parks and recreation areas. Since diversion works involve surface water sources, the collected water generally required treatment before it is considered safe for human consumption.

2.2.3. State Owned and/or Operated Water Systems

A State water system is defined as a water system owned and/or operated by the State that provides water service to State projects or facilities; provides source water and treatment of source water; stores water in storage reservoirs; provides booster pump capacity; conveys water through a distribution system and distributes water to service connections. A State water system is also defined when a County or private source supplies a State owned and/or operated water service serving State facilities. There were 36 State water systems identified: 11 public water systems, 7 agricultural irrigation systems and 18 smaller potable and nonpotable water systems. A public water system as defined by the State Department of Health is a potable water system, which has 15 or more service connections, or regularly serves an average of 25 or more people for at least 60 days each year. The State water systems are listed in **Table 2.1** by State department. Location maps of State water systems are shown in **Figures 2.11 through 2.15**. Schematic line diagrams showing water systems components, end users and existing/future water demands are provided in **Appendix B**.



Dept. of Land and Natural Resources
Land Division
Engineering Branch
Commission on Water Resource Management

HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 Miles
Scale: 1"=5.5 miles

LEGEND:
- State Wells, State Well No., (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING REGISTERED STATE WELLS - HAWAII
FIGURE 2.1

Date: February 2003

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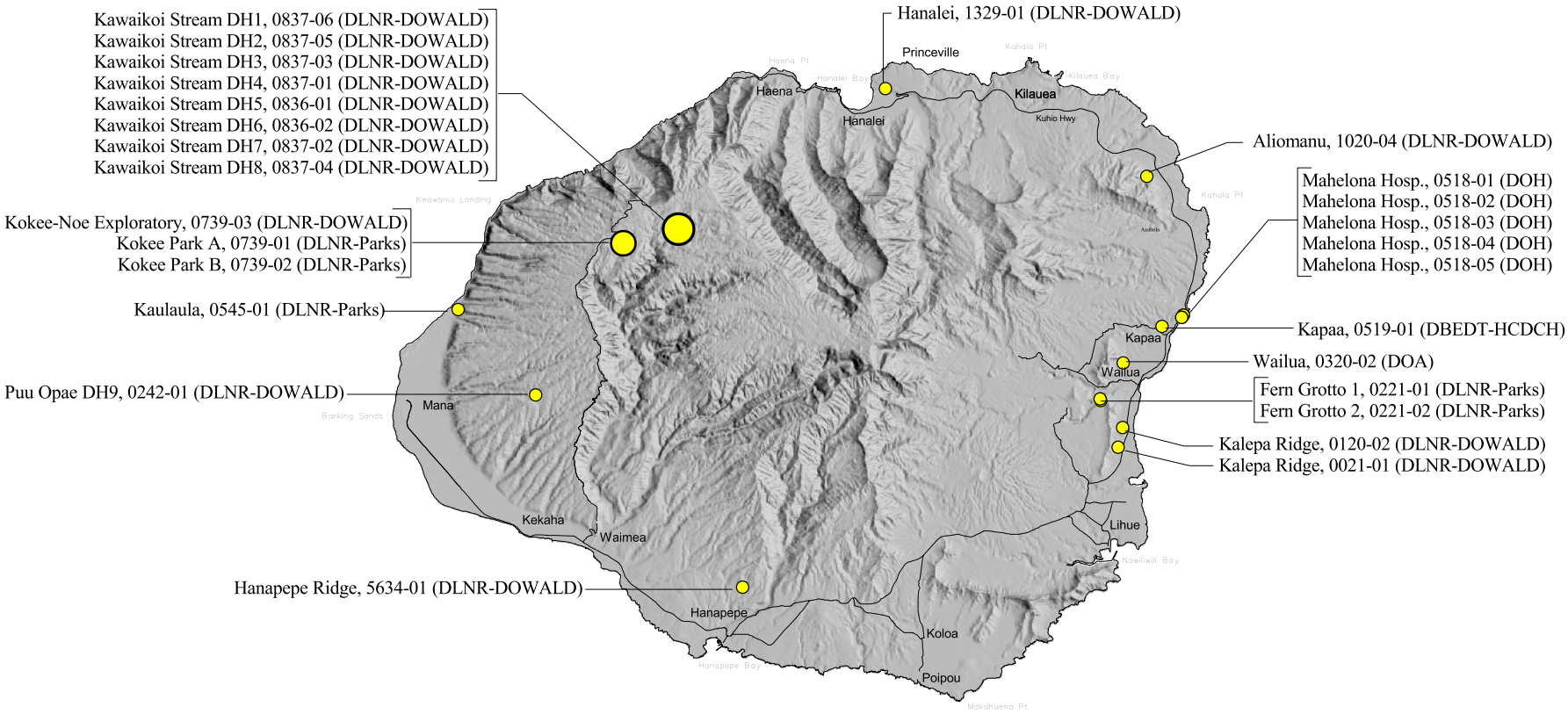
Consulting Engineers
1388 Kapiolani Boulevard
Honolulu, Hawaii 96814



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Land Division
Engineering Branch
Commission on Water Resource Management

HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 Miles
Scale: 1"=2 miles

LEGEND:
- State Wells, State Well No., (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING REGISTERED STATE WELLS - KAUAI
FIGURE 2.2

Date: February 2003

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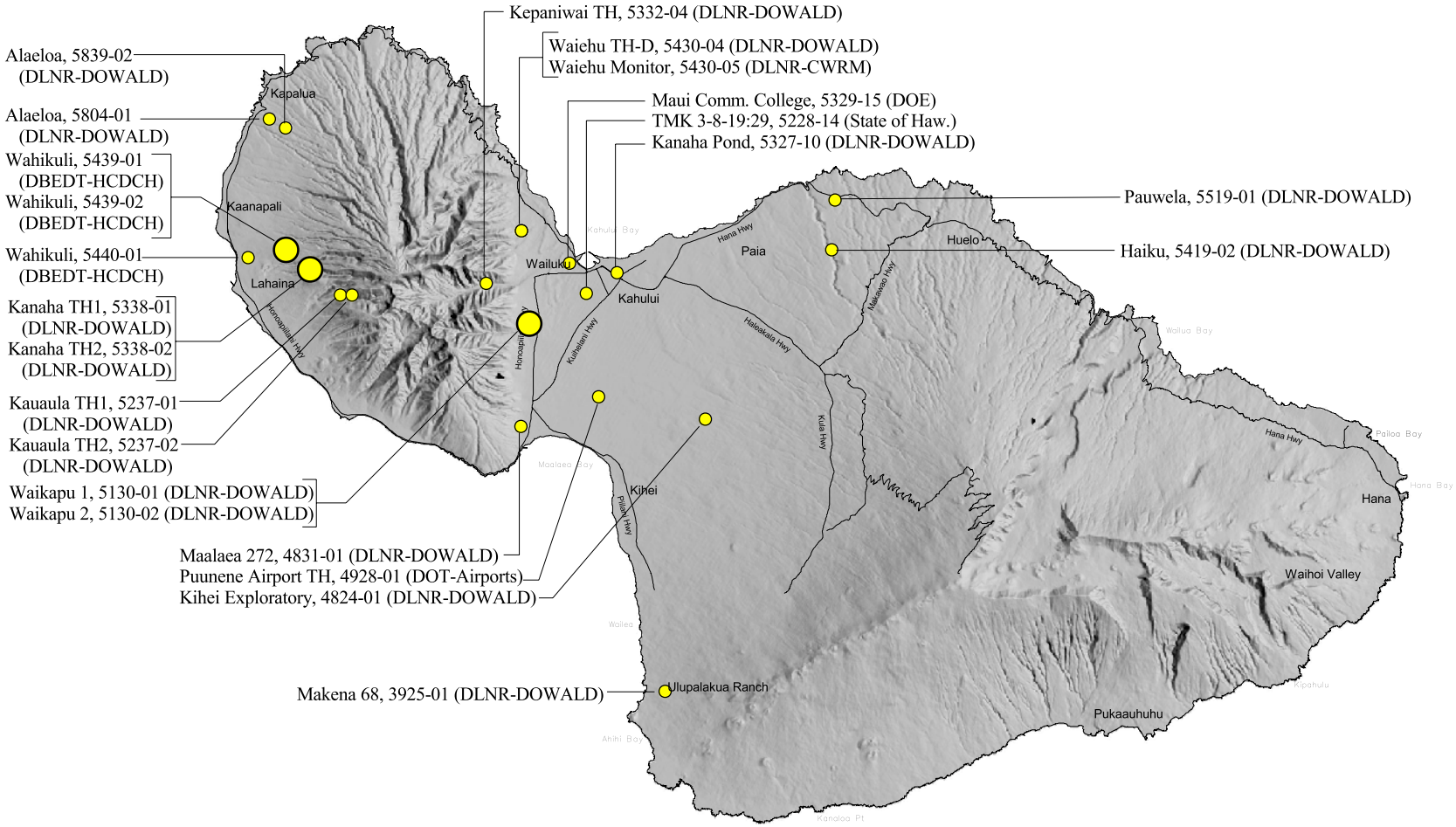

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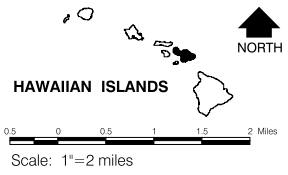

LEGEND:
- State Wells, State Well No., (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING REGISTERED STATE WELLS - MAUI
FIGURE 2.3

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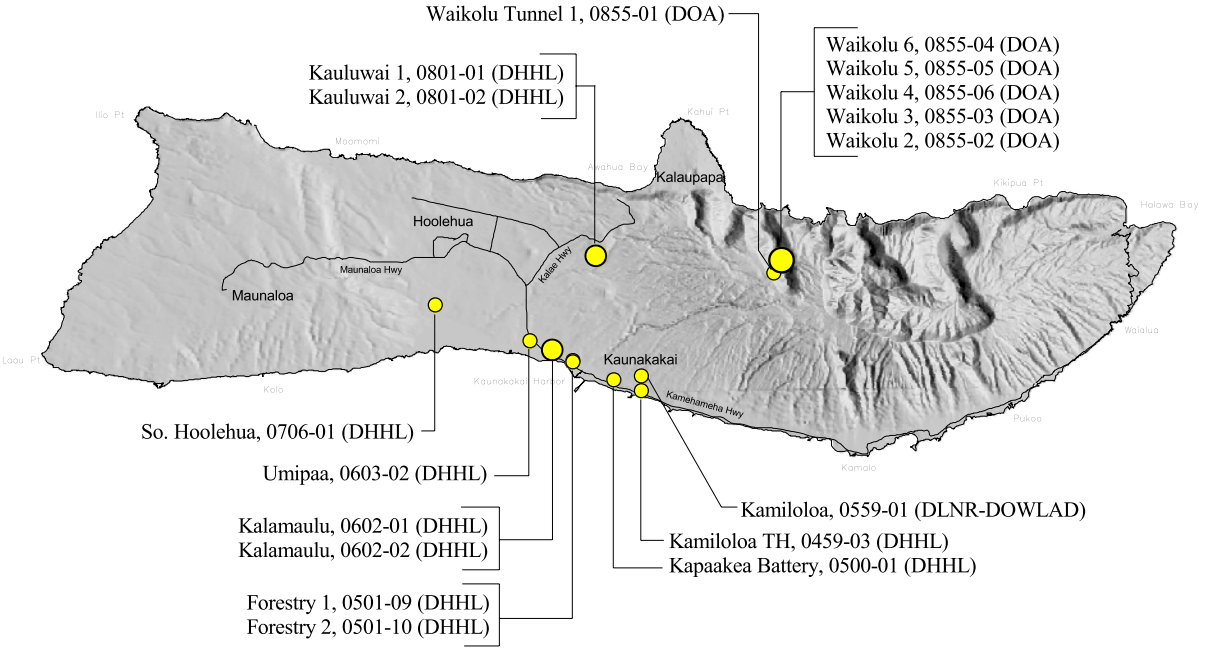

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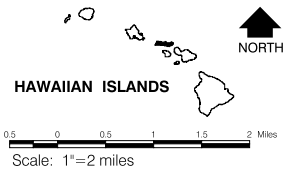

LEGEND:

- State Wells, State Well No., (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING REGISTERED STATE WELLS - MOLOKAI
FIGURE 2.4

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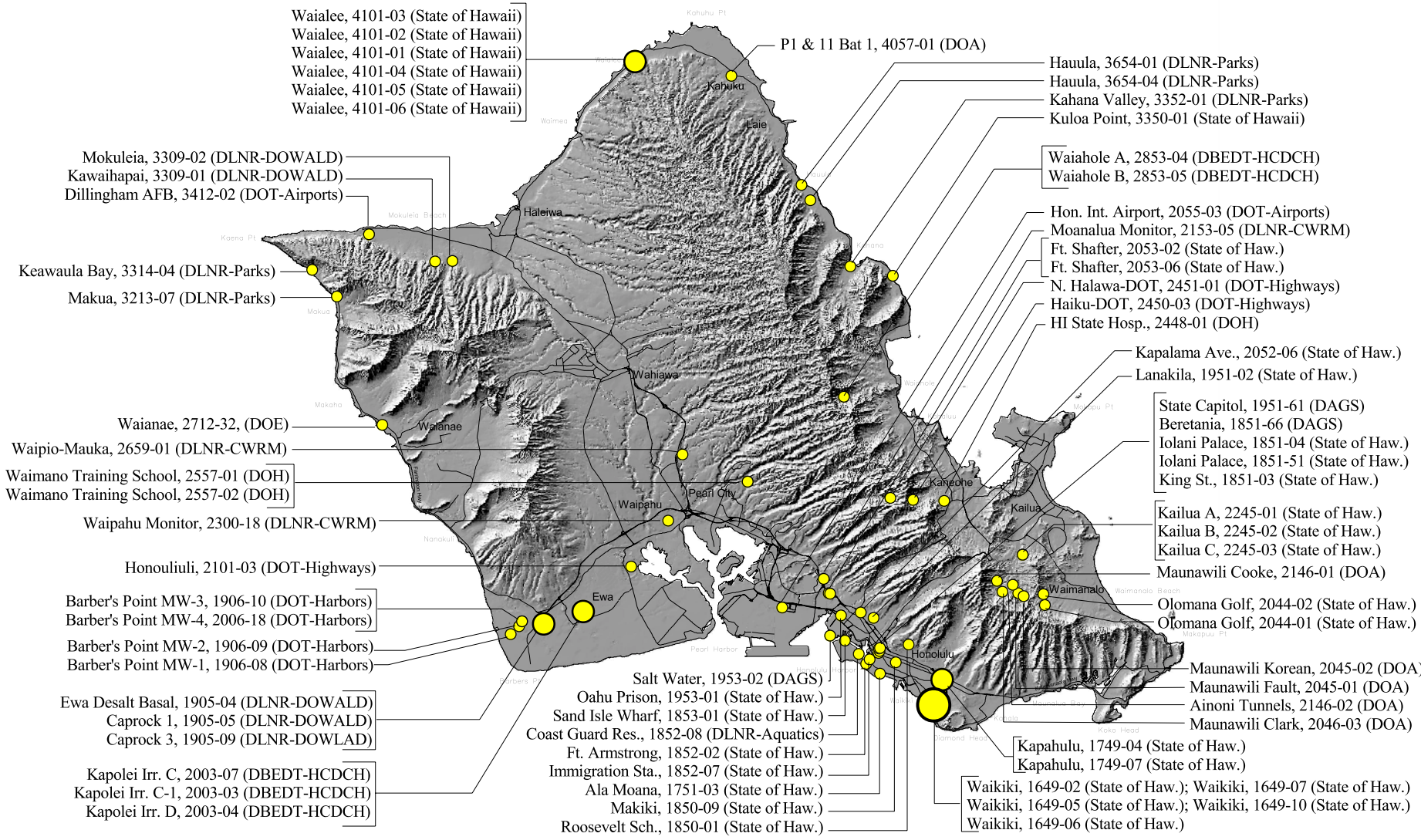

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HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 Miles
Scale: 1"=2 miles

LEGEND:
- State Wells, State Well No., (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING REGISTERED STATE WELLS - OAHU
FIGURE 2.5

Date: February 2003

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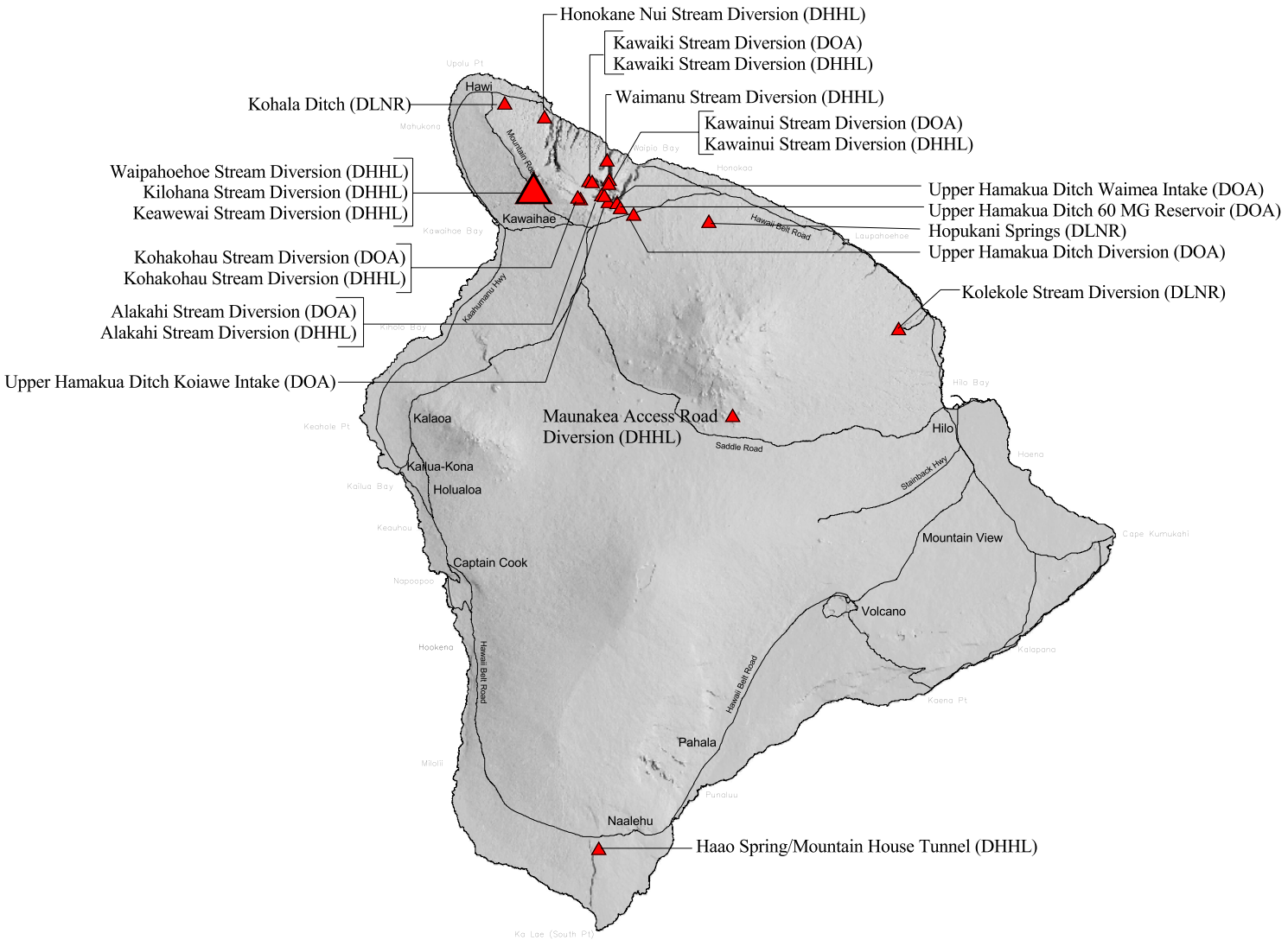

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HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 Miles
Scale: 1"=5.5 miles

LEGEND:
- State Stream Diversions (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE STREAM DIVERSIONS - HAWAII
FIGURE 2.6

Date: February 2003

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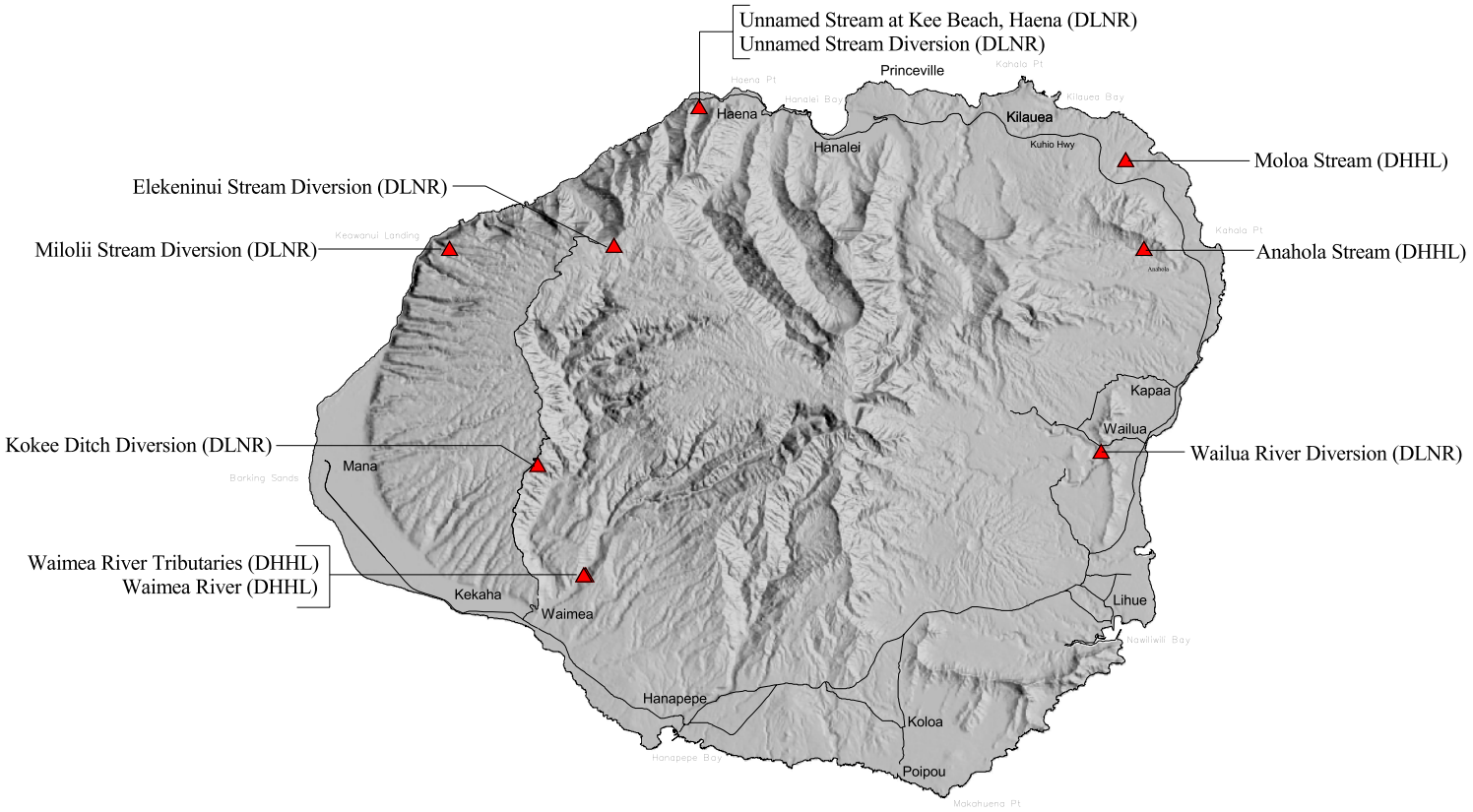

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Engineering Branch
Commission on Water Resource Management

HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 Miles
Scale: 1"=2 miles

LEGEND:
- State Stream Diversions (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE STREAM DIVERSIONS - KAUAI
FIGURE 2.7

Date: February 2003

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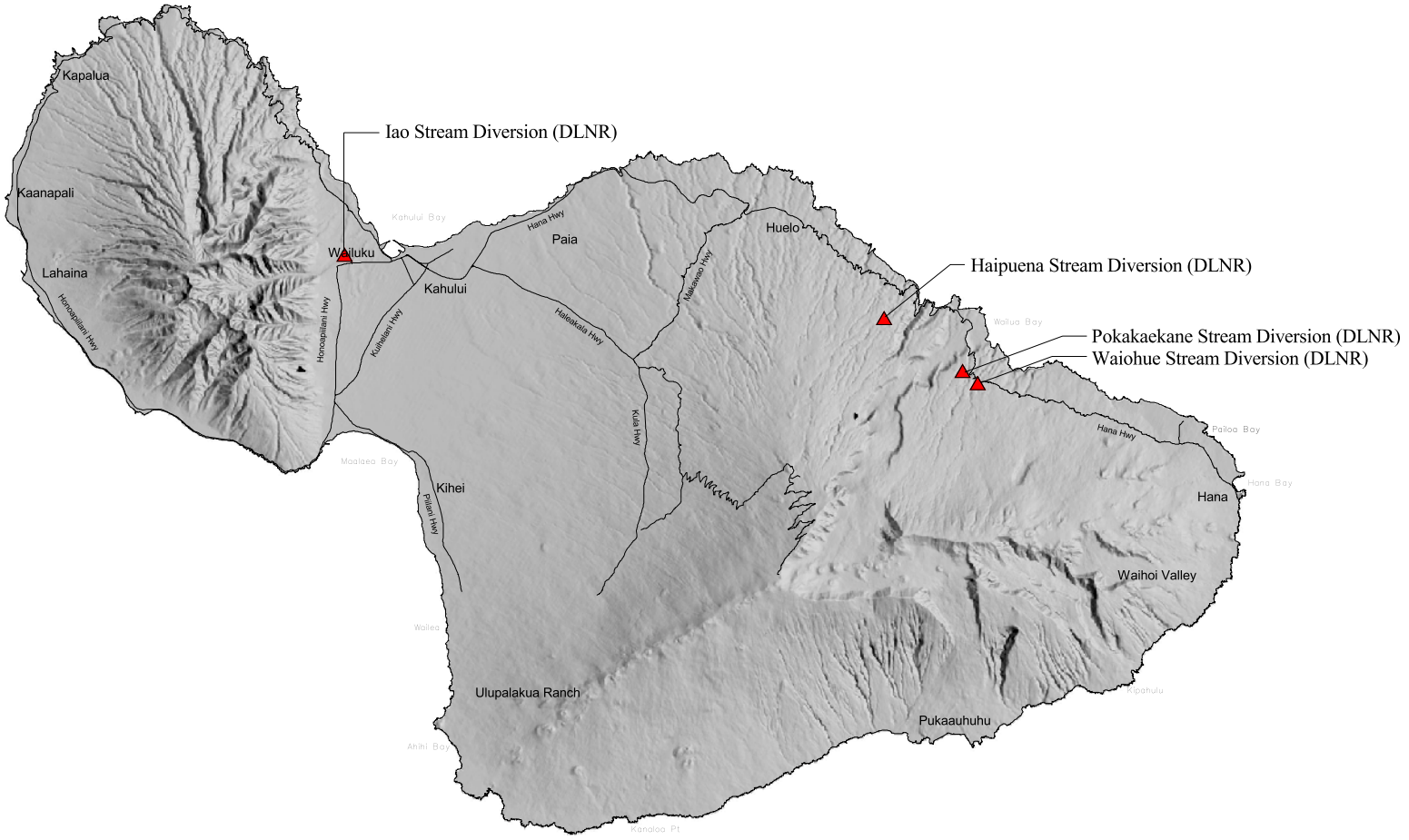

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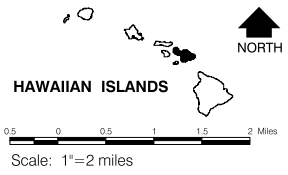

LEGEND:

- State Stream Diversions (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE STREAM DIVERSIONS - MAUI
FIGURE 2.8

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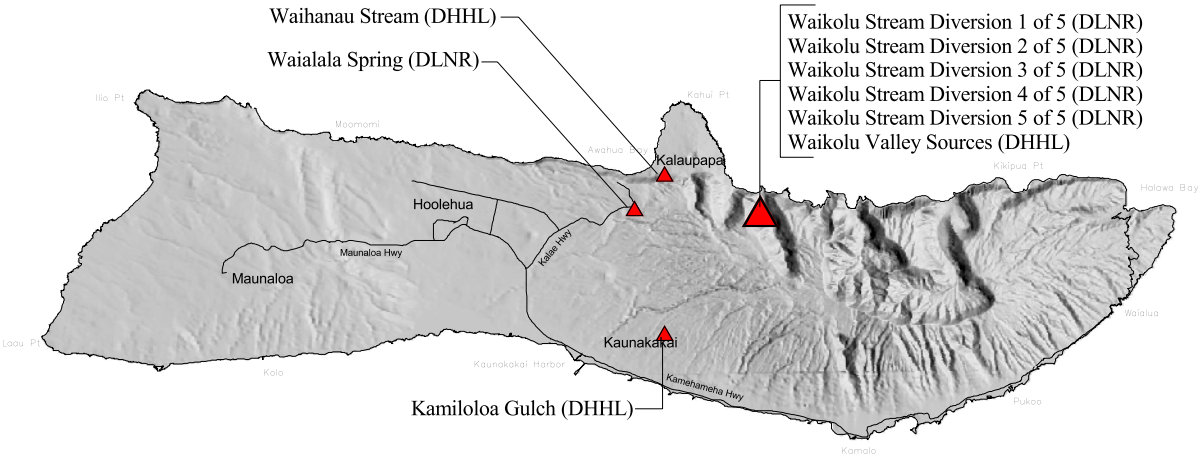

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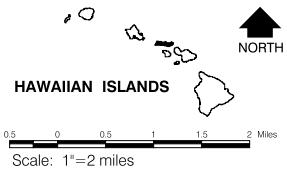

LEGEND:

▲ State Stream Diversions (State Dept.)
—— Major Highways/Roads

State Water Projects Plan
EXISTING STATE STREAM DIVERSIONS - MOLOKAI
FIGURE 2.9

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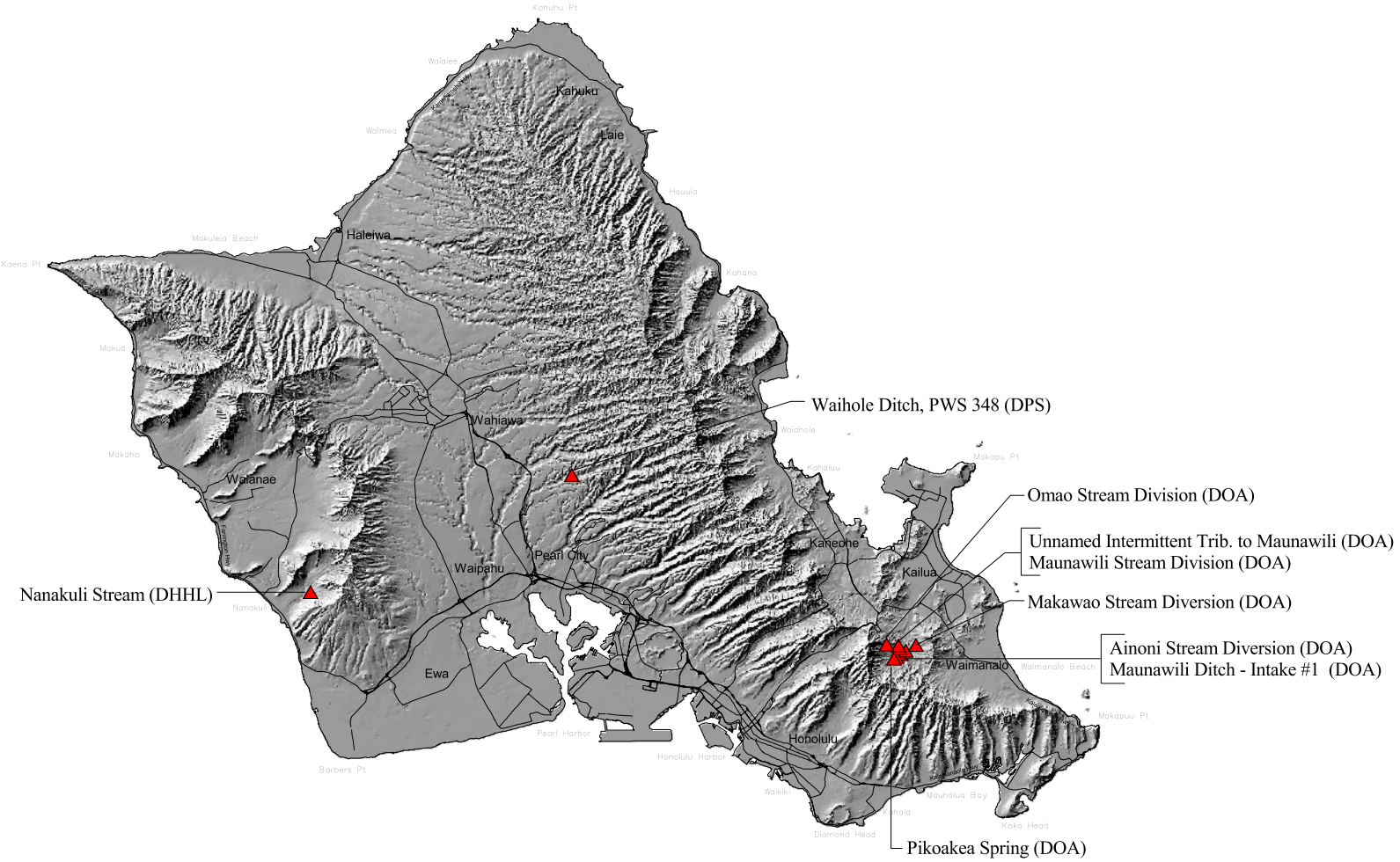

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LEGEND:

- State Stream Diversions (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE STREAM DIVERSIONS - OAHU
FIGURE 2.10

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Table 2.1
Water Systems Owned or Operated by the State

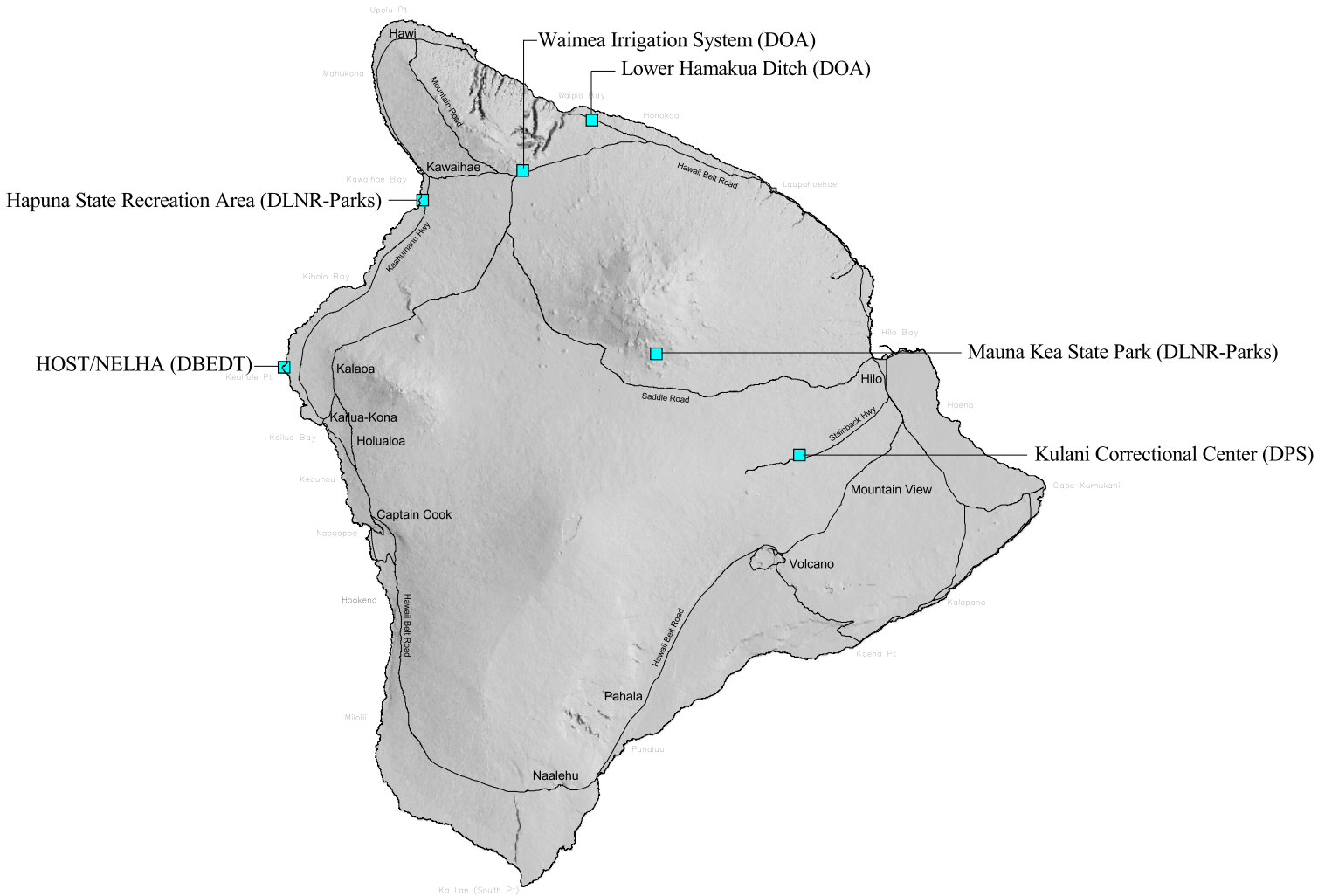
Water System Name	State Agency	Island	Primary Use	State Owned	State Operated
Lower Hamakua Ditch	DOA	Hawaii	Irrigation	No, KSBE, & Other Private	Yes
Waimea Irrigation System	DOA	Hawaii	Irrigation	Yes	Yes
Kekaha Irrigation System	DOA	Kauai	Irrigation	Yes, Source owned by Kekaha Sugar Plantation	Yes *
Molokai Irrigation System	DOA	Molokai	Irrigation	Yes	Yes
Kahuku Irrigation System	DOA	Oahu	Irrigation	Yes	Yes *
Waiahole Ditch	Ag. Bus. Develop. Corp.	Oahu	Nonpotable	Yes	Yes
Waimanalo Irrigation System	DOA	Oahu	Irrigation	Yes	Yes
NELHA	DBEDT	Hawaii	Potable	Yes, Source provided by County, DWS	Yes
Waiahole Water System	DBEDT	Oahu	Potable	Yes	Yes *
Anahola Water System	DHHL	Kauai	Potable	Yes	Yes
Hoolehua Water System	DHHL	Molokai	Potable	Yes	Yes
Hawaii State Hospital	DOH	Oahu	Potable	Yes, Source provided by BWS	Yes
Waimano Training School	DOH	Oahu	Potable	Yes	Yes
Hawaii Youth Correctional Facility	DHS	Oahu	Potable	Yes, Source provided by BWS	Yes
Hapuna SRA	DLNR	Hawaii	Nonpotable	Yes	Yes
Mauna Kea SP	DLNR	Hawaii	Potable	Yes	Yes
Haena SP	DLNR	Kauai	Nonpotable	Yes	Yes
Kokee SP	DLNR	Kauai	Potable	Yes	Yes
Na Pali Coast SP	DLNR	Kauai	Nonpotable	Yes	Yes
Polihale SP	DLNR	Kauai	Potable	Yes	Yes

Note: * State water system operated by private contractor, managed by the State

Table 2.1 (continued)
Water Systems Owned or Operated by the State

Water System Name	State Agency	Island	Primary Use	State Owned	State Operated
Wailua River SP	DLNR	Kauai	Nonpotable	Yes	Yes
Waimea Canyon SP	DLNR	Kauai	Nonpotable	Yes	Yes
Kaumahina SW	DLNR	Maui	Nonpotable	Yes	Yes
Polipoli Springs SRA	DLNR	Maui	Nonpotable	Yes	Yes
Puaa Kaa SW	DLNR	Maui	Nonpotable	Yes	Yes
Iao Valley SP	DLNR	Maui	Nonpotable	Yes	Yes
Waialala SP	DLNR	Molokai	Potable	Yes	Yes
Kaena Point SP - Leeward	DLNR	Oahu	Nonpotable	Yes	Yes
Kahana Valley SP	DLNR	Oahu	Potable	Yes	Yes
Keaiwa Heiau SRA	DLNR	Oahu	Potable	Yes	Yes
Makiki-Tantalus SP - Puu Ualakaa SW	DLNR	Oahu	Potable	Yes	Yes
Waahila Ridge SRA	DLNR	Oahu	Potable	Yes	Yes
Kulani Correctional Center	DPS	Hawaii	Potable	Yes	Yes
Waiawa Correctional Facility	DPS	Oahu	Potable	Yes	Yes
Dillingham Airfield	DOT	Oahu	Potable	No, US Army	Yes *
Waialee Livestock Station	UH	Oahu	Irrigation	Yes	Yes

Note: * State water system operated by private contractor, managed by the State



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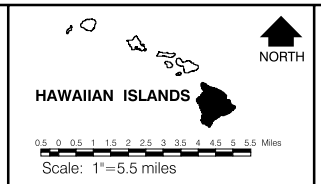

LEGEND:
- State Water Systems (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE WATER SYSTEMS - HAWAII
FIGURE 2.11

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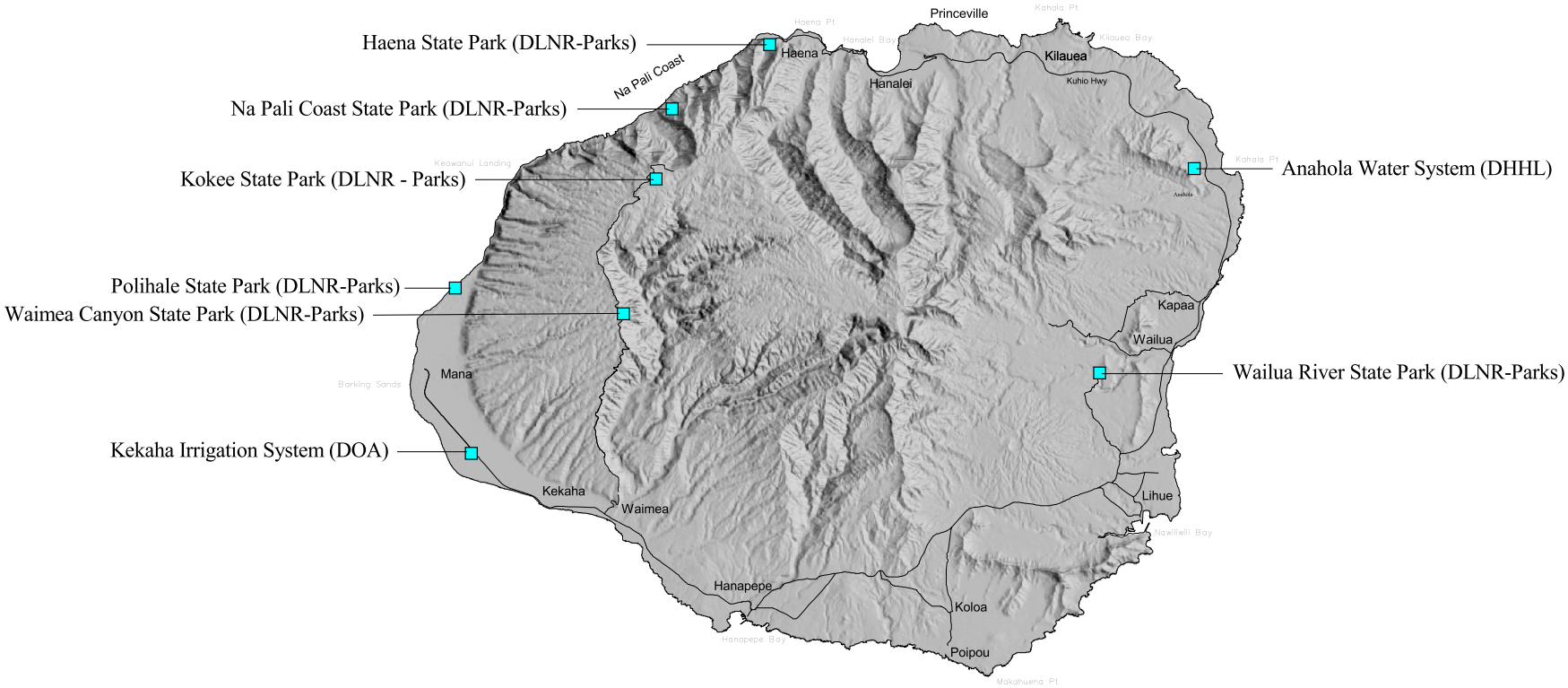

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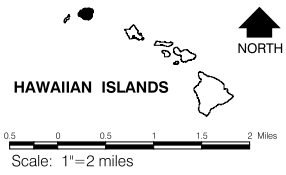

LEGEND:
- State Water Systems (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE WATER SYSTEMS - KAUAI
FIGURE 2.12

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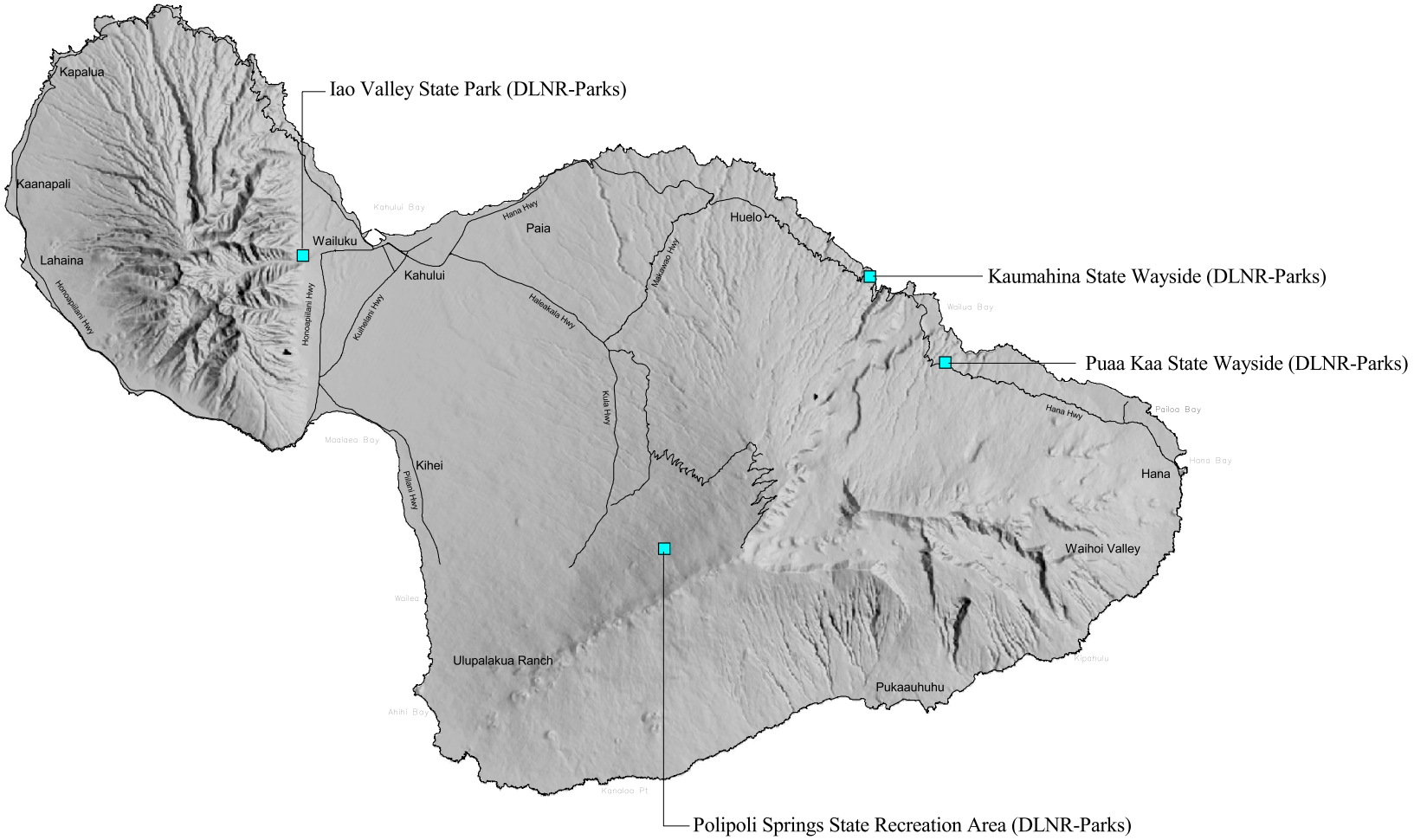

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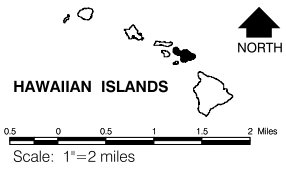

LEGEND:

- State Water Systems (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE WATER SYSTEMS - MAUI
FIGURE 2.13

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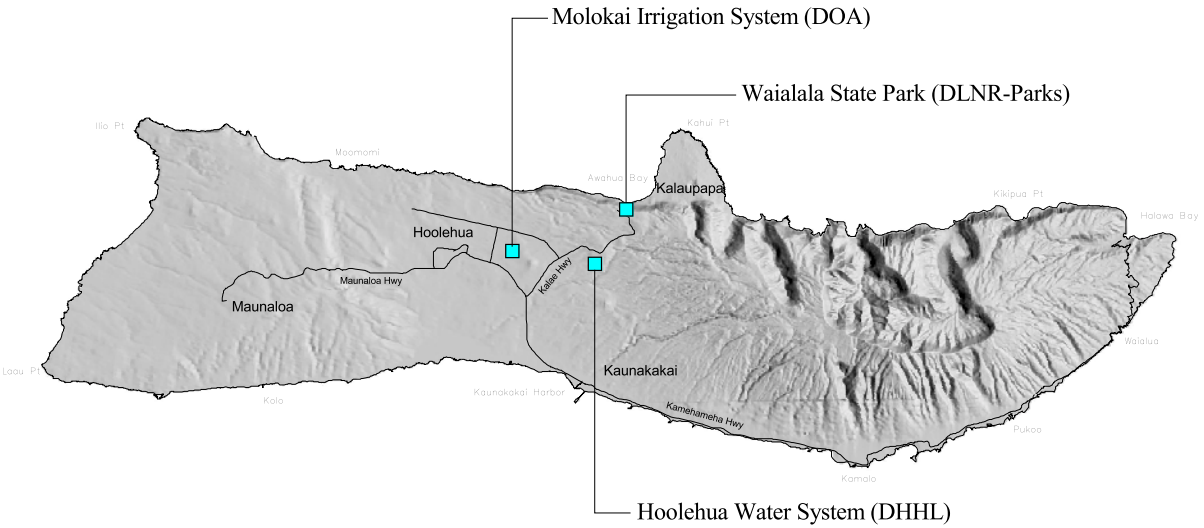

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LEGEND:

- State Water Systems (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE WATER SYSTEMS - MOLOKAI
FIGURE 2.14

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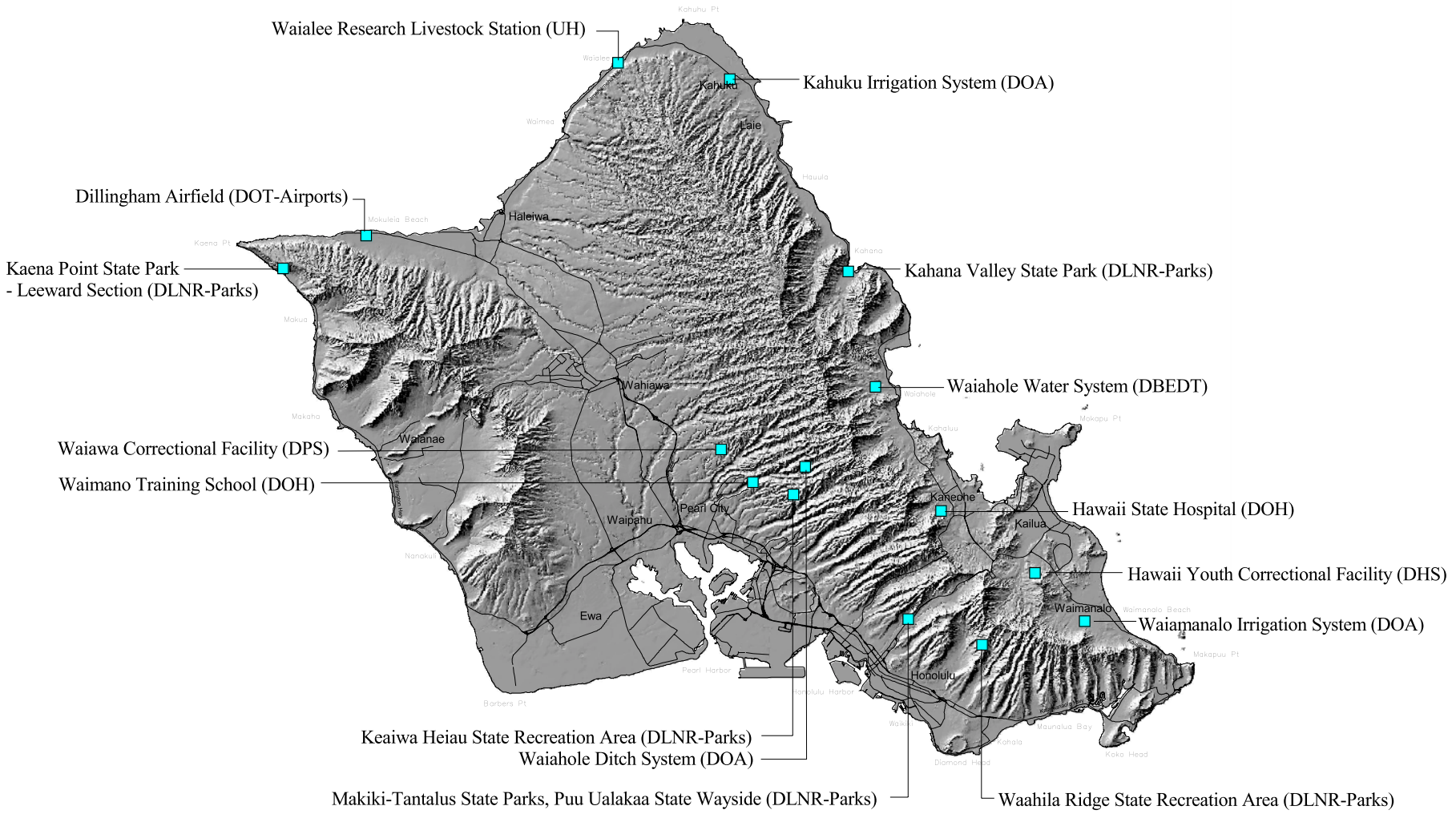

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HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 Miles
Scale: 1"=2 miles

LEGEND:
- State Water Systems (State Dept.)
- Major Highways/Roads

State Water Projects Plan
EXISTING STATE WATER SYSTEMS - OAHU
FIGURE 2.15

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2.2.3.1. Evaluation Of Water System Source Capacity

Water system sources range from single source (groundwater well, stream diversion) to multiple combination of sources. A standardized approach to evaluate water system source capacity was based on the following methodology:

1) Identify water system source and source capacity;

2) If a system is supplied by a groundwater well, the pump capacity of the well was used;

3) If a system is supplied by a stream diversion, the design capacity of the diversion was used, if the diversion capacity information was available;

4) Systems served by stream diversions and wells, the combined source capacity of the diversion and well was used;

5) If the stream diversion design capacity was not known, the intake capacity into the reservoir was used. (Note: Design stream diversion capacity was not available on many stream diversions. Stream diversion flows are rarely measured in the field.) For water systems supplied by stream diversions with no information concerning the stream diversion capacity, the evaluation of source capacity adequacy could not be performed.

The following procedure documents the criteria and methods used to determine the existing average and maximum day consumption, source capacity and water system surplus source capacity.

2.2.3.2. Determine the Existing Average Day and Maximum Day Consumption

Existing metered consumption records were obtained from State agencies. An estimation of water consumption was performed for water systems, which do not meter existing consumption. Water System Standard Domestic Consumption Guidelines average daily demand unit rates and land use type units/areas along with other unit rates provided by State departments were used to calculate estimated water demands. The maximum day demand was then calculated by multiplying the average day demand by a demand factor of 1.5. Primary use of the water was also identified.

2.2.3.3. Determine the Source Capacity

1) For water systems served by a single groundwater well, the safe source capacity was based on a well pump operating time of 16 hours a day, allowing for 8 hours of down time per average day. The safe source capacity is calculated by multiplying the well capacity by a factor of 16 hours/24 hours/day.

2) For water systems served by a single stream diversion, the source capacity was based on the design stream diversion capacity, if available.

3) For water systems served by multiple groundwater wells, the cumulative safe source capacity was based on the cumulative well capacities, well pump operating time of 16 hours a day with the largest well pump on stand-by.

4) For water systems served by multiple stream diversions, the source capacity was based on the cumulative design stream diversion capacities, if available.

5) For water systems served by both multiple groundwater wells and stream diversions, the cumulative safe source capacity was based on the cumulative well capacities and design stream diversion capacities, well pump operating time of 16 hours a day with the largest well pump on stand-by.

6) If the design stream diversion capacity was not known, the average intake capacity was used as the water system source capacity.

7) For water systems supplied by stream diversions with no information concerning the stream diversion capacity, the evaluation of source capacity adequacy could not be performed.

2.2.3.4. Determine Surplus Source Capacity

A comparison of the water system cumulative safe source capacity against existing maximum day consumption or estimation of maximum day demand was performed to evaluate source capacity adequacy. Water systems with source capacity greater than existing maximum day demand were identified as water system with surplus source capacity.

2.2.3.5. Determine Irrigation System Source and Storage Capacity

Existing State irrigation system source and storage capacities were referenced using engineering design reports and water budget computations. The design reports identify the irrigation system inflow source capacity, required storage volume, and the design irrigation area based on system demands. Water budget computations evaluate storage requirements based on the inflow and outflow of the irrigation system. The inflow into the system is based on source capacity and rainfall. Outflow from the system is based on

irrigation demand requirements (crop requirements, planting schedules), system loss and evapotranspiration.

2.2.3.6. Evaluation of Future Project Water Demand

Future projects to be served by existing State water systems were identified. The future project water demand was added to the existing consumption and evaluated against the source capacity of the water system. For irrigation systems, detailed information of the irrigation requirements was not available. New water budget calculations are recommended for irrigation systems with planned expansions.

CHAPTER 3
PROPOSED WATER-RELATED STATE PROJECTS

3.1. GENERAL

The State of Hawaii, in its effort to satisfy the many needs of the public, has numerous projects scheduled for implementation by the various State departments. In order to anticipate the future water requirements of proposed State projects, an inventory of State projects requiring water was compiled. State departments were contacted for their proposed project listings and schedules. The collected data was reviewed and sorted to obtain a listing of future projects. The project data was used as the basis for water resource planning, water system improvements and source development. In general, projects involving new housing developments, agriculture/irrigation projects, major facilities or major expansions were considered as having significant impact on water resources.

3.2. EVALUATION AND METHODOLOGY OF SWPP WATER DEMAND

3.2.1. Evaluation of SWPP Project Information

The status of State projects and water requirement information submitted for the SWPP varied from the planning stage, engineering stage to the final design stage. Project information in the planning stage remained conceptual and schematic, with water demand units or areas grossly estimated. Project information in the engineering stage was based on the project design. Project information in the final design stage had water demand requirements based on construction documents, typically plumbing fixture units, and known units or areas.

Project information received through the SWPP survey forms were reviewed for completeness and accuracy. Generally, project water demand calculations were made to conform to Water System Standards domestic consumption guidelines (refer to **Table 3.1**) to determine average day water demands. The use of standard guidelines to compute water demands allows consistency of projected water demands among all State departments and other components of the Hawaii Water Plan.

Some State projects however, specified primary water uses not classified by Water System Standards. Project water demands were calculated using unit rates from other reference sources such as: DOH Wastewater Standards, American Society of Heating and Refrigeration and Air Condition, engineering studies and historical consumption records. These unit rates are shown on **Table 3.2**.

Table 3.1
Domestic Consumption Guideline
Average Daily Demand*

Zone	Hawaii	Kauai	Maui	Oahu
RESIDENTIAL:				
Single Family or Duplex	400 gal/unit	500 gal/unit	600 gal/unit or 3000 gal/acre	500 gal/unit or 2500 gal/acre
Multi-Family Low Rise	400 gal/unit	350 gal/unit	560 gal/unit or 5000 gal/acre	400 gal/unit or 4000 gal/acre
Multi-Family High Rise	400 gal/unit	350 gal/unit	560 gal/unit	300 gal/unit
COMMERCIAL:	3000 gal/acre	3000 gal/acre	6000 gal/acre	3000 gal/acre
Commercial/Industry Mix	--	500 gal/acre	140 gal/1000 sq. ft.	100 gal/ 1000 sq. ft.
Commercial/Residential Mix	--	3000 gal/acre	140 gal/1000 sq. ft.	120 gal/1000 sq. ft.
RESORT (To include hotel for Maui only):	400 gal/unit	350 gal/unit	350 gal/unit or 17000 gal/acre	350 gal/unit or 4000 gal/acre
LIGHT INDUSTRY:	4000 gal/acre	4000 gal/acre	6000 gal/acre	4000 gal/acre
SCHOOLS, PARKS:	4000 gal/acre or 60 gal/student	2500 gal/acre plus 20 gal/student	1700 gal/acre or 60 gal/student	4000 gal/acre or 60 gal/student
HOSPITAL:			1800 gal/acre	
AGRICULTURAL:			5000 gal/acre	

*Where two or more figures are listed for the same zoning, the daily demand resulting in higher consumption use shall govern the design unless specified otherwise.

Note: Table 3.1 is taken from Table 15, Domestic Consumption Guideline Average Daily Demand, Water System Standards, State of Hawaii, 1985, Volume I.

Table 3.2
Department Specific Unit Rates

State Department	Zone	Primary Use	Consumption Guideline Average Daily Demand	Remarks	Source
DOA	Agriculture	Nonpotable Irrigation	5000 gals/acre	Planning Level	DOA
DOE	New Cafeteria	Potable	3 gals/meal	Design Level	American Society of Heating, Refrigeration, and Air Conditioning
	New Gymnasium	Potable	20 gals/student	Planning Level Assumed 200 students	DOE
DLNR-BOATING	Harbor Ships/Piers	Potable	50 gals/boat	Non-Live In	DLNR-Boating
			250 gals/boat	Live In	DLNR-Boating
DLNR-PARKS	Parks-Restroom Facility	Potable or Nonpotable	5 gals/park user	w/out showers Assumed 1000 park users/day	DOH
			10 gals/park user	w/ showers Assumed 1000 park users/day	DOH
DPS	Correctional Facility	Potable	150 gals/inmate	Planning Level	DPS
DOT-HIGHWAYS	Landscaping	Nonpotable Irrigation	6000 – 12000 gals/acre	Range for Temporary Irrigation	DOT-Highways
			8000 gals/acre	Temp. Irrig. Average	DOT-Highways
			2000 gals/acre	Permanent	DOT-Highways

3.2.2. Project Water Demand Calculation Methodology

SWPP project water demands were calculated using the following methodology:

1) Demands for projects that conform to the Water System Standards Land Use Types were based on project units or areas, then multiplied by the standard unit rates to determine the average day demand. Examples include: *New School*, used projected student enrollment multiplied by 60 gals/student (depending on island); *Residential Housing* on Oahu, used number of residential units multiplied by 500 gals/unit.

2) Other references and assumptions to determine unit rates and method of demand calculations were used for projects that do not conform to Water System Standard Land Use Types, as discussed below.

3.2.2.1. Non-Standard Guidelines and Methods

The following guidelines and methods were used to calculate and verify SWPP project average day demands for projects with land use types not specified in Water System Standards:

1) Agricultural Parks/Subdivisions: Use agricultural irrigation area, and then multiply by 5,000 gal/acre to determine irrigation demand.

2) DOE-New Classrooms at Existing School for Projected Increase in Student Enrollment: Determine the projected increased student enrollment or proposed number of new classrooms. If water demand based on the number of classrooms, multiply classrooms by 30 students per classroom. If water demand based on increased students, multiply projected number of students by 60 gal/student to determine potable demand.

3) DOE-New Administration Building/Library/Renovation to Classroom at Existing School: Determine the floor area, and then multiply by Water System Standard Commercial/Industrial Mix unit rate to determine the potable demand.

4) DOE-New Cafeteria at Existing School: Determine the total enrollment of students, and then multiply by 3 gal/student to determine potable demand.

5) DOE-New Gymnasium at Existing School: Determine number of students using gymnasium per day, assume fall sports season = 200 students, multiply by 20 gal/student to determine the potable demand.

6) Expansion of Correctional Facility: Determine the number of additional inmates, and then multiply by 150 gal/inmate to determine potable demand.

7) Harbor/Boat Slips and Piers: Determine number of boats, and then multiply by 50

gal/boat (non-live in situation) or 250 gal/boat (live in situation) to determine the potable demand.

8) Highway Landscaping: Determine the landscaped highway area, and then multiply by 8,000 gal/acre for temporary landscaping demand. The temporary landscaping period lasts for the first two years of project. Use a reduced unit rate of 2,000 gal/acre for the permanent landscaping demand.

9) New State Building: Determine building floor area based on number of floors in building and use Water System Standard, Commercial/Industrial Mix unit rate to determine the potable demand. Landscaping demand was determined using landscape area multiplied by Water System Standard, Parks unit rate.

10) Renovation to State Building/Facility: Determine renovated floor area, and then multiply by Water System Standard Commercial/Industrial Mix unit rate to determine the potable demand.

11) Restroom/Park Facility: Determine the projected number of park users, if park projection not available, assume 1,000 park users/day, multiply by 5 gal/park user (facility without showers) or 10 gal/park user (facility with showers) to determine park demand.

3.3. SWPP PROJECT WATER DEMAND

3.3.1. SWPP Projects by State Department

The individual State projects and water demands are provided in tabular form in **Appendix C** (sorted by State department), **Appendix D** (sorted by island), and **Appendix E** (sorted by hydrologic sector and system). Summary tables of total demands for each State department and by island are listed in **Tables 3.3 and 3.4** at the end of this section. General descriptions of SWPP projects proposed by the State departments, departmental contacts, water demand calculation methodology, schedules and status of projects are detailed below.

3.3.1.1. Department of Accounting and General Services

The Department of Accounting and General Services (DAGS) provides facilities planning and engineering support to various State departments. The two sections contacted within DAGS were the Planning Section, which deals with future long-term projects; and the Project Management Section, which deals with projects currently in design. DAGS provides planning and engineering support to the Department of Education, Department of Health, Judiciary, Department of Public Safety, the University of Hawaii and the Aloha Stadium.

DAGS Planning Section projects typically remain in the conceptual planning stage. Estimates of building floor area, landscaping area and Water System Standards were used

to estimate water demands based on land use type. Projects from DAGS Planning include: civic centers, judiciary centers, public libraries and State office buildings. Projects are typically scheduled beyond 2005. Project locations are provided in **Figure 3.1**.

DAGS Project Management Section projects are in the final design and construction document stage. Project information is provided from known plumbing fixture units, building floor areas and landscaping areas. Water demands are calculated using Water System Standard unit rates or by converting plumbing fixture units into a peak demand in gallons per minute (gpm). The average day demand represented in gallons per day (gpd) is estimated from the peak demand. Projects from DAGS Project Management include: school renovations, public libraries, Kapolei Sports Recreation Complex and other State facilities. The project water demands are typically required within the next two years. Project locations are provided in **Figure 3.1**.

3.3.1.2. Department of Agriculture

The Division of Agricultural Resource Management, along with DOA irrigation system field operators was contacted for project information. The State agricultural park program was initiated to provide Hawaii's farmers with essential land and water resources to ensure economically viable farm operations with long-term tenure and security from urbanization pressures, and to promote economies in farm production and distribution through common facilities and activities. In general, the program seeks to support Hawaii's diversified agricultural industries. Major water-related projects by the Department of Agriculture (DOA) are associated with the development or expansion of agricultural parks. The DOA is proposing several new projects: agricultural parks/subdivisions, which include: the Future Subdivisions in Honokaa, Palaau, Waimea, Waikele, Paauilo; Agricultural Parks in Lanai, Barbers Point and Royal Kunia and the Upcounty Maui Irrigation Project, Lower Kula Watershed Project and Waimea/Paauilo Watershed Project. Existing agricultural irrigation systems planned to be expanded include: Waimea, Molokai and Waimanalo Irrigation Systems. Water demands were estimated using DOA unit rate of 5,000 gal/acre and are considered at the planning level. Projects are scheduled throughout the entire planning period. See **Figure 3.2** for the location of these DOA projects.

3.3.1.3. Department of Business, Economic Development & Tourism

The Department of Business, Economic Development & Tourism (DBEDT) is involved with exploring and pursuing opportunities for the State of Hawaii to broaden and diversify its economic base. Several corporations and departments that work directly on specific projects under DBEDT were contacted for project information, and include the following: Aloha Tower Development Corp.; Barbers Point Redevelopment Commission; Hawaii Community Development Corp. of Hawaii; Convention Center Authority; Hawaii Community Development Authority; and the Natural Energy Laboratory of Hawaii Authority. In general, water demands were calculated using the Water System Standards.

However, for some projects, the individual authority's estimate of water demand was based on historical consumption records. The projects being proposed by DBEDT include various community and housing developments in addition to the Kakaako Redevelopment Project, Hawaii Convention Center, Aloha Tower Development, and the Natural Energy Laboratory of Hawaii. The project water demands remain at the planning level. Projects are scheduled more on the short term, within the next five years. See **Figure 3.3** for the location of these and other DBEDT projects.

3.3.1.4. Department of Defense

The Engineering Division of the Army National Guard was contacted for Department of Defense (DOD) project information. The DOD is only proposing a few projects, which include the Waimea Readiness Center, Maui Consolidated Facilities, Regional Training Institute, Kalaeloa Training Facility and the Hawaii Veterans Center. Water demand projections were based on the number of employees and drill timers who are to occupy and use the facilities, and the number of hours and days the facilities would be used. Unit rates were estimated based on historical consumption data or estimation of water usage. Water demands listed for these projects are at a planning level. DOD projects are scheduled within the next five years. See **Figure 3.4** for the location of these projects.

3.3.1.5. Department of Education

The Department of Education (DOE) Facilities and Staff Services Branch has developed a Facilities Program to provide educational facilities that are well placed, sufficient in number, flexible, functional, and creatively designed. Personnel from the Facilities & Support Services Branch were contacted for project information. The Facilities Program is also to insure that the facilities accommodate population increases in growing residential areas, support the educational program, and promote the health and safety of the students, employees and the public. In an effort to achieve these objectives the DOE has projected its future facilities requirements as part of its Capital Improvements Program. The DOE is proposing over 200 projects on Oahu, Maui, Molokai, Kauai and Hawaii. These projects include new classrooms, administration buildings, cafeterias, libraries, band/chorus rooms, locker rooms/showers, gymnasiums, and many new schools. DOE project water demands were made to conform to Water System Standards, however some projects presented water requirements not listed in the standards. New units rates based on other references and estimation of water uses were developed to calculate water demands. DOE projects remain generally at the planning level, however several projects are at the engineering and design levels. Projects are scheduled throughout the planning period. DOE project locations are provided on **Figures 3.5 through 3.8**.

3.3.1.6. Department of Hawaiian Home Lands

The Department of Hawaiian Home Lands (DHHL) is delegated with the administration of lands that have been set aside for the benefit of qualified native Hawaiians. Qualified native Hawaiians are eligible to receive homestead leases and financial assistance from the DHHL. In its effort to provide additional homestead lots to qualified applicants, DHHL has proposed an extensive Capital Improvements Program. The Planning Office and field operators were contacted for project information. Project types range from housing developments to farm and agricultural developments. DHHL project demands were made to conform to Water System Standards. Water demands listed for these projects are at a planning level. Projects are scheduled beyond the year 2005, with the majority of projects scheduled in the year 2010. See **Figure 3.9** for the location of DHHL projects.

3.3.1.7. Department of Health

The Department of Health (DOH) Administrative Services Office was contacted for project information. The DOH is proposing several projects involving children residence facilities along with renovations to the Maui Memorial Hospital, Maluhia Expansion Day Hospital, Residence Childrens Facilities on Oahu and a New Vector Control Building. DOH project water demands were based on Water System Standards. The project demands remain at a planning and engineering level. DOH projects are scheduled within the next two years. See **Figure 3.4** for DOH project locations.

3.3.1.8. Department of Human Services

The Department of Human Services (DHS) Office of Youth Services was contacted for project information. The DHS is planning one project, the HYCF Vocational Training/Maintenance Facility on Oahu. The project water demand was calculated using Water System Standards and scheduled in the year 2001. The water demand for this project is at a planning level. See **Figure 3.4** for the project location.

3.3.1.9. Judiciary

The Judiciary Capital Projects Coordinator was contacted for project information. The Judiciary operates the State's court system, and is proposing one new facility. The Naalehu District Court on the island of Hawaii is the only project listed under the Judiciary. The project water demand was calculating Water System Standards and remains at the planning level. The project is scheduled for the year 2003. See **Figure 3.4** for the project location.

3.3.1.10. Department of Land of Natural Resources

The various divisions and branches within the Department of Land and Natural Resources (DLNR) were contacted for future projects requiring water. The Boating and Ocean Recreation Division and the State Parks Planning Section responded with projects. The proposed projects include new or expansion of existing boat harbors and parks. The landscaping portion of the project water demands was computed using Water System Standards; however, estimated water consumption from harbors, piers/slips housing boats and park facilities was calculated from other reference sources. For the Boating and Ocean Recreation projects, the types of measuring units included: number of employees; landscape area; number of restroom facilities; number of slips; number of piers; and number of boats. For the State Parks projects, visitor counts were estimated by using the 2008 projected visitor counts and applying a straight line projection from the current visitor count to projected counts for the intermediate years. Both Boating and Parks projects are at the planning level. The projects are scheduled throughout the planning period. See **Figure 3.10** for project locations.

3.3.1.11. Department of Public Safety

The Department of Public Safety (DPS) manages the operations of the State correctional institutions and is proposing the addition and expansion of a few correctional facilities. The DPS Administrative Services, Capital Improvements Section was contacted for project information. The DPS projects include: New 200-Bed Addition at Waiawa Correctional Facility, New 84-Bed Housing at Women's Community Correctional Center on Oahu and expansion and renovation at the Maui Community Corrections Center. The project water demands were computed using the given number of inmates and a DPS unit rate of 150 gal/inmate. The project demands remain at the engineering level and are scheduled within the next two years. See **Figure 3.4** for the project locations.

3.3.1.12. Department of Transportation

The Department of Transportation (DOT) is responsible for all major State-owned transportation facilities including airports, harbors, and highways. The need for additional and/or expanded transportation facilities increases as resident and visitor populations continue to grow. The general location of new projects or proposed facilities expansions is shown in **Figure 3.11**.

1) Airports Division

The Airports Division oversees the operations of nine airport complexes throughout the State. The Airports Planning Section was contacted for project information. No new airport installations are being proposed, however, all of the airport facilities have long-term master plans to accommodate increased traffic and activity. Proposed projects include new buildings and expansion/renovation of existing airport facilities.
Projected water demands were based on airport master plans for new facilities or

renovations to existing facilities. Water demands listed for these projects are at a planning level and scheduled throughout the planning period.

2) Harbors Division

The Harbors Division has several master plans for harbors on the islands of Hawaii, Kauai, Maui, Molokai, and Oahu. The Harbors Planning Section was contacted for project information. Proposed projects include new harbors and expansion to existing harbors.

Project water demands were calculated using Water System Standards. Water demands listed for these projects are at a planning level and scheduled throughout the planning period.

3) Highways Division

Water requirements for the Highways Division projects are primarily associated with landscaping of roadside or median areas of the highway facilities. The Highways Hydraulic Design Section was contacted for project information. The general policy of the Highways Division is to incorporate "drought tolerant" plant materials along their facilities. The intent is to select plants, which can survive at the facility location without irrigation, utilizing only the natural occurring rainfall. Generally irrigation is only required to initially establish the landscaping. However, certain projects where visual impacts are important and more extensive landscaping is proposed are expected to require permanent irrigation systems.

Irrigation requirements varied, and unit rates for temporary landscaping water usage ranged between 6,000 gpad to 12,000 gpad, typically using 8,000 gpad. Water demands were divided into two periods: the above listed rates were applied to the first one to two years as temporary for initial start up of the landscaping; after the start up period, the water demand is reduced to ¼ of the initial demand for the permanent demand. Nonpotable water for landscape irrigation was assumed. Many projects will use potable water source for the nonpotable needs. Water demands listed for these projects are at a planning level. Projects are schedule within the next five years.

3.3.1.13. University of Hawaii

Each campus facilities planning coordinator was contacted for project information, including: Office of Long Range Physical Development, West Oahu Campus Consultant, Community Colleges, University of Hawaii at Manoa Facilities Planning and Management Office, University of Hawaii at Hilo, and the College of Tropical Agriculture and Human Resources. Projects associated with the University of Hawaii (UH) system include: expansion and improvements to existing UH Manoa, UH Hilo, Community College campuses statewide. Project water demands were generally computed using Water Systems Standards. A few projects were further into the

engineering and design phase and were computed using plumbing fixture units. Project demands are at the planning and design levels. The projects are scheduled throughout the planning period. See **Figure 3.12** for project locations.

3.3.1.14. Other State Departments

As part of the SWPP survey, all State departments were contacted and asked to report future projects requiring water; however, several departments did not have any projects to report at this time. Those departments included:

1) Department of Attorney General
2) Department of Budget and Finance
3) Department of Commerce and Consumer Affairs
4) Department of Human Resource Development
5) Department of Labor & Industrial Relations
6) Department of Taxation

3.3.2. Hydrological Units

As outlined in the State Water Code, the geographical boundaries for the development of regional plans coincide with the hydrological units established in the Water Resources Protection Plan. The general boundaries of the various hydrological sectors and aquifer systems for each island are shown in **Figures 3.13 through 3.18**.

The hydrological maps identify the sustainable yields, permitted water use (where applicable), and SWPP projected 2020 demands by hydrological sectors. **Table 3.2a** summarizes the sustainable yields, permitted water use and SWPP projected 2020 demands for each aquifer sector and system. The table provides an overview of future State water requirements in relation with current permitted water use and available sustainable yields. The additional water needed to support future State projects will affect available sustainable yields in several hydrological sectors. The sectors identified were: (Oahu Sectors) Honolulu, Pearl Harbor, Central; and (Molokai Sector) Central.

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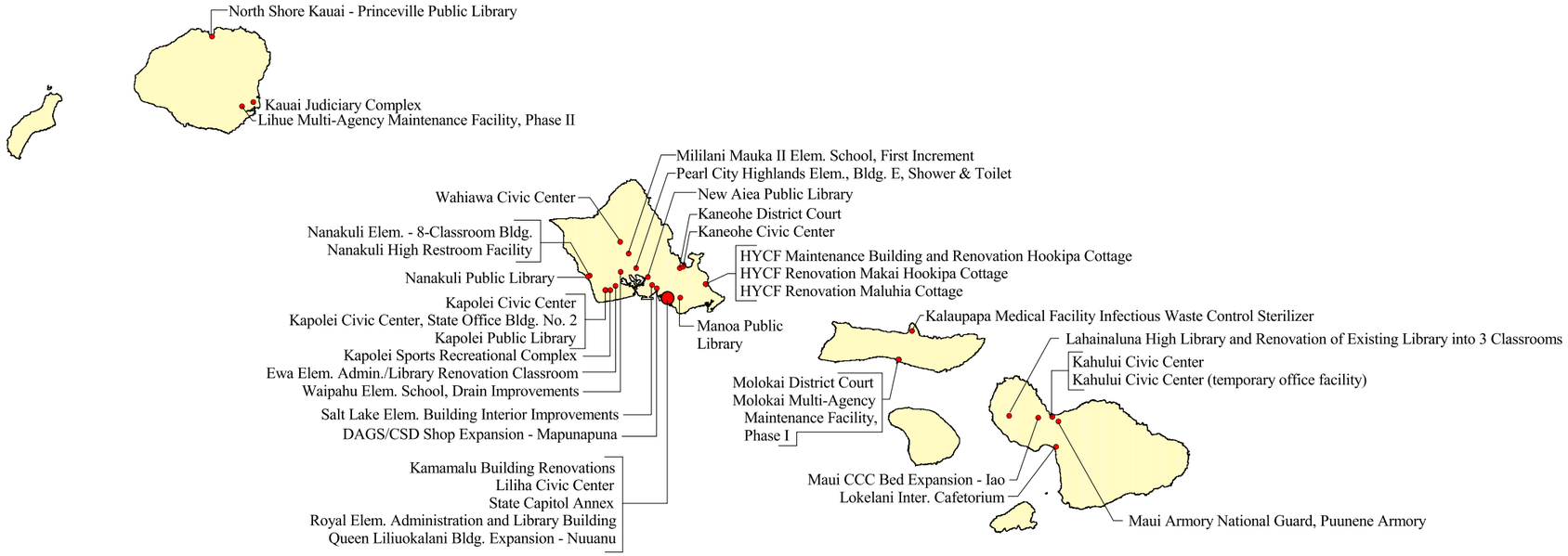

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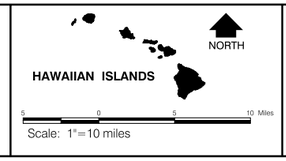
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - Dept. of Accounting and General Services

State Water Projects Plan
STATE PROJECTS - DEPT. OF ACCOUNTING AND GENERAL SERVICES
FIGURE 3.1

Date: February 2003

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Consulting Engineers
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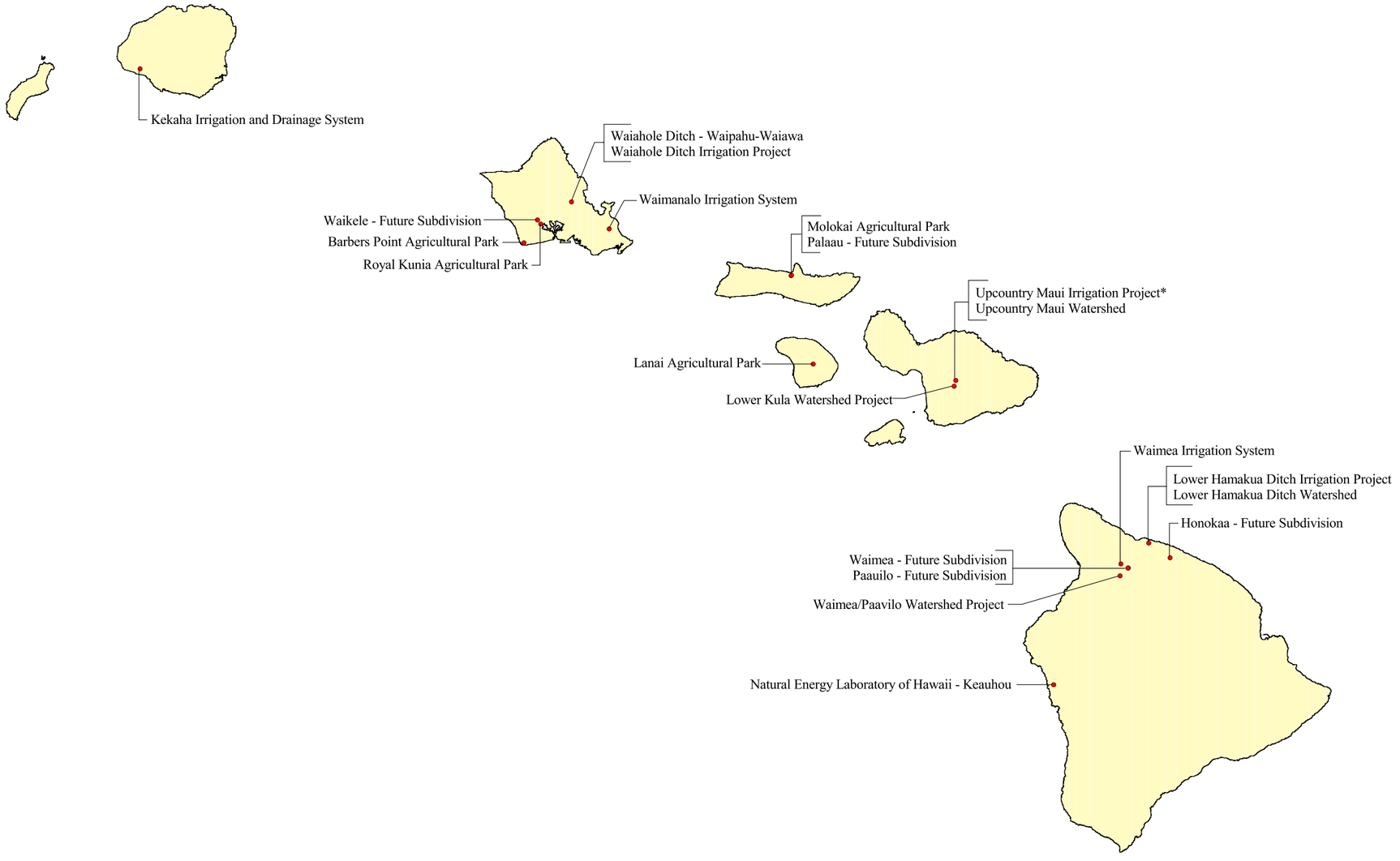
Honolulu, Hawaii 96814



*Approximate location, subject to change.

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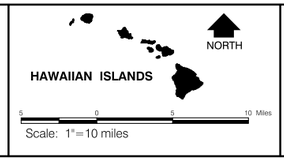

LEGEND:

- State Projects - Dept. of Agriculture

State Water Projects Plan
STATE PROJECTS - DEPT. OF AGRICULTURE
FIGURE 3.2

Date: February 2003

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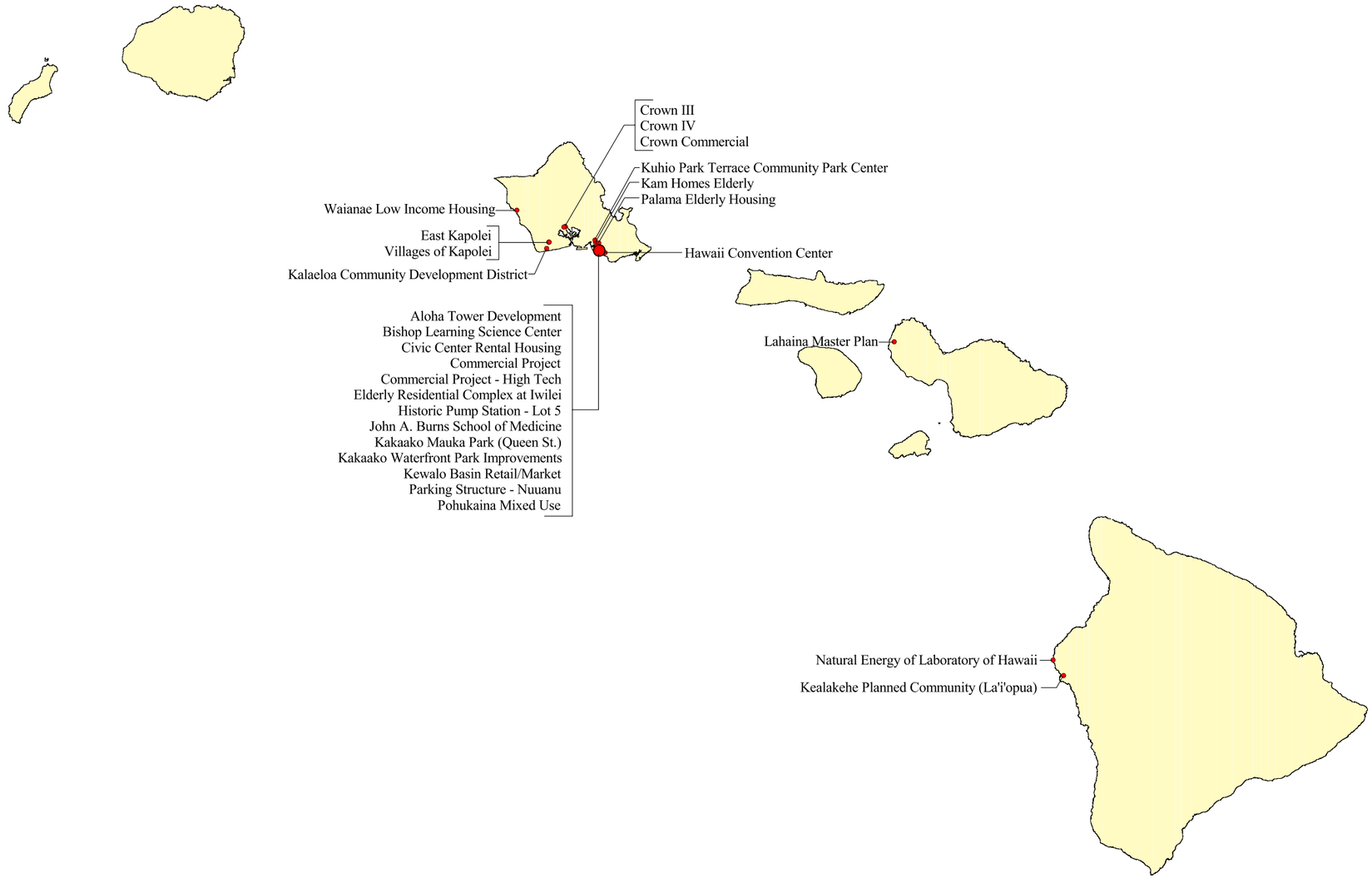
Honolulu, Hawaii 96814



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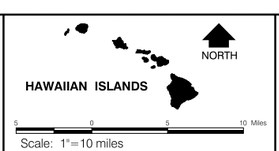

LEGEND:

- State Projects - Department of Business Economic Development and Tourism

State Water Projects Plan
STATE PROJECTS - DEPT. OF BUSINESS ECONOMIC DEVELOPMENT AND TOURISM
FIGURE 3.3

Date: February 2003

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Consulting Engineers
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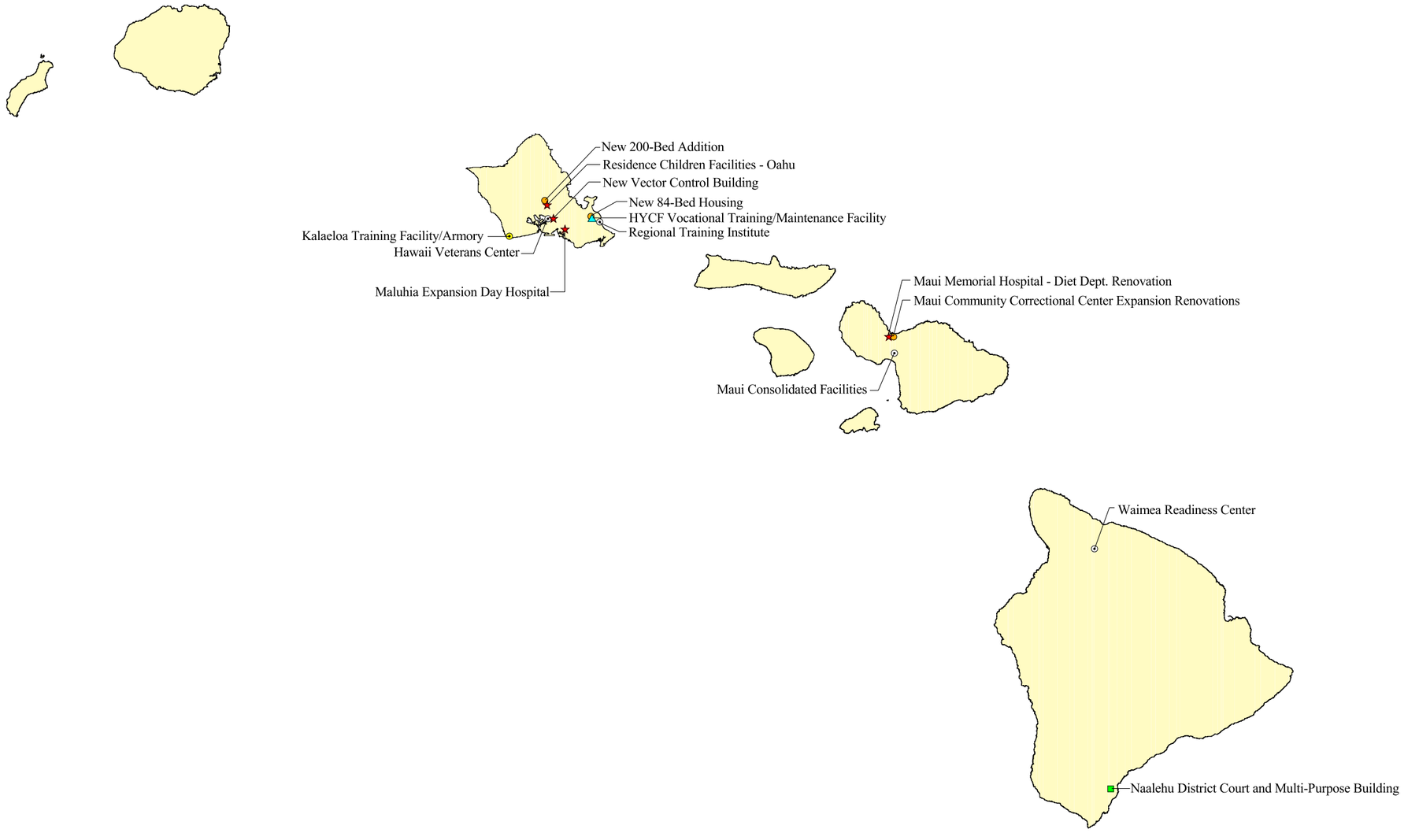

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Land Division
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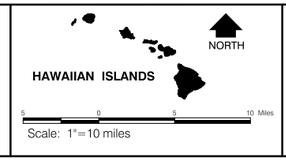

LEGEND:

- State Projects - Dept. of Defense
- State Projects - Dept. of Health
- State Projects - Dept. of Human Services
- State Projects - Dept. of Public Safety
- State Projects - Judiciary

State Water Projects Plan
STATE PROJECTS - DEPT. OF DEFENSE, DEPT. OF HEALTH, DEPT. OF HUMAN SERVICES, DEPT. OF PUBLIC SAFETY, JUDICIARY
FIGURE 3.4

Date: February 2003

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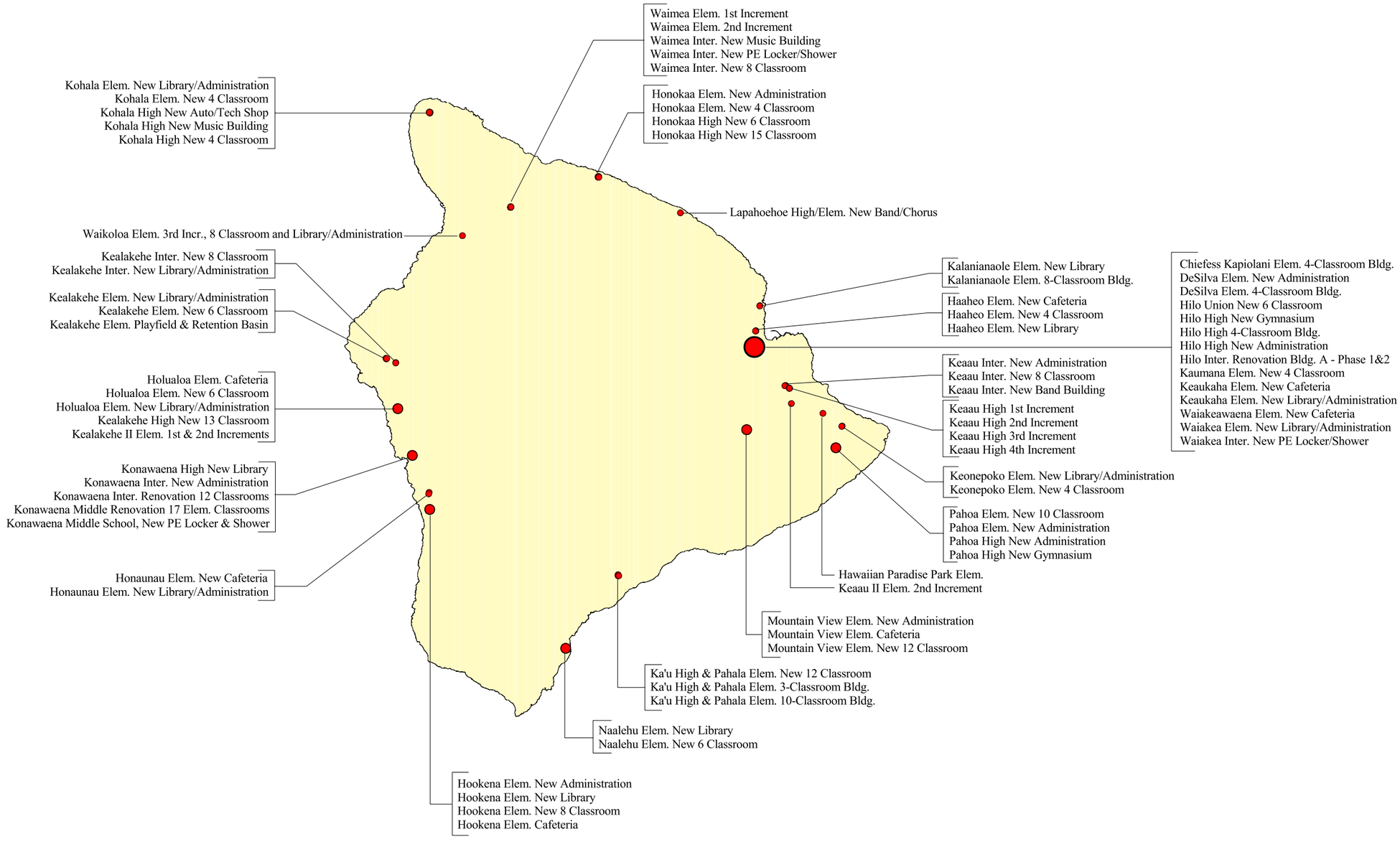

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Land Division
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HAWAIIAN ISLANDS
NORTH
2.5 0 2.5 5 Miles
Scale: 1"=5 miles

LEGEND:

- State Projects - Dept. of Education - Hawaii

State Water Projects Plan
STATE PROJECTS - DEPT. OF EDUCATION - Hawaii
FIGURE 3.5

Date: February 2003

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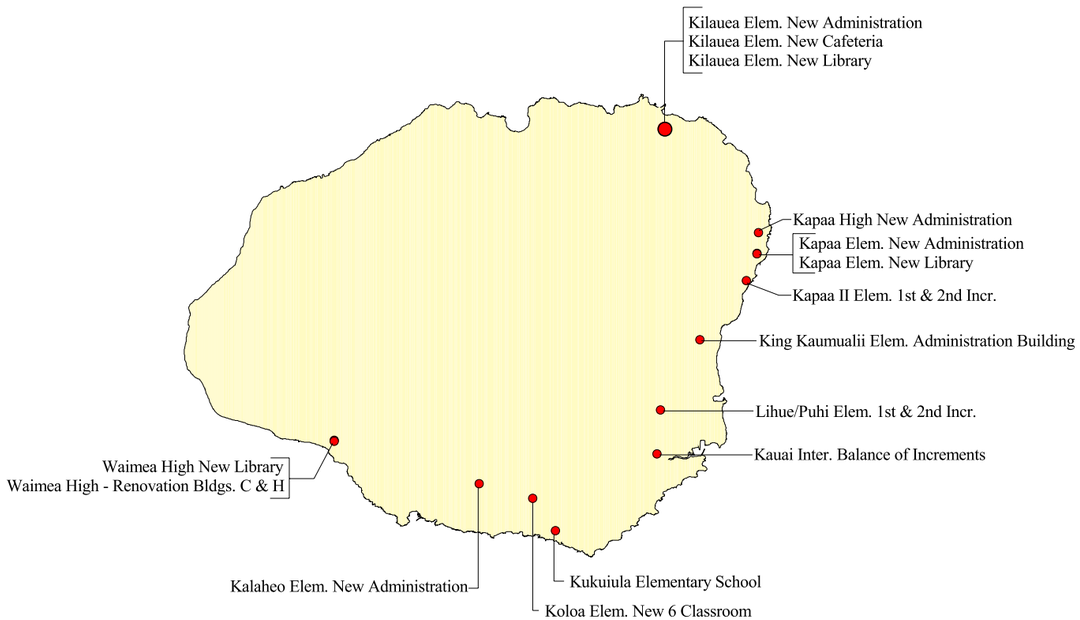

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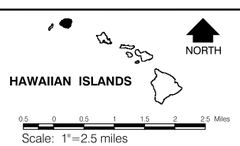
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - Dept. of Education - Kauai

State Water Projects Plan
STATE PROJECTS - DEPT. OF EDUCATION - Kauai
FIGURE 3.6

Date: February 2003

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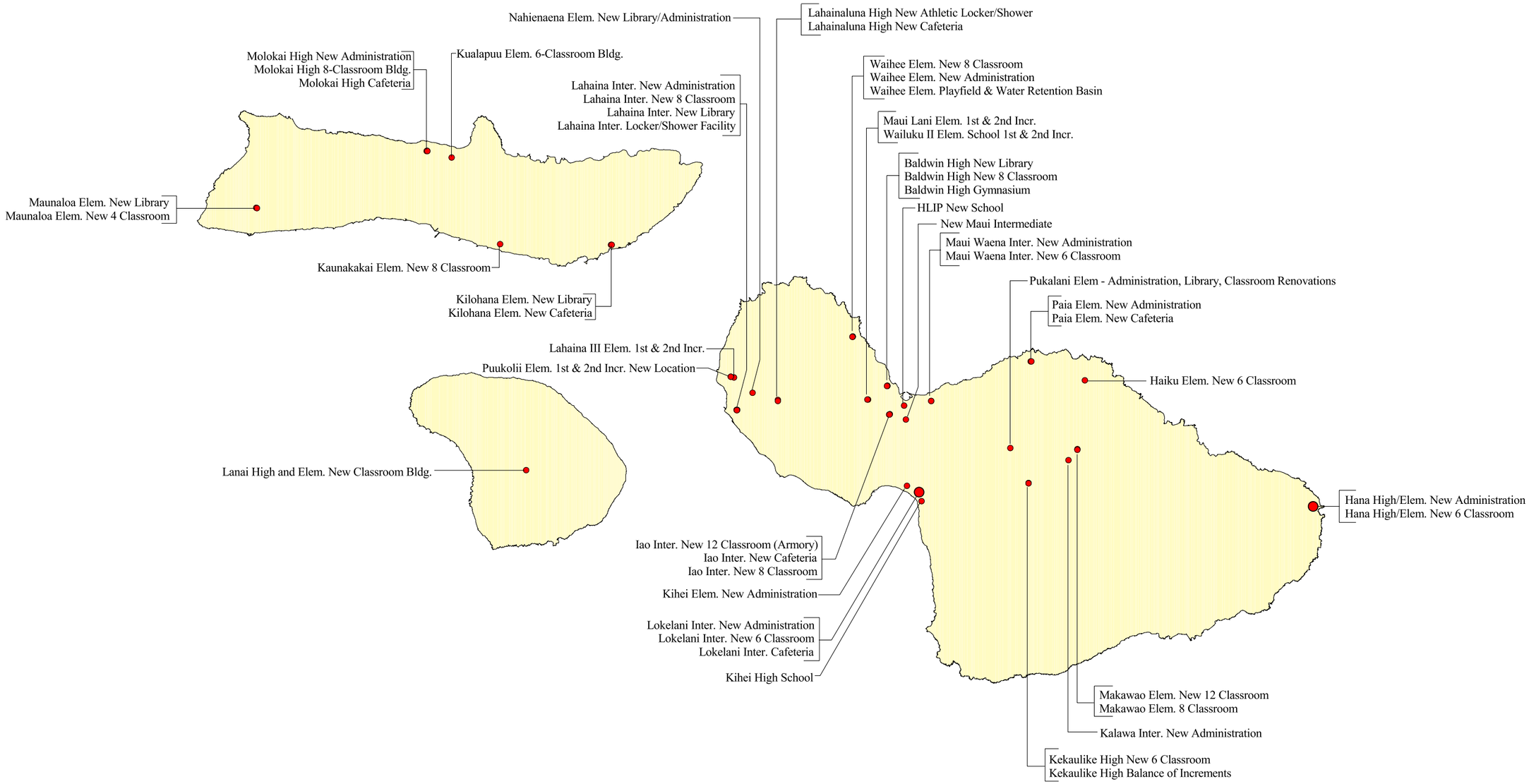

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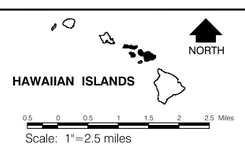
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - Dept. of Education - Maui, Molokai, Lanai

State Water Projects Plan
STATE PROJECTS - DEPT. OF EDUCATION - Maui, Molokai, Lanai
FIGURE 3.7

Date: February 2003

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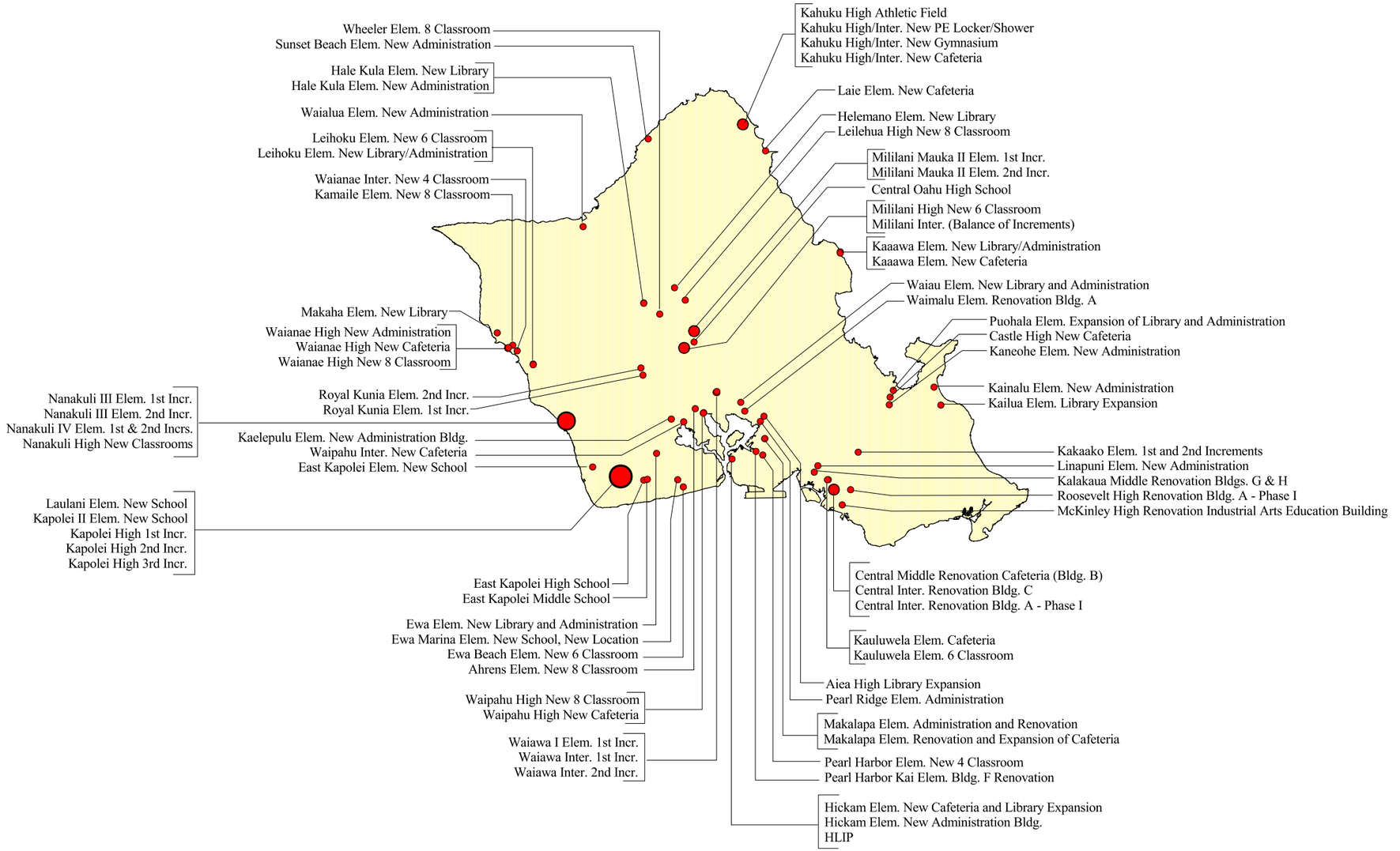

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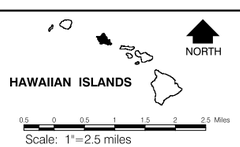
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - Dept. of Education - Oahu

State Water Projects Plan
STATE PROJECTS - DEPT. OF EDUCATION - Oahu
FIGURE 3.8

Date: February 2003

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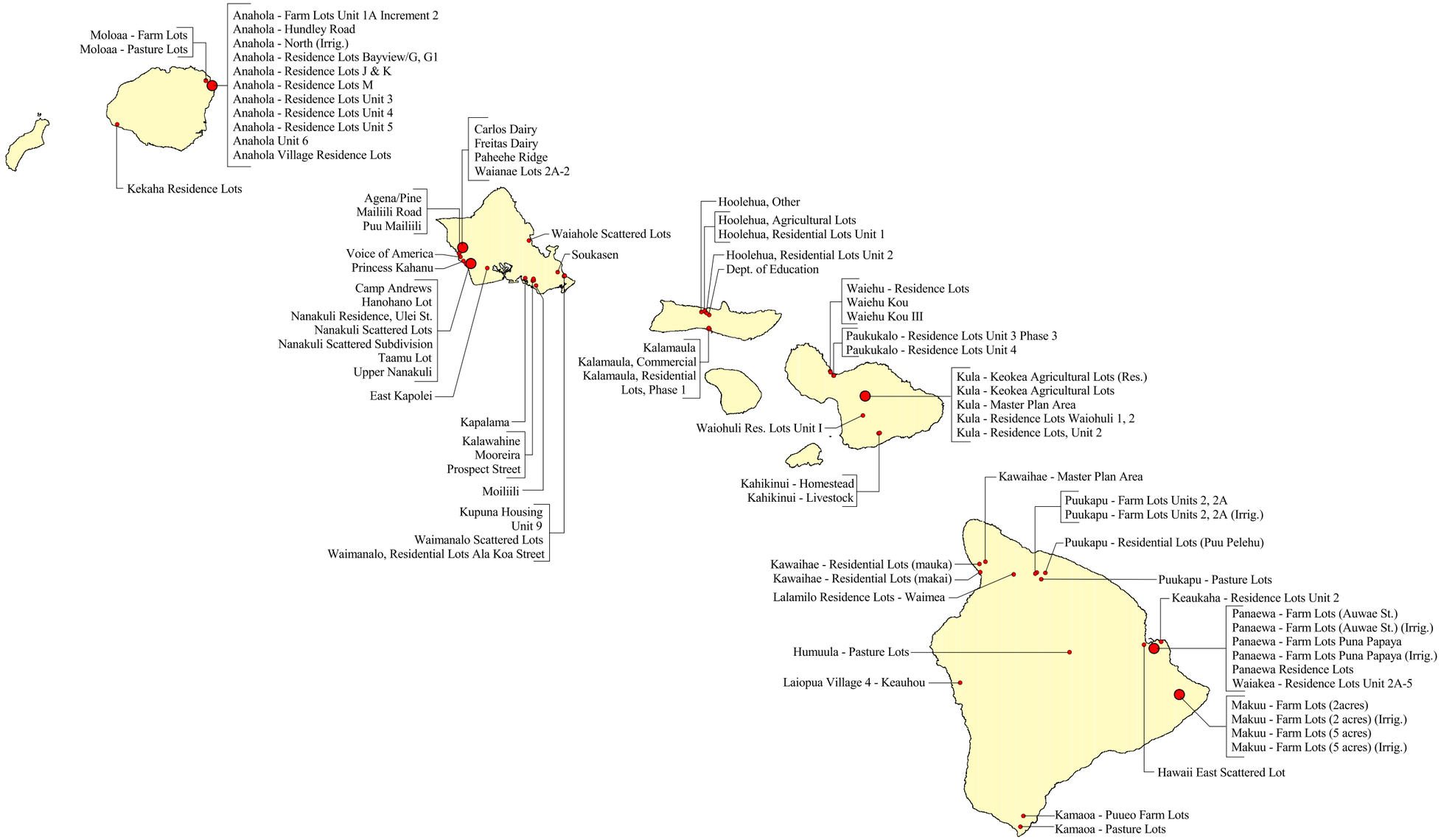

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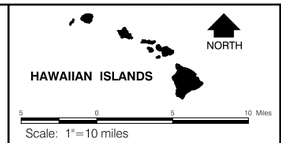
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - Department of Hawaiian Home Lands

State Water Projects Plan
STATE PROJECTS - DEPARTMENT OF HAWAIIAN HOME LANDS
FIGURE 3.9

Date: February 2003

1388 Kapiolani Boulevard

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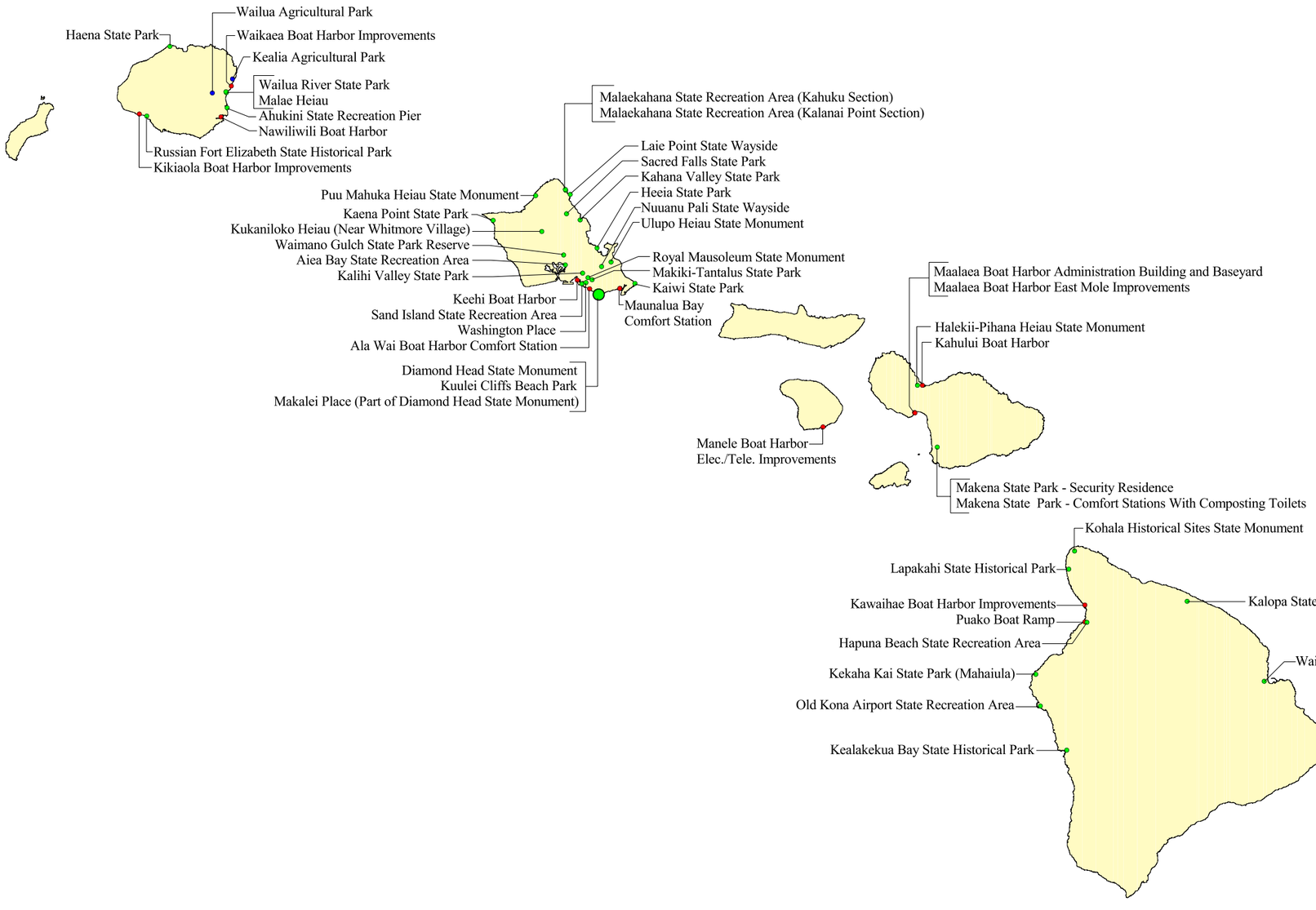

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Land Division
Engineering Branch
Commission on Water Resource Management

LEGEND:

- State Projects - Department of Land and Natural Resources (Parks)
- State Projects - Department of Land and Natural Resources (Boating)
- State Projects - Department of Land and Natural Resources (Engineering)

State Water Projects Plan
STATE PROJECTS - DEPT. OF LAND AND NATURAL RESOURCES
FIGURE 3.10

Date: February 2003

1388 Kapiolani Boulevard
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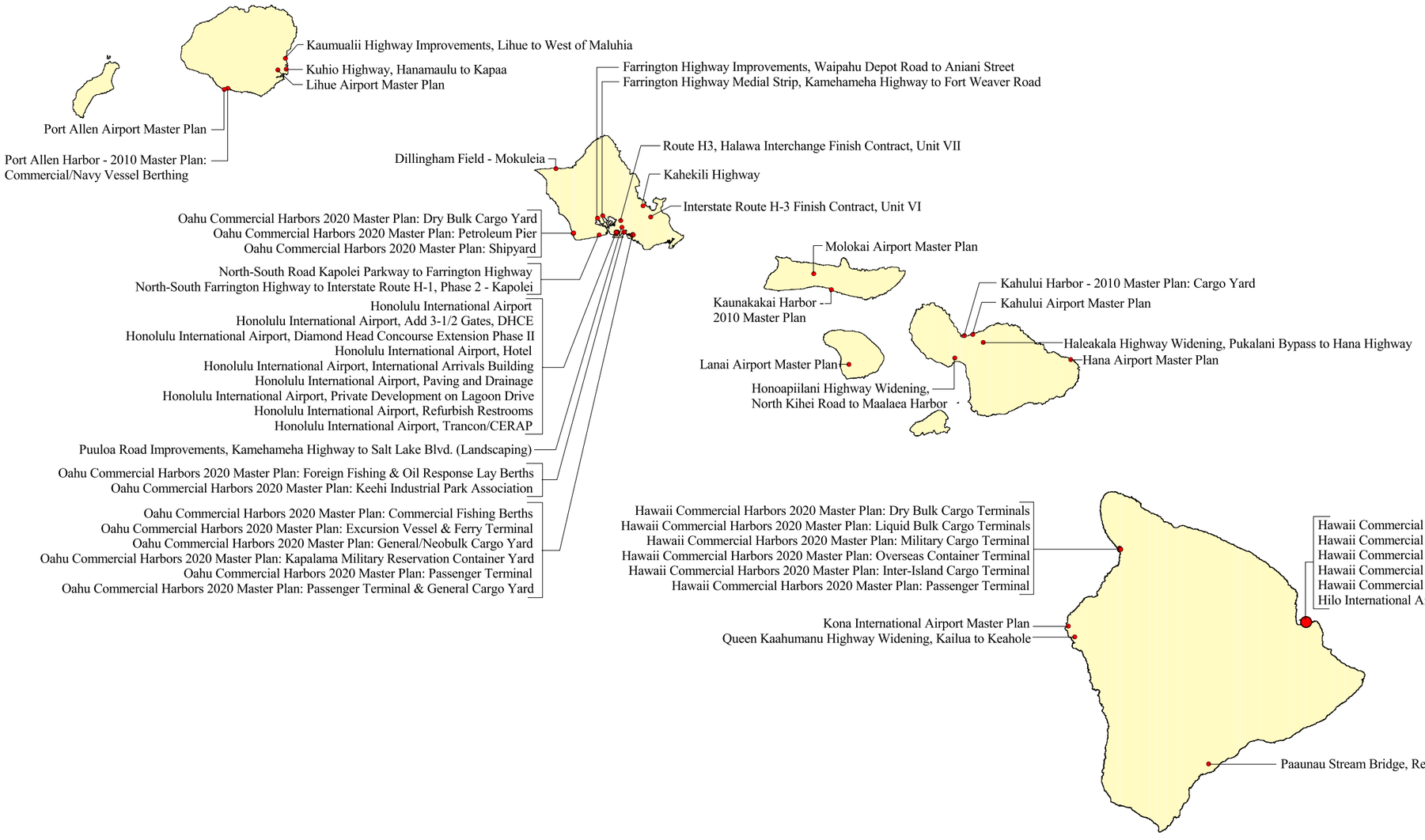
Consulting Engineers
Honolulu, Hawaii 96814



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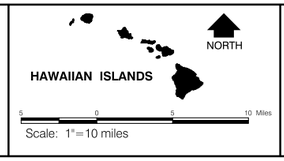
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - Department of Transportation

State Water Projects Plan
STATE PROJECTS - DEPARTMENT OF TRANSPORTATION
FIGURE 3.11

Date: February 2003

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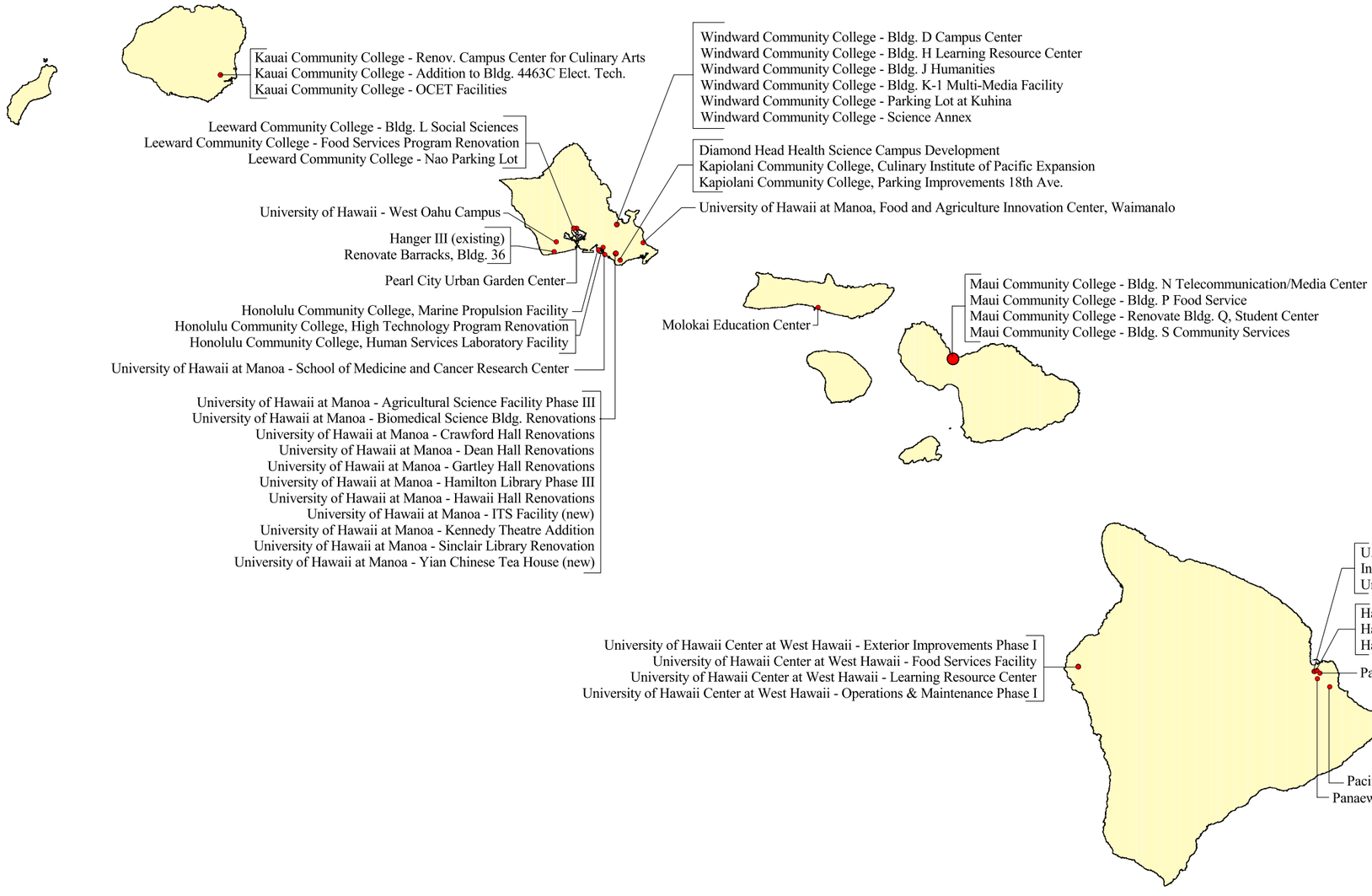
Honolulu, Hawaii 96814



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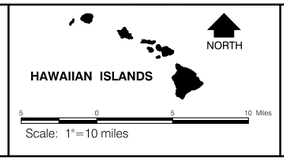
Engineering Branch
Commission on Water Resource Management



LEGEND:

- State Projects - University of Hawaii

State Water Projects Plan
STATE PROJECTS - UNIVERSITY OF HAWAII
FIGURE 3.12

Date: February 2003

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Consulting Engineers
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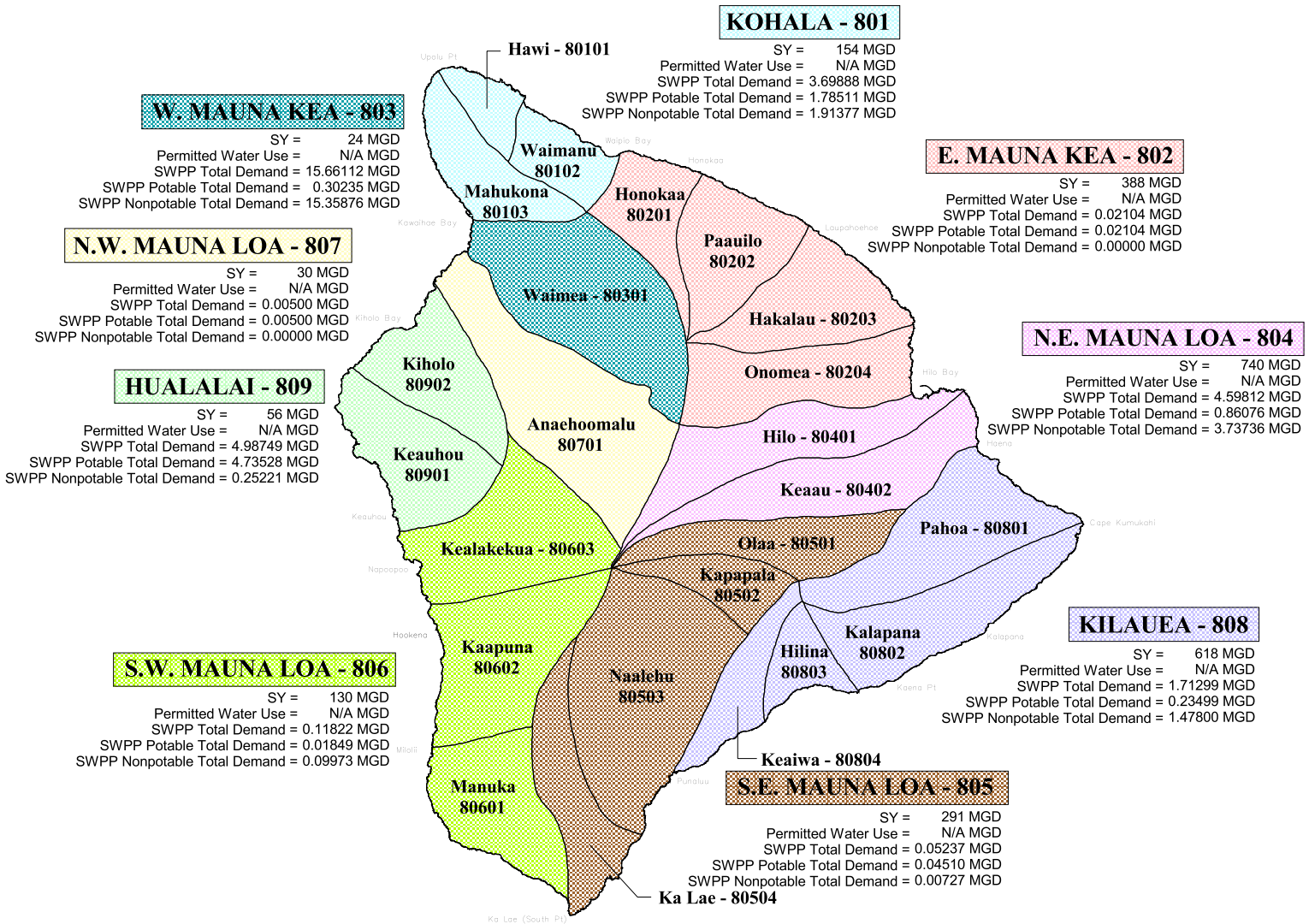
Honolulu, Hawaii 96814



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Engineering Branch
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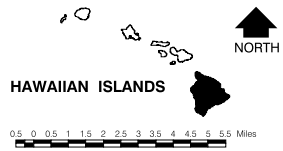

LEGEND:

KOHALA - 801 Hydrological Sector - No.

Hawi - 80101 Aquifer System - No.

State Water Projects Plan
HYDROLOGIC UNITS - HAWAII
FIGURE 3.13

Date: February 2003

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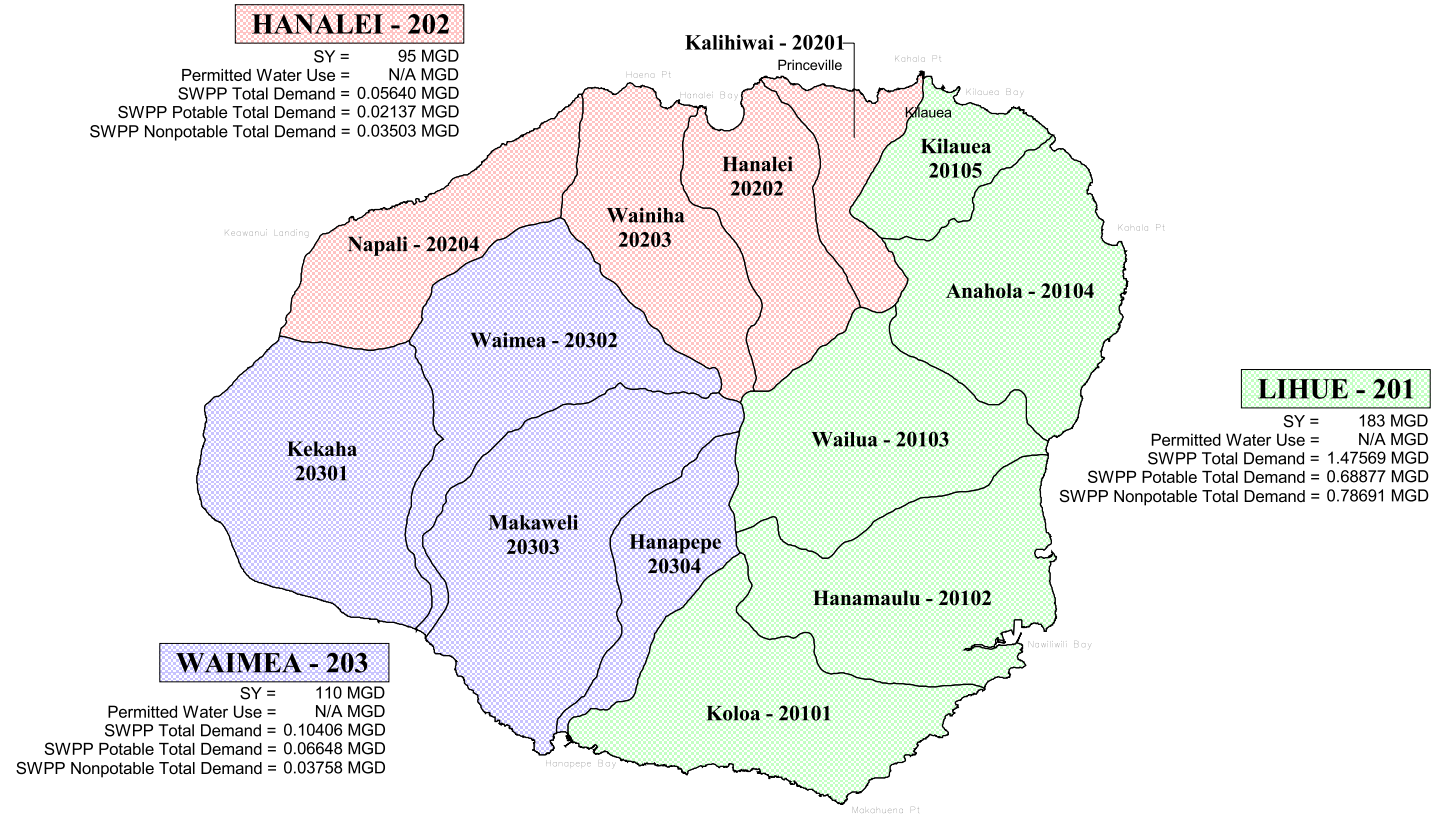
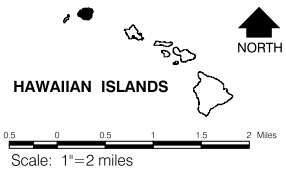
Honolulu, Hawaii 96814



Dept. of Land and Natural Resources
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

HANALEI - 202 Hydrological Sector - No.
Kalihiwai - 20201 Aquifer System - No.

State Water Projects Plan
HYDROLOGIC UNITS - KAUAI
FIGURE 3.14

Date: February 2003

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Consulting Engineers
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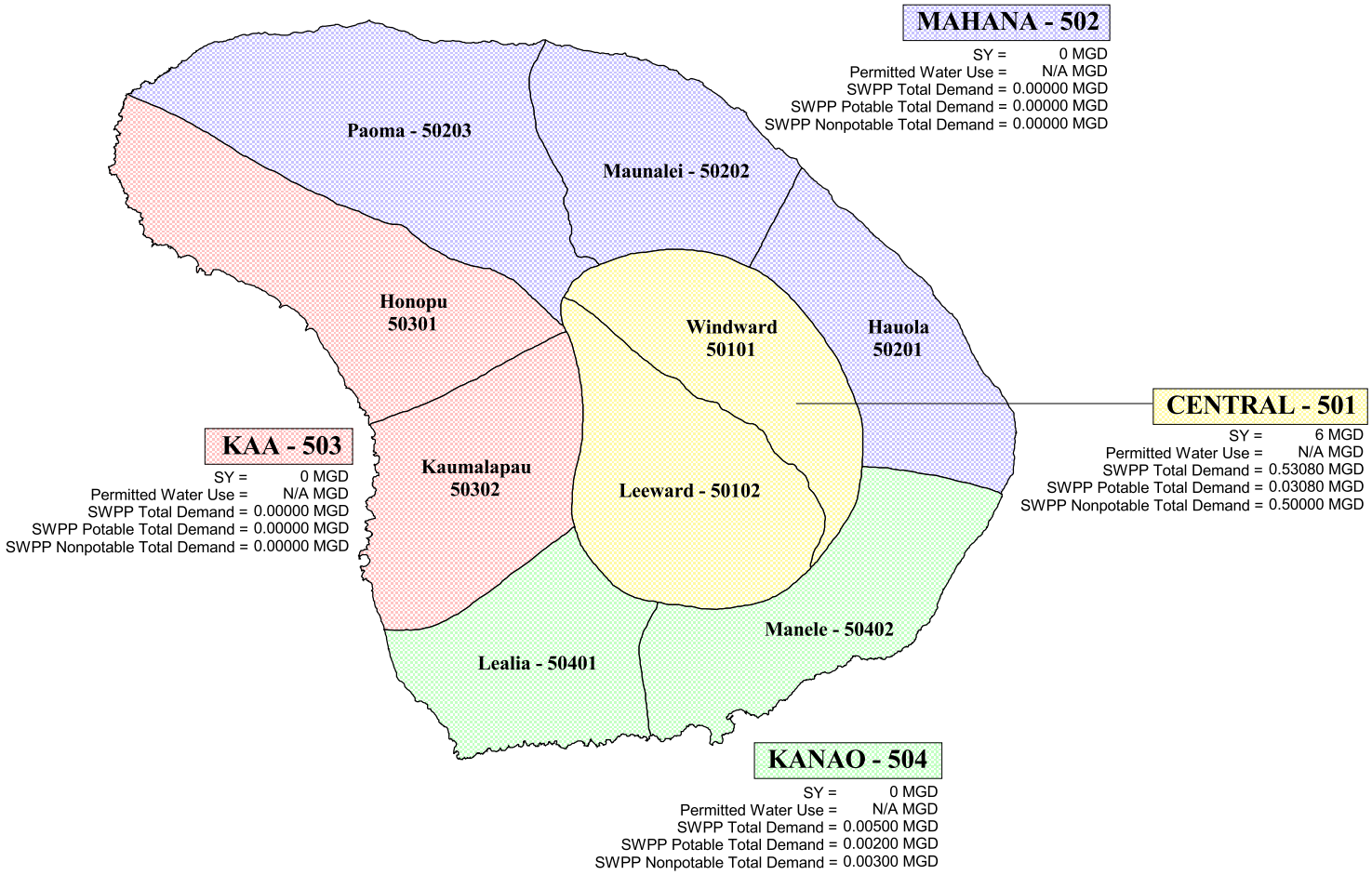
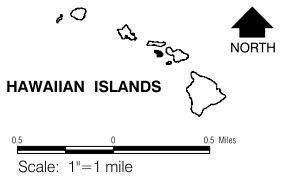
Honolulu, Hawaii 96814



Dept. of Land and Natural Resources
Land Division
Engineering Branch
Commission on Water Resource Management



LEGEND:

CENTRAL - 501 Hydrological Sector - No.
Windward - 50101 Aquifer System - No.

State Water Projects Plan
HYDROLOGIC UNITS - LANAI
FIGURE 3.15

Date: February 2003

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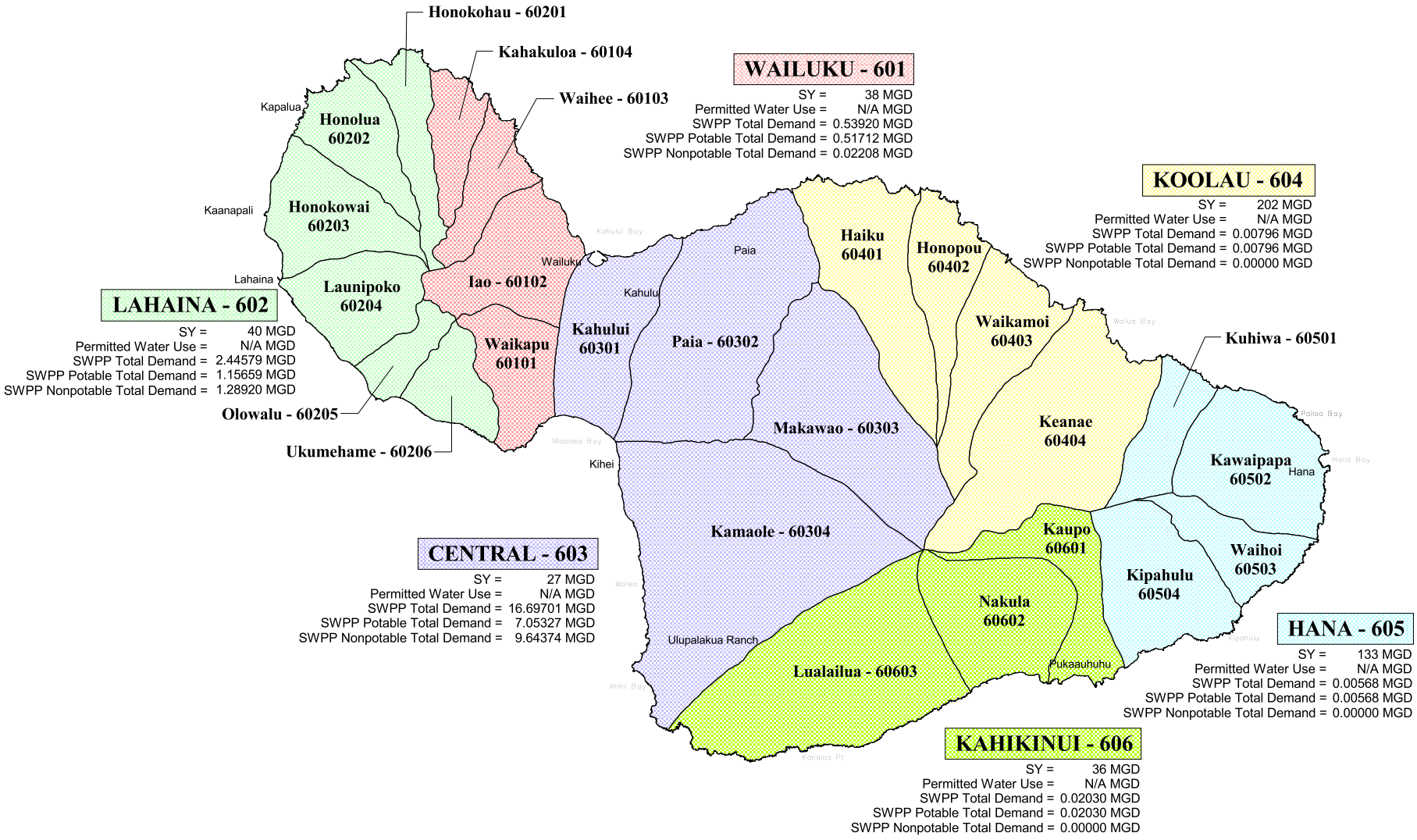
Honolulu, Hawaii 96814



Dept. of Land and Natural Resources
Land Division
Engineering Branch
Commission on Water Resource Management

LEGEND:

WAILUKU - 601 Hydrological Sector - No.
Waikapu - 60101 Aquifer System - No.

State Water Projects Plan
HYDROLOGIC UNITS - MAUI
FIGURE 3.16

Date: February 2003

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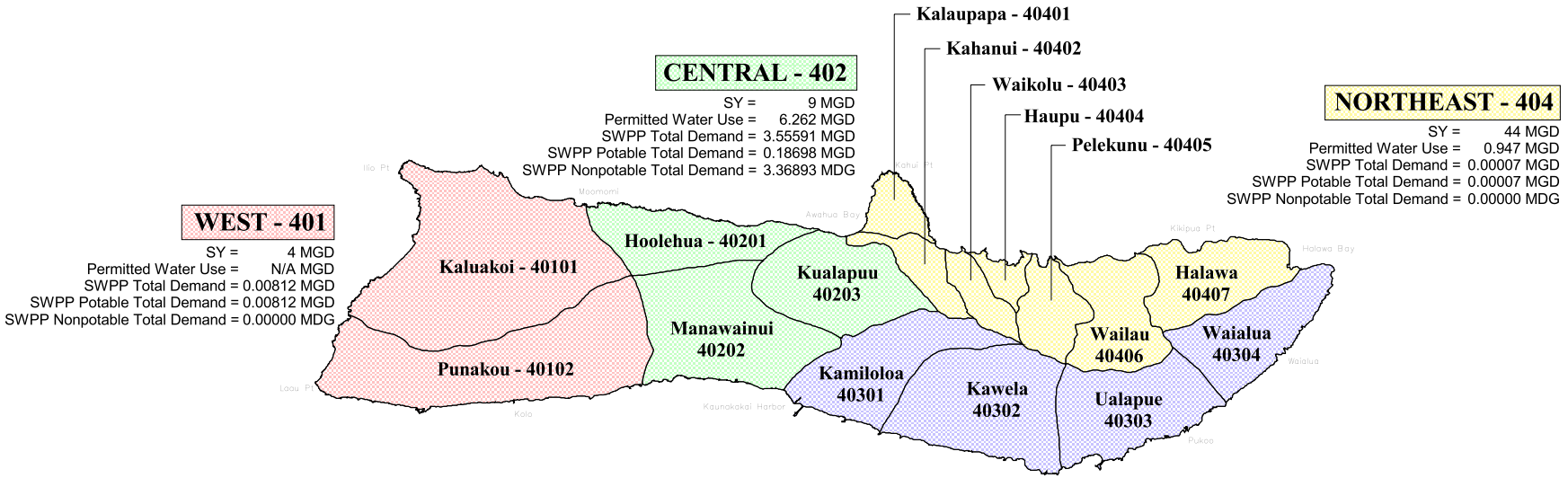

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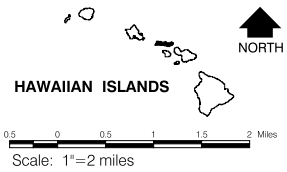

LEGEND:

WEST - 401	Hydrological Sector - No.
Kaluakoi - 40101	Aquifer System - No.

State Water Projects Plan
HYDROLOGIC UNITS - MOLOKAI
FIGURE 3.17

Date: February 2003

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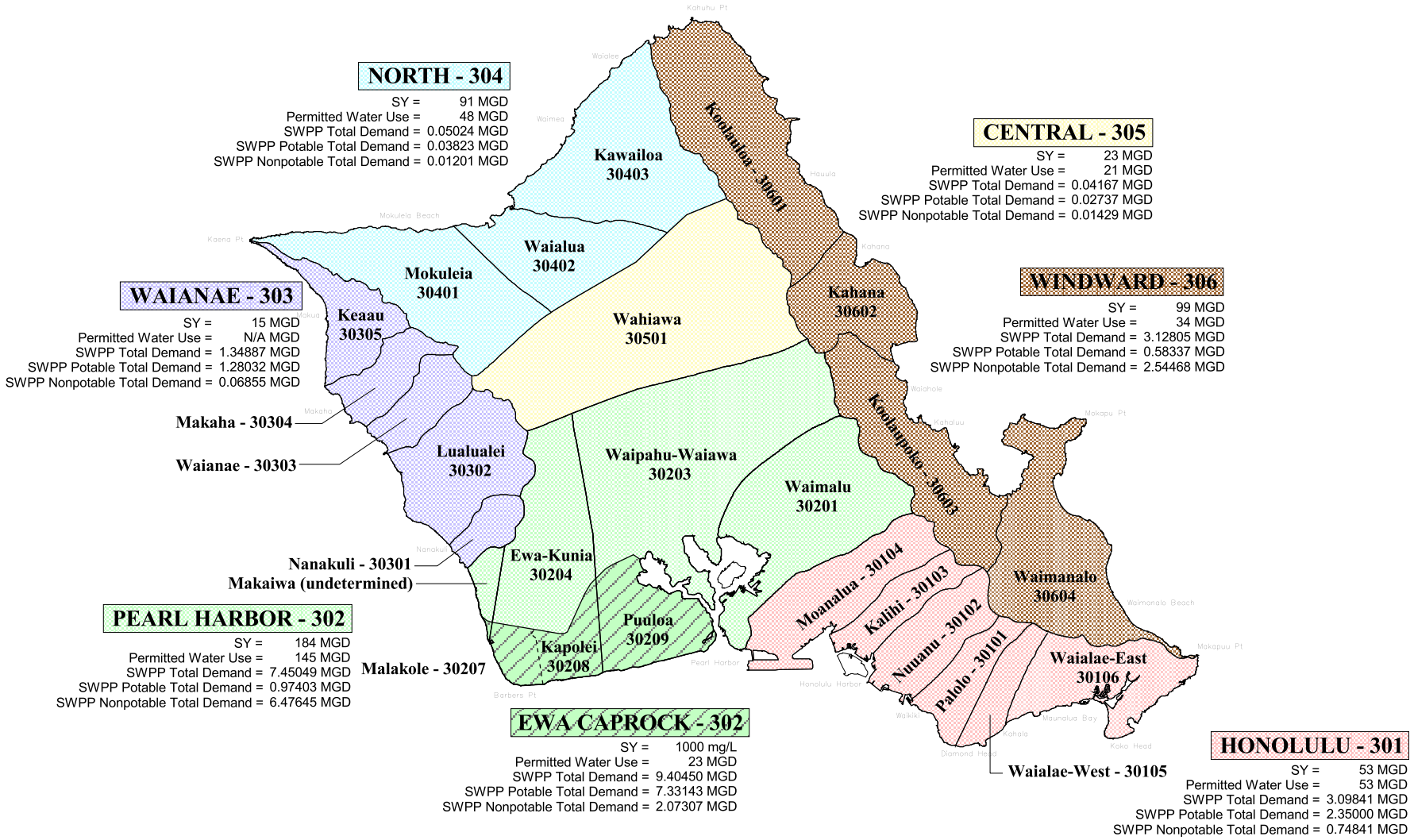

Dept. of Land and Natural Resources
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HAWAIIAN ISLANDS
NORTH
0.5 0 0.5 1 1.5 2 Miles
Scale: 1"=2 miles

LEGEND:

HONOLULU - 301 Hydrological Sector - No.
Palolo - 30101 Aquifer System - No.

State Water Projects Plan
HYDROLOGIC UNITS - OAHU
FIGURE 3.18

Date: February 2003

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Table 3.3
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
KAUAI	**LIHUE**	**201**			**183**	**N/A**	**3.28737**	**0.60065**	**3.88802**
			KOLOA	20101	30		0.00755	0.03686	0.04441
			HANAMAULU	20102	40		0.13242	0.24333	0.37575
			WAILUA	20103	60		1.01740	0.00517	1.02257
			ANAHOLA	20104	36		2.13000	0.31302	2.44302
			KILAUEA	20105	17		0.00000	0.00227	0.00227
	HANALEI	**202**			**95**	**N/A**	**0.02137**	**0.03503**	**0.05640**
			KALIHIWAI	20201	16		0.00000	0.00000	0.00000
			HANALEI	20202	35		0.00101	0.00139	0.00240
			WAINIHA	20203	24		0.03402	0.01998	0.05400
			NAPALI	20204	20		0.00000	0.00000	0.00000
	WAIMEA	**203**			**110**	**N/A**	**0.03758**	**0.05148**	**0.08906**
			KEKAHA	20301	12		0.00000	0.04500	0.04500
			WAIMEA	20302	42		0.00000	0.00150	0.00150
			MAKAWELI	20303	30		0.03758	0.00198	0.03956
			HANAPEPE	20304	26		0.00000	0.00300	0.00300
OAHU	**HONOLULU**	**301**			**53**	**53**	**0.69601**	**2.99840**	**3.69440**
			PALOLO	30101	5	5.646	0.37764	0.49870	0.87634
			NUUANU	30102	15	15.27	0.06234	0.59273	0.65508
			KALIHI	30103	9	8.761	0.24060	0.82211	1.06271
			MOANALUA	30104	18	19.960	0.01143	1.02438	1.03580
			WAIALAE WEST	30105	4	2.987	0.00400	0.05000	0.05400
			WAIALAE EAST	30106	2	0.600	0.00000	0.01048	0.01048

NOTE: Permitted Water Use as of September 2000.

Table 3.3 (cont'd)
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
OAHU	**EWA CAPROCK**	**302**			**N/A**	**23**	**3.00222**	**7.42740**	**10.42962**
			MALAKOLE	30207	N/A	5.928	1.21000	0.65100	1.86100
			KAPOLEI	30208	N/A	2.033	1.79222	6.76560	8.55782
			PUULOA	30209	N/A	14.817	0.00000	0.01080	0.01080
	PEARL HARBOR	**302**			**165**	**145**	**6.58545**	**0.89039**	**7.47584**
			WAIMALU	30201	45	46.793	0.21732	0.01961	0.23693
			WAIPAHU WAIAWA	30203	104	82.905	7.94813	0.71579	8.66392
			EWA KUNIA	30204	16	15.413	0.00000	0.15500	0.15500
	WAIANAE	**303**			**15**	**N/A**	**0.12845**	**1.28473**	**1.41319**
			NANAKULI	30301	1		0.00643	0.65041	0.65684
			LUALUALEI	30302	3		0.03800	0.45530	0.49330
			WAIANAE	30303	3		0.02990	0.16753	0.19743
			MAKAHA	30304	4		0.03000	0.00066	0.03066
			KEAAU	30305	4		0.02412	0.01084	0.03496
	NORTH	**304**			**91**	**48**	**0.01201**	**0.03836**	**0.05037**
			MOKULEIA	30401	12	6.319	0.00000	0.03500	0.03500
			WAIALUA	30402	40	30.311	0.00000	0.00045	0.00045
			KAWAILOA	30403	39	1.549	0.01201	0.00291	0.01492
	CENTRAL	**305**			**23**	**21**	**0.02737**	**0.01430**	**0.04167**
			WAHIAWA	30501	23	20.386	0.01430	0.02737	0.04167
	WINDWARD	**306**			**99**	**34**	**0.39799**	**1.53041**	**1.92841**
			KOOLAULOA	30601	35	20.586	0.15999	0.06088	0.22087
			KAHANA	30602	13	2.465	0.00000	0.00250	0.00250
			KOOLAUPOKO	30603	43	10.312	0.06096	0.15132	0.21228
			WAIMANALO	30604	8	1.656	1.30946	0.18330	1.49276

NOTE: Permitted Water Use as of September 2000.

Table 3.3 (cont'd)
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
MOLOKAI	**WEST**	**401**			**4**	**0**	**0.00000**	**0.00812**	**0.00812**
			KALUAKOI	40101	2	0	0.00000	0.00000	0.00000
			PUNAKOU	40102	2	0	0.00000	0.00812	0.00812
	CENTRAL	**402**			**9**	**6.262**	**3.36893**	**0.18698**	**3.55591**
			HOOLEHUA	40201	2	0	0.54893	0.07627	0.62520
			MANAWAINUI	40202	2	1.567	0.00000	0.09184	0.09184
			KUALAPUU	40203	5	4.842	2.82000	0.01887	2.83887
	SOUTH EAST	**403**			**24**	**2.342**	**0.00000**	**0.04418**	**0.04418**
			KAMILOLOA	40301	3	0.867	0.00000	0.04269	0.04269
			KAWELA	40302	5	0.8	0.00000	0.00000	0.00000
			UALAPUE	40303	8	0.238	0.00000	0.00149	0.00149
			WAIALUA	40304	8	0.437	0.00000	0.00000	0.00000
	NORTH EAST	**404**			**44**	**0.947**	**0.00000**	**0.00007**	**0.00007**
			KALAUPAPA	40401	2	0	0.00000	0.00007	0.00007
			KAHANUI	40402	3	0.094	0.00000	0.00000	0.00000
			WAIKOLU	40403	5	0.853	0.00000	0.00000	0.00000
			HAUPU	40404	2	0	0.00000	0.00000	0.00000
			PELEKUNU	40405	9	0	0.00000	0.00000	0.00000
			WAILAU	40406	15	0	0.00000	0.00000	0.00000
			HALAWA	40407	8	0	0.00000	0.00000	0.00000
LANAI	**CENTRAL**	**501**			**6**	**N/A**	**0.50000**	**0.00390**	**0.50390**
			WINDWARD	50101	3		0.00000	0.00000	0.00000
			LEEWARD	50102	3		0.50000	0.00390	0.50390

NOTE: Permitted Water Use as of September 2000.

Table 3.3 (cont'd)
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
LANAI	**MAHANA**	**502**			**0**	**N/A**	**0.00000**	**0.00000**	**0.00000**
			HAUOLA	50201	0		0.00000	0.00000	0.00000
			MAUNALEI	50202	0		0.00000	0.00000	0.00000
			PUOMA	20203	0		0.00000	0.00000	0.00000
	KAA	**503**			**0**	**N/A**	**0.00000**	**0.00000**	**0.00000**
			HONOPU	50301	0		0.00000	0.00000	0.00000
			KAUMALAPAU	50302	0		0.00000	0.00000	0.00000
	KANAO	**504**			**0**	**N/A**	**0.00270**	**0.00250**	**0.00520**
			LEALIA	50401	0		0.00000	0.00000	0.00000
			MANELE	50402	0		0.00270	0.00250	0.00520
MAUI	**WAILUKU**	**601**			**38**	**N/A**	**0.02208**	**0.46025**	**0.48233**
			WAIKAPU	60101	2		0.00000	0.00150	0.00150
			IAO	60102	20		0.01698	0.44372	0.46070
			WAIHEE	60103	8		0.00510	0.01503	0.02013
			KAHAKULOA	60104	8		0.00000	0.00000	0.00000
	LAHAINA	**602**			**40**	**N/A**	**1.15657**	**1.28922**	**2.44579**
			HONOKOHAU	60201	10		0.00000	0.00000	0.00000
			HONOLUA	60202	8		0.00000	0.00000	0.00000
			HONOKOWAI	60203	8		0.00000	0.06000	0.06000
			LAUNIPOKO	60204	8		1.28922	1.09657	2.38579
			OLOWALU	60205	3		0.00000	0.00000	0.00000
			UKUMEHAME	60206	3		0.00000	0.00000	0.00000

NOTE: Permitted Water Use as of September 2000.

Table 3.3 (cont'd)
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
MAUI	**CENTRAL**	**603**			**27**	**N/A**	**6.86264**	**4.12594**	**10.98858**
			KAHULUI	60301	1		0.46694	0.55435	1.02129
			PAIA	60302	8		0.04900	0.01559	0.06459
			MAKAWAO	60303	7		0.00000	5.98567	5.98567
			KAMAOLE	60304	11		3.61000	0.30703	3.91703
	KOOLAU	**604**			**202**	**N/A**	**0.00000**	**0.00796**	**0.00796**
			HAIKU	60401	31		0.00000	0.00796	0.00796
			HONOPOU	60402	29		0.00000	0.00000	0.00000
			WAIKAMOI	60403	46		0.00000	0.00000	0.00000
			KEANAE	60404	96		0.00000	0.00000	0.00000
	HANA	**605**			**133**	**N/A**	**0.00000**	**0.00568**	**0.00568**
			KUHIWA	60501	16		0.00000	0.00000	0.00000
			KAWAIPAPA	60502	48		0.00000	0.00568	0.00568
			WAIHOI	60503	20		0.00000	0.00000	0.00000
			KIPAHULU	60504	49		0.00000	0.00000	0.00000
	KAHIKINUI	**606**			**36**	**N/A**	**0.00000**	**0.01720**	**0.01720**
			KAUPO	60601	18		0.00000	0.00000	0.00000
			NAKULA	60602	7		0.00000	0.00000	0.00000
			LUALAILUA	60603	11		0.00000	0.01720	0.01720

NOTE: Permitted Water Use as of September 2000.

Table 3.3 (cont'd)
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
HAWAII	**KOHALA**	**801**			**154**	**N/A**	**6.91377**	**1.78511**	**8.69888**
			HAWI	80101	27		5.00073	0.00057	5.00130
			WAIMANU	80102	110		1.82500	0.00000	1.82500
			MAHUKONA	80103	17		0.08804	1.78454	1.87258
	EAST MAUNA KEA	**802**			**388**	**N/A**	**0.00000**	**0.02104**	**0.02104**
			HONOKAA	80201	31		0.00000	0.00881	0.00881
			PAAUILO	80202	60		0.00000	0.00500	0.00500
			HAKALAU	80203	150		0.00000	0.00043	0.00043
			ONOMEA	80204	147		0.00000	0.00680	0.00680
	WEST MAUNA KEA	**803**			**24**	**N/A**	**11.35876**	**0.23236**	**11.59112**
			WAIMEA	80301	24		11.35876	0.23236	11.59112
	N.E. MAUNA LOA	**804**			**740**	**N/A**	**1.34352**	**1.82575**	**3.16927**
			HILO	80401	347		0.99352	0.65100	1.64452
			KEAAU	80402	393		0.35000	1.17475	1.52475
	S.E. MAUNA LOA	**805**			**291**	**N/A**	**0.00727**	**0.04510**	**0.05237**
			OLAA	80501	124		0.00000	0.00285	0.00285
			KAPAPALA	80502	19		0.00000	0.00000	0.00000
			NAALEHU	80503	117		0.00727	0.01225	0.01952
			KALAE	80504	31		0.00000	0.03000	0.03000

NOTE: Permitted Water Use as of September 2000.

Table 3.3 (cont'd)
Summary of SWPP Projected Water Demands, Sustainable Yield, and Permitted Water Use by Aquifer System

Island	Aquifer Sector	Sector No.	Aquifer System	System No.	Sus. Yield (MGD)	Permitted Water Use (MGD)	SWPP 2018 Nonpotable Demand (MGD)	SWPP 2018 Potable Demand (MGD)	SWPP 2018 Total Demand (MGD)
HAWAII	**S.W. MAUNA LOA**	**806**			**130**	**N/A**	**0.05237**	**0.01729**	**0.10902**
			MANUKA	80601	42		0.00000	0.00000	0.00000
			KAAPUNA	80602	50		0.07973	0.00405	0.08378
			KEALAKEKUA	80603	38		0.01200	0.01324	0.02524
	N.W. MAUNA LOA	**807**			**30**	**N/A**	**0.00000**	**0.00500**	**0.00500**
			ANAEHOOMALU	80701	30		0.00000	0.00500	0.00500
	KILAUEA	**808**			**618**	**N/A**	**1.47000**	**0.23506**	**1.70506**
			PAHOA	80801	435		1.47000	0.21613	1.68613
			KALAPANA	80802	157		0.00000	0.00000	0.00000
			HILINA	80803	9		0.00000	0.00000	0.00000
			KEAIWA	80804	17		0.00000	0.01893	0.01893
	HUALALAI	**809**			**56**	**N/A**	**0.25473**	**3.80838**	**4.06311**
			KEAUHOU	80901	38		0.25473	3.80838	4.06311
			KIHOLO	80902	18		0.00000	0.00000	0.00000

NOTE: Permitted Water Use as of September 2000.

3.4. SUMMARY OF PROJECTED WATER REQUIREMENTS

3.4.1. SWPP Project Water Demands

SWPP project data was revised and updated as of September 2002 through coordination of each State department. Project water demands were updated based department input and current project status. There were 584 State projects that were reported requiring water. It is anticipated that SWPP project data will be updated every two years by DLNR.

Table 3.4
Total Projected Demands by State Department

	Total Additional Yearly Projected Cumulative Average Day Demand (mgd)							
Department	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
DAGS	0.124	0.606	0.691	0.775	0.775	0.957	0.957	0.997
DOA	7.505	7.755	8.765	8.765	14.765	35.315	35.315	35.470
DBEDT	1.023	2.259	3.676	4.154	4.625	8.075	10.789	13.833
DOD	0.791	0.792	0.793	0.793	0.793	0.793	0.793	0.793
DOE	0.620	0.810	2.227	2.243	2.243	2.598	2.598	2.598
DHHL	0.648	0.660	2.025	2.025	2.025	11.659	15.390	15.815
DOH	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
DHS	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Judiciary	0.000	0.000	0.008	0.008	0.008	0.008	0.008	0.008
DLNR	0.462	0.602	1.121	1.170	1.221	2.251	2.255	2.302
DPS	0.107	0.107	0.107	0.143	0.143	0.143	0.143	0.143
DOT	0.234	0.712	1.330	1.944	1.971	2.030	2.256	2.417
UH	0.669	3.789	4.466	4.554	4.623	5.579	6.038	6.486
State Totals	**12.194**	**18.089**	**25.221**	**26.586**	**33.204**	**69.421**	**76.554**	**80.874**

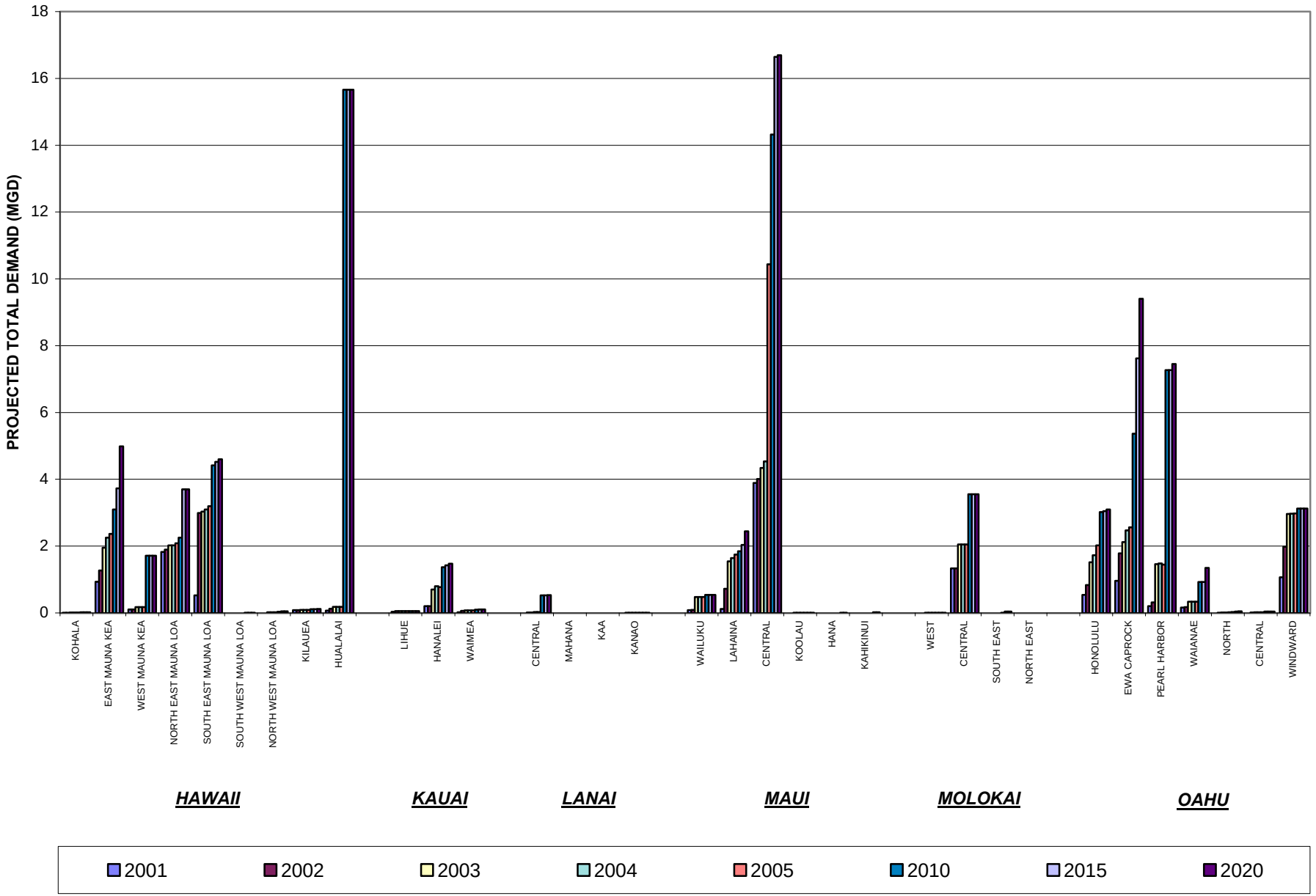
Table 3.5
Total Projected Demands by Island

	Total Additional Yearly Projected Cumulative Average Day Demand (mgd)							
Island	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
Hawaii	3.553	6.477	7.484	7.852	8.128	27.304	29.509	30.855
Kauai	0.261	0.325	0.838	0.937	0.905	1.524	1.584	1.636
Lanai	0.002	0.018	0.018	0.033	0.033	0.534	0.535	0.536
Maui	4.107	4.827	6.379	6.675	12.680	16.716	19.254	19.716
Molokai	1.336	1.336	2.064	2.064	2.064	3.570	3.607	3.608
Oahu	2.936	5.114	8.437	9.026	9.393	19.772	22.064	24.522
State Totals	**12.194**	**18.089**	**25.221**	**26.586**	**33.204**	**69.421**	**76.554**	**80.874**

FIGURE 3.19

PROJECTED WATER DEMANDS

BY HYDROLOGICAL SECTOR



The total project water demands were sorted and summarized to report the yearly cumulative average day demands throughout the 20-year planning period. **Table 3.4** reports the projected water demand for SWPP projects by State department. **Table 3.5** shows the projected water demand for SWPP projects by island. Existing demands are as reported by State departments. The future additional demands do not include the existing water consumption totals. A graph of the projected water demand by hydrological sector is shown on **Figure 3.19** to indicate the relative demands by geographical area.

3.4.2. Prioritization of State Water Demands

State department water needs scheduled within the next five years (2005) will receive priority in the use of existing State water supply resources. The SWPP Water Development Strategy (Chapter 5) outlines source options to address short-term demands. Project demand requirements scheduled within the next five years were presented to indicate the magnitude project water demands by island. **Table 3.6** lists the total cumulative average day demands by primary use: potable, nonpotable and projects using potable water for nonpotable needs (Nonpotable using Potable) for the next five years.

Table 3.7 lists the SWPP projects with significant water demands on each island within the next five years. The project name, State department, primary use, aquifer system and 2005 water demand are provided.

Table 3.6
Projected SWPP Water Demands From 2001 to 2005

		Total Yearly Projected Cumulative Average Day Demand (mgd)				
Island	**Primary Use**	**2001**	**2002**	**2003**	**2004**	**2005**
Statewide	**Total**	**12.194**	**18.098**	**25.221**	**26.586**	**33.204**
Hawaii	Potable	1.257	1.761	2.462	2.753	2.986
	Nonpotable	2.175	4.575	4.575	4.575	4.575
	Nonpotable using Potable	0.120	0.141	0.447	0.523	0.567
	Total	**3.553**	**6.477**	**7.484**	**7.852**	**8.128**
Kauai	Potable	0.238	0.254	0.451	0.539	0.545
	Nonpotable	0.021	0.034	0.034	0.034	0.034
	Nonpotable using Potable	0.002	0.037	0.353	0.363	0.326
	Total	**0.261**	**0.325**	**0.838**	**0.937**	**0.905**
Lanai	Potable	0.001	0.015	0.015	0.030	0.030
	Nonpotable	0.000	0.000	0.000	0.000	0.000
	Nonpotable using Potable	0.001	0.003	0.003	0.003	0.003
	Total	**0.002**	**0.018**	**0.018**	**0.033**	**0.033**
Maui	Potable	0.419	0.785	1.953	2.140	2.089
	Nonpotable	3.610	3.610	3.610	3.610	9.610
	Nonpotable using Potable	0.078	0.433	0.816	0.925	0.981
	Total	**4.107**	**4.827**	**6.379**	**6.675**	**12.680**
Molokai	Potable	0.016	0.016	0.195	0.195	0.195
	Nonpotable	1.320	1.320	1.869	1.869	1.869
	Nonpotable using Potable	0.000	0.000	0.000	0.000	0.000
	Total	**1.336**	**1.336**	**2.064**	**2.064**	**2.064**
Oahu	Potable	1.703	3.008	4.399	4.687	5.039
	Nonpotable	1.038	1.288	2.395	2.396	2.397
	Nonpotable using Potable	0.195	0.818	1.642	1.943	1.957
	Total	**2.936**	**5.114**	**8.437**	**9.026**	**9.393**

Table 3.7
Prioritized List of SWPP Projects to 2005

Project Name	Island	Dept.	Primary Use	Aquifer Sector	2005 Cumulative Demand (mgd)
Waimea Irrigation System	Hawaii	DOA	Nonpotable	Kohala	1.825
Pacific Aquacult&Coastal Resour Ctn	Hawaii	UH	Nonpotable	NE Mauna Loa	1.650
Natural Energy Laboratory of Hawaii	Hawaii	NELHA	Potable	Hualalai	0.900
Pacific Aqu&Coas Res Ctn UHH Farm	Hawaii	UH	Nonpotable	NE Mauna Loa	0.750
Kealakehe Planned Com (La'i'opua)	Hawaii	HCDCH	Potable	Hualalai	0.587
Panaewa Farm Well and Pump	Hawaii	UH	Nonpotable	NE Mauna Loa	0.350
Queen Kaahumanu Hwy, Kailua to Keahole	Hawaii	DOT-Hwy	Nonpotable	Hualalai	0.240
Kona International Airport Master Plan	Hawaii	DOT-A	Potable	Hualalai	0.152
Laiopua Village 4	Hawaii	DHHL	Potable	Hualalai	0.100
Kaumualii Hwy Improvements	Kauai	DOT-Hwy	Nonpotable	Lihue	0.232
Anahola Unit 6	Kauai	DHHL	Potable	Lihue	0.125
Upcountry Maui Irrigation Project	Maui	DOA	Nonpotable	Central	3.610
Lahaina Master Plan	Maui	HCDCH	Combined	Lahaina	1.490
Waiohuli Residential Lots Unit 1	Maui	DHHL	Potable	Central	0.230
HLIP School (New School)	Maui	DOE	Potable	Wailuku	0.120
Kahului Airport Access Road	Maui	DOT-High	Nonpotable	Central	0.100
Maui Comm Correction Ctr, Expan/Ren	Maui	DPS	Potable	Central	0.100
Waiehu Kou	Maui	DHHL	Potable	Wailuku	0.100
Molokai Agricultural Park	Molokai	DOA	Nonpotable	Central	1.320
Hoolehua Agricultural Lots	Molokai	DHHL	Nonpotable	Central	0.549
Waimanalo Irrigation System	Oahu	DOA	Nonpotable	Windward	1.250
UH Manoa, Waimanalo Food&Ag Ctr	Oahu	UH	Combined	Windward	1.235
Royal Kunia Agricultural Park	Oahu	DOA	Nonpotable	Pearl Harbor	0.750
Kalaeloa Training Facility/Armory	Oahu	DOD	Potable	Ewa Caprock	0.717
Villages of Kapolei	Oahu	HCDCH	Potable	Ewa Caprock	0.530
Kapolei Civic Center, State Ofc Bldg	Oahu	DAGS-PL	Potable	Ewa Caprock	0.442
Diamond Head State Monument	Oahu	DLNR-Parks	Nonpotable	Honolulu	0.277
Hawaii Convention Center	Oahu	Conv. Cnt	Potable	Honolulu	0.250
North-South Rd, Farr Hwy to H-1 Ph.2	Oahu	DOT-Hwy	Nonpotable	Ewa Caprock	0.240
Sand Island State Recreation Area	Oahu	DLNR-Parks	Nonpotable	Honolulu	0.239
Kalaeloa Comm. Dev. District	Oahu	Bar. Pt Com.	Potable	Ewa Caprock	0.204
Oahu Commercial Harbors: Dry Bulk	Oahu	DOT-Harbors	Potable	Ewa Caprock	0.110
East Kapolei	Oahu	HCDCH	Potable	Ewa Caprock	0.100

3.4.3. Issues, Concerns and Uncertainties Related to Project Demands

The issues, concerns and uncertainties raised in this section are based on discussions with departmental contacts, evaluation of SWPP survey data and calculation of SWPP project water demands. The comments and recommendations are provided for discussion purposes only and suggest ways of improving the gathering of more accurate SWPP data in the future.

1) Improve the project coordination among the various divisions and branches within departments. Recommend maintaining an updated list and information of all future department projects.

2) Establish a uniform method of calculating projected water demand by using standard land use types of units and areas, unit rates based on either Water System Standards or other accepted references. Establish uniform consumption guidelines for State departments to follow while projecting future water demand and reviewing submitted project demands. Generally, project water demands computed from Water System Standards represent planning level demands. Project demands should be reevaluated or calculated when additional or design information becomes available.

3) Water demand information of projects that do not receive funding or encounter funding delays by the legislature should be maintained and kept current. Projects in the initial planning phase generally have limited data to compute project water demands.

4) Modifications or changes to CIP projects brought on by funding issues, project priority status, or departmental policies may affect the completion and water requirements of State projects.

5) Establish a uniform method of calculating project average day demand based on plumbing fixture units. Establish uniform guidelines or range of demands to convert project water demands from gallons per minute to gallon per day for various land uses. A comparison of the actual metered water consumption and estimated demand projection upon project completion is recommended.

6) Project water demands using State water allocation credits from the BWS should be monitored and reviewed. Project water demands, which remain on a planning level, should be revised based on final design criteria. New project demands should be resubmitted to the BWS to adjust the water allocation balance.

3.4.4. Range of Projected Water Demands

The SWPP project water demands were formulated into high, medium and low demand ranges. The SWPP demand ranges will be used in the updating of other components in the Hawaii Water Plan and the Integrated Resource Planning process to coordinate statewide source planning strategies. The medium forecast is composed from SWPP project water demands as reported by State departments. The low range forecast was developed by reducing the base or medium forecast demands by 20 percent. The reduction to the low demand forecast range accounts for demand side management measures, savings from water conservation, conservatism within the Water Standard System unit rates and uncertainties with project funding, construction of projects and project delays. The high range forecast was determined by increasing the medium demand range by a 20 percent factor. The high-end forecast provides a contingency to the medium demand forecast to account for additional future State projects or modifications to SWPP projects. See **Table 3.8** for the range of demands.

Table 3.8
SWPP High, Medium and Low Demand Forecast Ranges

	Total Yearly Projected Cumulative Average Day Demand (mgd)							
Range	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
High	14.63	21.72	30.27	31.90	39.84	83.30	91.86	97.05
Medium	12.19	18.10	25.22	26.59	33.20	69.42	76.55	80.87
Low	9.76	14.48	20.18	21.27	26.56	55.54	61.24	64.70

CHAPTER 4
WATER CONSERVATION PROGRAMS FOR STATE DEPARTMENTS

4.1. GENERAL

Water conservation for the State of Hawaii could play an important role in the management and budgeting of the State's water resources. According to the United States Environmental Protection Agency (U.S.E.P.A.) Water Conservation Plan Guidelines, water conservation measures include, but are not limited to the following:

1) Universal Metering
2) Water Accounting and Loss Control
3) Costing and Pricing
4) Information and Education
5) Water Use Audits
6) Retrofits
7) Pressure Management
8) Landscape Efficiency
9) Replacement and Promotions
10) Reuse and Recycling
11) Water use Regulation
12) Integrated Resource Management

4.2. U.S.E.P.A. CONSERVATION MEASURES

The following are brief descriptions of the U.S.E.P.A. conservation measures. For more details on each measure, refer to Appendix A in the U.S.E.P.A. Water Conservation Plan Guidelines, August 6, 1998.

4.2.1. Universal Metering

Metering is important in managing and accounting of water supplies. Components of universal metering are as follows:

1) Source-water metering
2) Service-connection metering
3) Public-use water metering
4) Fixed-interval meter reading
5) Checking meter condition and accuracy
6) Meter testing, calibration, repair, and replacement

4.2.2. Water Accounting and Loss Control

A water accounting system can help to track water throughout a system, and identify areas that may require attention for problems such as large volumes of nonaccount water (metered but not billed, or unmetered). Components of water accounting and loss control are as follows:

1) Account for water
2) Repair known leaks
3) Analysis of nonaccount water
4) System audit
5) Leak detection and repair strategy
6) Automated sensors/telemetry
7) Loss-prevention program

4.2.3. Costing and Pricing

Costing and pricing are considered conservation strategies because they involve an understanding the true value of water and conveying information about that value, through prices, to the water customers. Components of costing and pricing are as follows:

1) Cost-of-service accounting
2) User charges
3) Metered rates
4) Cost analysis
5) Nonpromotional rates
6) Advanced pricing methods

4.2.4. Information and Education

The goal of information and education is to produce water savings when customers change their water-use habits. Components of information and education are as follows:

1) Understandable water bill
2) Information available
3) Informative water bill
4) Water bill inserts
5) School program
6) Public education program
7) Workshops
8) Advisory committee

4.2.5. Water-Use Audits

An audit can provide valuable information on how the water is used, and how to reduce the usage through specific conservation measures. Components of water-use audits are as follows:

1) Audits of large-volume users
2) Large-landscape audits
3) Selective end-use audits

4.2.6. Retrofits

Retrofitting involves replacing existing fixtures with more efficient water-use fixtures. Components of retrofits are as follows:

1) Retrofit kits available
2) Distribution of retrofit kits
3) Targeted programs

4.2.7. Pressure Management

Reducing water pressure in the system can decrease items such as leakage, flow through fixtures, and stresses on pipes and joints, which may lead to leaks. Lower pressures can also decrease system deterioration, and end-use fixtures and appliances. Components of pressure management are as follows:

1) System wide pressure management
2) Pressure-reducing valves

4.2.8. Landscape Efficiency

Outdoor water usage can be a major component of daily consumption. Reducing the outdoor usage can be accomplished with the efficiency-oriented landscape principles listed below:

1) Promotion of landscape efficiency
2) Selective irrigation submetering
3) Landscape planning and renovation
4) Irrigation management

4.2.9. Replacements and Promotions

Programs may be developed to encourage replacement of old fixtures with new water efficient fixtures and appliances. This can be accomplished with the following:

1) Rebates and incentives
2) Promotion of new technologies

4.2.10. Reuse and Recycling

This involves the use of recycled water for nonpotable purposes, thus reducing the amount of potable water used in nonpotable applications. These include the following:

1) Industrial applications
2) Large-volume irrigation applications
3) Selective residential applications

4.2.11. Water-Use Regulation

Regulations can be used to manage water use during droughts or other water-supply emergency situations, or to control and regulate new developments with regard to water conservation measures and practices. The components of water-use regulation are as follows:

1) Water-use standards and regulations
2) Requirements for new developments

4.2.12. Integrated Resource Management

Integrated resource management involves the management of water along with other resources, where water conservation can be jointly accomplished with the conservation of these other resources. This can be accomplished through two areas of technologies:

1) Supply-side technologies
2) Demand-side technologies

4.3. WATER CONSERVATION REDUCTIONS

Water conservation measures outlined in water conservation guidelines from the American Water Works Association, California Urban Water Conservation Council, and the U.S.E.P.A. project reductions of 5% to 25% in specific end uses, with reductions as high as 90% with reuse and recycling in cooling tower programs. **Table 4.1** lists the different conservation measures and the range of projected reductions based on the above reference material.

Table 4.1
Estimated Water Savings from Conservation Measures

Conservation Category	Conservation Measure Description	Estimated Water Savings
Universal Metering	Metering with commodity rates for all new connections and retrofit of existing connections	20%
	Connection metering	20%
	Submetering	20-40%
Water Accounting and Loss Control	Distribution system water audits, leak detection and repair	10%
Information and Education	Information and education	2-5%
Water Use Audits	End-use audits, general industrial water conservation	10-20%
	End-use audits, outdoor residential use	5-10%
	End-use audits, large landscape water audits	10-20%
Retrofits	Governmental plumbing retrofit	5%
	Governmental interior retrofit, percent indoor use for pre-1980 construction	5%
Pressure Management	Pressure management, system pressure reduction	3-6% of total production
	Pressure management, residential pressure reducing valves	5-30%
Landscape Efficiency / Outdoor Water-Use Efficiency	Landscape, large water audits	10-20%
	Landscape audit, percent outdoor use for pre-1980 construction	10%
	Landscape, low water use plants	7.5%
	Landscape, lawn watering guides	15-20%
	Landscape, large landscape management	10-25%
Water-Use Regulation	Reuse, graywater for residential	20-30 gal/capita/day
	Landscape requirements for new commercial, industrial, multifamily complexes	10-20%
Reuse and Recycling	Reuse and recycling, cooling tower program	Up to 90%

Information for Table 4-1 combined from the following sources:

1. Memorandum of Understanding Regarding Urban Water Conservation in California, California Urban Water Conservation Council, amended March 9, 1994.
2. Water Conservation Guidebook For Small and Medium Sized Utilities, American Water Works Association, August 1993.
3. Water Conservation Plan Guidelines, U.S. Environmental Protection Agency, 1998.

4.4. DESCRIPTION OF STATE WATER CONSERVATION PROGRAMS

During the State Water Projects Plan survey, each department was asked to report any water conservation programs they may have, and to identify the specific measures used.

4.4.1. Inventory of Existing Water Conservation Programs

None of the State departments surveyed reported any department-wide water conservation programs. However, a few departments and divisions reported some water conservation efforts in their responses to the survey, as described in the following section.

4.4.2. State Department Responses to Survey

Of the twenty (20) State departments surveyed, seven (7) provided responses to the water conservation portion of the survey. The response for each department is summarized below.

4.4.2.1. Department of Defense

The Department of Defense does not have a department-wide program. However, each division follows the respective governmental (Federal, State, or County) requirements. For example, the Hawaii Air National Guard includes measures such as:

1) Reuse and Recycling
2) Universal Metering
3) Landscape Efficiency
4) Retrofits: low flow plumbing

These are specified in DA-PAM 200-1, Environmental Protection and Enhancement & AR 420-49, Utility Services.

4.4.2.2. Department of Hawaiian Homelands

The Department of Hawaiian Homelands reported that they are consistent with the Honolulu Board of Water Supply (BWS) policies. The BWS policies include measures such as:

1) Retrofits: installation and retrofitting with water conserving devices
2) Landscape Efficiency: irrigation restrictions, xeriscaping
3) Water Use Regulation: water rationing
4) Water Use Audits
5) Water Accounting and Loss Control: leak detection
6) Reuse and Recycling: non-potable landscape irrigation
7) Information and Education: water conservation education

4.4.2.3. Natural Energy Laboratory of Hawaii Authority

The Natural Energy Laboratory of Hawaii Authority indicated the following goals of their water conservation program.

1) Reducing water demand/water usage
2) Educating customers about the value of water
3) Improving the utilization and extending the life of existing facilities
4) Protecting and preserving environmental resources
5) Substituting use of non-potable water for potable water

The conservation measures that they are implementing to reach these goals include the following.

1) Universal Metering: source water metering, service connection metering and reading, meter public use water, test, calibrate repair and replace meters
2) Water Accounting and Loss Control: account for water, repair known leaks, leak detection and repair strategy
3) Costing and Pricing: cost of service accounting, user charges, metered rates
4) Water Use Audits: audits of large volume users, large landscape audits
5) Pressure Management: system wide pressure regulation
6) Water Use Regulation: water use standards and regulations
7) Information and Education: information available
8) Landscape Efficiency: promotion of landscape efficiency, landscape planning and renovation, selective irrigation submetering, irrigation management
9) Reuse and Recycling: industrial applications

4.4.2.4. Department of Transportation, Highways Division

The Department of Transportation, Highways Division, is in the process of developing a set of new guidelines for landscaping entitled, Landscaping Managing System, prepared by Belt Collins Hawaii, which should help to reduce the overall irrigation demands. The goals of the guidelines are to:

1) Reduce overall water demand and usage
2) Lower variable operating costs
3) Minimize the need for capital projects
4) Improve on the utilization and extending the life of existing facilities
5) Improve drought or emergency preparedness
6) Improve reliability, and margins of safe and dependable yields
7) Protecting and preserving environmental resources
8) Substitute use of non-potable water for potable water

The approach of the guidelines utilizes several water conservation measures which include the following.

1) Universal Metering: source water metering
2) Water Accounting and Loss Control: water accounting, and leak repair
3) Costing and Pricing: rate metering
4) Water Use Audits: audits of large volume users, large landscape audits
5) Water Use Regulation: water use standards and regulations, requirements for new developments
6) Landscape Efficiency: promotion of landscape efficiency, landscape planning and renovation, selective irrigation submetering, irrigation management
7) Reuse and Recycling: large volume irrigation applications

4.4.2.5. Department of Transportation, Harbors Division

The Department of Transportation, Harbors Division, reported several measures that they are taking to conserve water, but did not indicate any formal conservation program. The measures include:

1) Universal Metering: source water metering, service connection metering and reading, public use water metering, fixed interval meter reading, meter accuracy analysis, testing, calibration and repair/replacement of meters
2) Water Accounting and Loss Control: water accounting, leak repair, non-account water analysis, water system audit, leak detection and repair strategy, loss prevention program
3) Costing and Pricing: cost of service accounting, user charges, metered rates, cost analysis, advanced pricing methods
4) Water Use Audits: audits of large volume users, large landscape audits, selective end use audits
5) Pressure Management: selective use of pressure reducing valves
6) Water Use Regulation: requirements for new developments
7) Information and Education: information available, informative water bill
8) Reuse and Recycling: industrial applications

4.4.2.6. University of Hawaii, Community Colleges

The University of Hawaii Community Colleges do not have a formal water conservation program. However, they did indicate some water conservation goals that they would like to achieve which include the reduction of water demand/usage, and lowering variable operating costs. Some of the measures that they are taking to achieve these goals include:

1) Water Use Regulation: requirements for new developments such as water saving fixtures
2) Information and Education: understanding water bill
3) Landscape Efficiency: promotion of landscape efficiency such as drip irrigation

4.4.2.7. University of Hawaii

The University of Hawaii does not have a formal water conservation program. However, they are taking measures to conserve water as opportunities present themselves. These measures include to following.

1) Water Accounting and Loss Control: repair known leaks
2) Landscape Efficiency: irrigation management such as irrigation timers being set for evening operation

4.5. WATER CONSERVATION PROGRAM RECOMMENDATIONS

There are varying efforts to implement water conservation measures within the different State departments. The majority of the departments surveyed did not report any water conservation measures, while a few reported several measures that they are trying to implement. Based on the responses from this SWPP survey, the State should consider developing a Statewide Water Conservation Program to assist all State departments in their efforts to conserve water. The State should inventory all State water uses to determine the existing water consumption from State facilities. The following are recommendations for developing this program.

1) Follow the Water Conservation Plan Guidelines, U.S. Environmental Protection Agency, 1998 as a guideline;
2) Use other established state programs as a possible guideline, such as the Water for Texas, A Utility Manager's Guide to Water Conservation, Texas Water Development Board; and
3) Development and implementation of a coordinated water conservation program for State departments should be pursued, pending availability of funds.

CHAPTER 5
SWPP WATER DEVELOPMENT STRATEGY

5.1. GENERAL

The State Water Projects Plan (SWPP) Water Development Strategy was formulated to identify and evaluate source development options for proposed State projects. The strategy provides possible options and an outline of recommended actions planned to meet forecasted water demands from State sponsored projects on an individual project basis. The options utilize existing and proposed State department water resources. The strategy options and recommendations are categorized into two periods: Short-term and Long-term. Source options in the Short-term period detail the use of existing and proposed resources scheduled within the initial 10 years of the SWPP planning horizon, between 2001 and 2010. The source options in the Long-term period outline planning activities for projects scheduled in the final 10 years. Proposed source options, however may overlap between Short-term and Long-term periods. The strategy options assigned to each project are preliminary in nature and must be further evaluated with regard to scheduling, funding, system storage, system distribution, system reliability, requirements for infrastructure improvements, and other planning considerations.

The majority of State sponsored projects are, and will continue to be, serviced by County water systems. Therefore, planning and appropriation of funding to supply water for these projects will primarily be allocated to the development of new sources and infrastructure or towards payment of a proportional cost for new source development and infrastructure expansions and connection to County water systems. Planning and coordination with the County water departments and Department of Land and Natural Resources (DLNR) will be required. DLNR, Land Division, Engineering Branch is the State agency responsible for water source planning, exploration and development. Generally, the State will dedicate water sources and water system infrastructure to County water agencies for integration into the County water systems.

Components of SWPP Water Development Strategy include:

1) Strategy Objectives and Planning Criteria
2) State Department Coordination
3) Source Development Option Descriptions
4) Implementation of Water Development Strategy for SWPP Projects by Island
5) Discussion of Water Development Strategy by Island
6) Recommendations

5.2. SWPP WATER DEVELOPMENT STRATEGY DESCRIPTION

5.2.1. SWPP Water Development Strategy Objectives and Planning Criteria

SWPP Water Development Strategy objectives direct the planning and development of water resources to meet projected State department water requirements. The planning criteria sets forth the boundaries in which strategy options are developed and provides a guideline to evaluate the effectiveness of the strategy options.

5.2.1.1. Strategy Objectives

The SWPP Water Development Strategy objectives include:

1) Determine guidelines and planning criteria for strategy options.
2) Identify new source development options to meet and reduce SWPP project demands. Source options targeted to accommodate medium range SWPP demand projections, as reported by State departments.
3) Arrange options into Short-term and Long-term periods. Water Development Strategy designed to prioritize and implement source options on an individual project basis.
4) Determine unmet, "remaining" potable and nonpotable demands requiring additional new source development.
5) Develop implementation schedule of new State resources to accommodate demand requirements.
6) Coordinate SWPP project demand data with demand requirements from County water systems, and integrate the SWPP Water Development Strategy with County Water Use and Development Plans (WUDP).

5.2.1.2. Strategy Planning Criteria

1) <u>Coordinated Planning Effort</u>
   a) Establish consensus, commitment and continued participation among all State departments to the SWPP planning process.
   b) Provide a clear mechanism for State departments to review, modify and plan for future project water demands.
   c) Allow departments to coordinate the planning of State funded resource development projects.
   d) Require departments to regularly review and append demand projections and source development options.
   e) Establish consistent planning methodology in developing projected State project water demands and generating source development costs.

2) Efficient Use of Water

Maximize the efficient use of water resources by:

a) Identifying surplus source capacity within State water systems and existing State sources.
b) Utilizing the remaining balance of source allocation credits from County/private water purveyors.
c) Identifying State projects using potable sources that may be replaced by lesser quality water.
d) Implementation of potential demand side reduction measures (e.g. water conservation).
e) Making the best use of existing potable and nonpotable resources before developing new resources.

3) Water Supply Reliability

a) Minimize the frequency, magnitude and duration of water shortages.
b) Continued water supply system reliability, which is dependent upon available sources, storage capacity, delivery capacity, transmission capacity, magnitude and location of water demands and water system operation. Appropriate consideration of the source component and relationship with water supply reliability.

4) Economic Cost

a) Minimize the capital and operating costs of proposed source options and related expenditures.

5) Water Quality

a) Compliance with Federal, State and County policies for water quality.
b) Compliance with State Water Quality Standards set forth in Administrative Rules, Title 11, Chapters 54 and 20.
c) Consistency with Water Resource Protection Plan and Water Quality Plan.

6) Environmental Impacts

a) Ensure source development strategy and recommendations comply with the State Water Code and regulations for ground water and surface water use and protection established by the Commission.
b) Consistency with established Federal, State and County policies, procedures and program measures.
c) Consistency with Water Resource Protection Plan and Water Quality Plan.

7) Flexibility to Deal with Future Uncertainties and Growth

a) Allow flexibility in the strategy to account for, anticipate and respond to changes and growth in forecasted water demands.
b) Early identification of contingency plans to address uncertainties.
c) Maintenance and updating of SWPP project information through regularly scheduled State department review.
d) Coordination of planning efforts with the Statewide Framework for Updating the

Hawaii Water Plan and the process of Integrated Resource Planning. Formulate SWPP project demands into high, medium and low forecast ranges to allow for contingency planning.

e) Establish a reserve base of water supply/capacity to meet unexpected State project demands.

8) Development and Implementation of SWPP Water Development Strategy
   a) The SWPP Water Development Strategy identifies possible source options to support projected State department project water demands. Source options were assigned to each SWPP project based on a prioritized strategy process. This iterative process determines the remaining balance of SWPP projects not accounted for by existing or new State resources. Under this strategy remaining SWPP project demands will be coordinated with County WUDP's. Remaining unmet project demands will be supplied by County water systems (discuss with County Water Departments) or new State source developments.
   b) Implementation of Water Development Strategy.

5.2.2. State Department Coordination

State departments were surveyed to obtain projected water demands from future State projects (2001 - 2020). As part of the SWPP Water Development Strategy, departments will need to review proposed source options for their respective SWPP projects. Each department received a folder containing current SWPP project information and a copy of the Water Development Strategy. The project folder serves as a mechanism to coordinate, review and regularly update SWPP project information and the Water Development Strategy between departments and DLNR. The objectives are to provide each department with an accounting of existing and new resources, identification of remaining project demands without source options, and to coordinate future planning of departmental resources for SWPP projects by DLNR. The remaining unmet project demands provide the basis for future State source development and integration of State projects into County source development plans. Departments will be required to review and update State projects information every two years. The updated project information will be submitted and maintained by the DLNR, Land Division, Engineering Branch. All State departments are strongly recommended to coordinate source development planning and water service agreements from various water purveyors with DLNR.

5.2.3. SWPP Water Development Strategy

The following Water Development Strategy options were developed in part to create an iterative planning process, which accounts for and reduces project demands through assignment of source options to individual SWPP projects. The strategy follows a guiding principal of using existing resources before developing and expending new resources. A Water Development Strategy was developed for each island to document proposed project source options and to summarize remaining project demands. The strategy incorporates all State department water demands and coordinates the use of

available source/resources.

Strategy options identify the actions to be accomplished to meet identified project demand requirements. Source options were arranged into the Short-term (2001-2010) and Long-term (2011-2020) periods. Projects scheduled during the Short-term period are viewed to be more likely to be funded and constructed. Source options in the Short-term were divided into two components. The first component documents SWPP projects accommodated by existing State resources. The second component identifies additional source options to address the remainder of future (short-term) SWPP project demands. The options in the Long-term period are aimed to provide demand side reductions of project demands. The SWPP Water Development Strategy and recommendations should be evaluated in conjunction with each County WUDP. Generally, the remaining balance of SWPP project demands is anticipated to be satisfied through a coordinated development effort between DLNR and County water departments.

The primary water source and/or water system anticipated to serve SWPP projects were identified through department surveys. Water systems owned/operated by Federal, State, County or Private water purveyors anticipated to serve SWPP projects were identified. The relationship between the water system and SWPP project documents the means in which water will be provided. Special source or service agreements between private water purveyors and State departments were also documented.

5.2.3.1. SWPP Water Development Strategy Formula

The Water Development Strategy formula specifies the iterative process and accounting used to reduce SWPP project demands to determine the remaining balance of unmet SWPP project demands through assignment of available or planned source options.

X – (A+B+C+D+E+F+G) = Remaining Balance of Unmet SWPP Project Demands

X = Total SWPP Project Water Demand (Potable and Nonpotable)
A = Project demands accounted for by Existing State Water Systems
B = Project demands accounted for by Existing Master Plans
C = Project demands accounted for by Existing State or Private Sources
D = Project demands accounted for by County and Private Water Agreements
E = Project demands accounted for by New/Planned State Wells
F = Project demands accounted for by New State Water Systems
G = Project demands accounted for by Planned Private Sources

Remaining SWPP Project Demands (to be integrated within each County WUDP) equals the total SWPP project water demand minus the sum of projects demands accounted for by strategy options: Existing State Water Systems, Existing Master Plans, Existing State or Private Sources, County and Private Water Agreements, Planned State Well/Sources, new State Water Systems and Planned Private Well/Sources.

A flowchart outlining the SWPP Water Development Strategy components and strategy formula is provided in **Figure 5.1**. The flowchart displays the order, organization and relationships of the source development options.

5.2.3.2. Water Development Strategy Option Descriptions

Water Development Strategy options utilize existing, planned, and/or new State resources to meet SWPP projected water demands, including available State water allocation credits. Strategy options described below set forth the recommended sequencing of available options used to meet department project demands. Based on this prioritized approach, proposed source options were assigned to each SWPP project. Source development option codes (example: EXSWS) assigned to individual SWPP projects.

5.2.3.2.1. Existing State Water Systems (EXSWS)

Existing State owned and/or operated water systems provide water service to State facilities. Existing State water systems capable of providing water service to SWPP projects were evaluated for availability of supply and source capacity. System evaluations were used to determine required impacts and improvements necessary to provide adequate source, storage, transmission and distribution components.

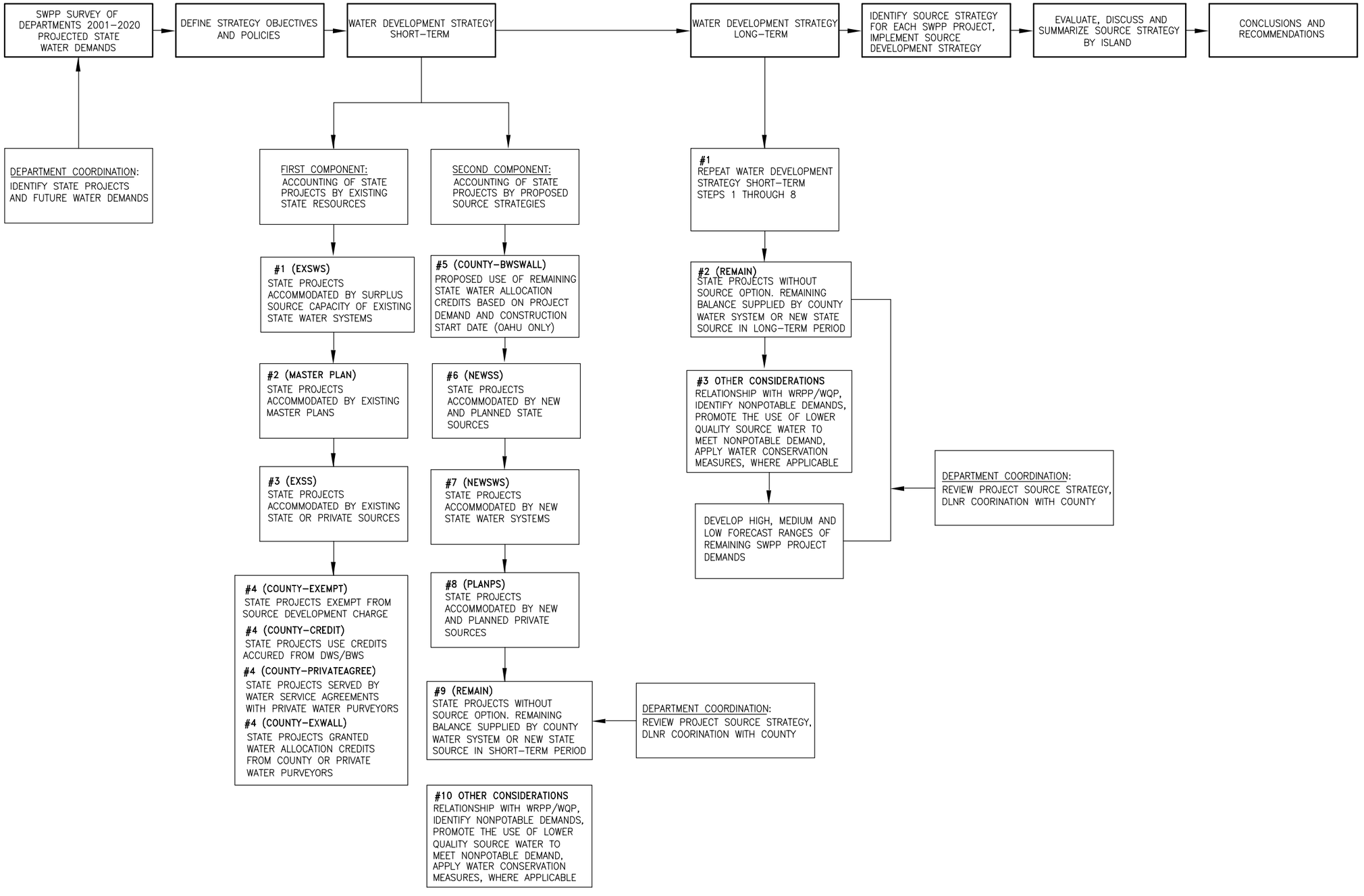
5.2.3.2.2. Existing Master Plan (MASTERPLAN - followed by the master plan report title)

Existing master plan reports that contain SWPP projects within development or study areas were researched and identified. These master plan reports evaluate and recommend on-site and off-site water system improvements based on projected water demands. Master plan reports, which have secured adequate wells or sources for the project were considered as a viable option to meet SWPP project requirements. Master plan reports without source identification should be monitored to insure SWPP project demands are supplied.

5.2.3.2.3. Existing State or Private Sources (EXSS)

Existing State owned and private sources include potable ground water sources, nonpotable ground water sources and surface water sources. These resources are distinguished from State or private water systems and were considered as stand alone sources. Storage and distribution systems for these sources need to be identified. These sources were not identified as part of any existing State water system.

SWPP WATER DEVELOPMENT STRATEGY FLOWCHART



Dept. of Land and Natural Resources
Land Division

Engineering Branch
Commission on Water Resource Management

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State Water Projects Plan

SWPP WATER DEVELOPMENT STRATEGY FLOWCHART

Date: February 2003

FIGURE 5.1

5.2.3.2.4. SWPP Projects with County and Private Water Agreements (COUNTY-EXEMPT, CREDIT, PRIVATEAGREE, EXWALL, BWSWALL)

The County and Private Water Agreement represents several source options in which project source is acquired from County Water Departments or private water purveyors. The different source options include:

1) SWPP projects that are exempt from County source development charges;
2) SWPP projects granted source allocation/reservation as a result of compensation for capital improvements provided;
3) SWPP projects that have agreements to obtain water from private water purveyors;
4) SWPP projects for which water allocation credits have been specifically granted/authorized by the Honolulu Board of Water Supply (BWS); and
5) SWPP projects, which have been assigned/appropriated State water allocation credits from the State's remaining balance of BWS credits.

State projects involving renovation or replacement of existing facilities where the net balance of installed fixture units result in no increase in total fixture units are exempted from County water system facilities charges. SWPP projects in this category were designated with the strategy option abbreviation code of COUNTY-EXEMPT.

The State often provides capital improvements to off-site water system components as part of project requirements. The water system components are turned over to County Water Departments in exchange for County facilities charge credits or source water agreements. SWPP projects in this category were designated with the strategy option abbreviation code of COUNTY-CREDIT.

State departments have obtained water service agreements with private water purveyors. These service agreements allow SWPP projects to obtain water service from private water systems. SWPP projects in this category were designated with the strategy option abbreviation code of COUNTY-PRIVATEAGREE.

The State has acquired water allocation credits from the Honolulu BWS through payment agreements or compensation for water system improvements funded or constructed by the State. A similar water allocation credits program does not, however, existing presently with the other County Water Departments. These Oahu-specific water allocation credits allow State projects to obtain water service/supply from the BWS water systems. Generally, the allocation process requires that Oahu SWPP projects request the use of existing State water allocation credits from the BWS during the permitting stage of the project. The BWS then grants the request and the use of water allocation credits by correspondence to the State agency. SWPP projects that have secured the use of water allocation credits through this mechanism have been assigned the strategy option abbreviation code of COUNTY-EXWALL. Although these projects remain on the SWPP list of projects, no further source options are required. However, a facilities charge for the storage and transmission component of the project may still be required.

The State (DLNR) maintains a running balance of available water allocation credits remaining with the BWS, which may be accessible by SWPP projects. However, certain water allocation credits are exclusively designated for specific State agencies or projects, such as the University of Hawaii at Manoa, UH-Windward Community College, and the Job Corps. DLNR administers the accounting of these State water allocation credits by each State department. Under the strategy option abbreviation code of COUNTY-BWSALL, Oahu SWPP projects have been assigned credits from the remaining balance of water allocation credits. This assignment of credits should be distinguished, however, from those existing credits previously allocated under the COUNTY-EXWALL strategy. Additionally, credits reserved for specific State agencies were not available for shared allocation with other SWPP projects under this (COUNTY-BWSALL) strategy. Remaining available water allocation credits were assigned based upon department project water demands and project scheduling.

5.2.3.2.5. New/Planned State Wells (NEWSS)

Generally, the DLNR is the lead State department for the development of new water resources for the State. However, State departments such as DHHL and DBEDT also develop new sources independently of DLNR. Source water development programs are coordinated with County Water Departments with regard to infrastructure requirements to support State water demands. This strategy solution assigns SWPP projects to new or planned State wells. The proposed well pumping capacity is used to estimate the amount of water to be produced and/or credits to be obtained when the source is turned over to the County Water Department. Under this strategy, a reserve of ten percent of the well capacity is established for each new State well. The 10 percent reserve allows for uncertainties and changes to SWPP project schedules and water demand requirements. SWPP projects were thus assigned to each new well based upon 90 percent of the well's capacity. The reserve also provides flexibility within the recommended water development strategy.

5.2.3.2.6. New State Water Systems (NEWSWS)

New State water systems are constructed for certain State projects in areas without existing water service. These State water systems generally serve larger State facilities or projects including: airport facilities, parks, agricultural parks or irrigation systems and correctional facilities. New State water systems planned for State parks, UH West Oahu Campus, East Kapolei and DOA agricultural park projects were incorporated into the recommended water development strategies.

5.2.3.2.7. Planned Private Sources (PLANPS)

Planned private sources anticipated to serve SWPP projects were also identified during the SWPP survey of departments. Private water purveyors or sources supplying SWPP projects, typically have water service agreements between the private company and the State department. These water service agreements, which allow the State to receive water for the proposed project were also included as part of the strategy options.

5.2.3.2.8. Coordination of SWPP Project Demand with County Water Departments (REMAIN)

A Water Development Strategy for SWPP projects was developed for each island. The strategy implements an iterative process of assigning strategy options to SWPP projects to determine the remaining balance of State project water demands without a source option. The remaining balance of SWPP demands will be coordinated with County Water Departments. DLNR will initiate discussion on the availability and feasibility of County water systems accommodating SWPP project demands. In the event County systems are unable to supply remaining SWPP project demands, DLNR may be required to develop new State sources. DLNR may also propose a State-County joint venture to develop new sources. Other options include: the State to upgrade or improve County water system components in exchange for source development credits or the State to purchase County water allocation credits if made available to be purchased by DLNR for future SWPP project demands. SWPP project demands and Water Development Strategy will be submitted to each County for consideration into County WUDP's.

5.2.3.2.9. Other Strategy Considerations

<u>Relationship with the Water Resource Protection Plan and Water Quality Plan</u>

The Water Resource Protection Plan (WRPP) and the Water Quality Plan (WQP) provide input on the quantity (e.g. sustainable yield) and quality of water available to meet SWPP project water demands. These plan inputs also insure consistency with current regulations, standards and resource management policies. An example of the relationship between the SWPP, WRPP, and WQP is demonstrated in the presentation of State project water demands in relation to hydrological sector sustainable yield capacities (refer to Figure 3.19). Effective inter-agency coordination and communication of project information between plans must be maintained to insure SWPP compliance with SWPP framework requirements and to evaluate the feasibility proposed source development options.

<u>Promote the Use of Nonpotable Resources</u>

SWPP project nonpotable water demands were identified and summarized by hydrological sector and project schedule. Projects with nonpotable demand planned to be supplied by potable sources were also identified by hydrological sector and project

schedule. Existing local and regional nonpotable systems and reclaimed water systems were identified and assessed as to their availability. The development of on-site nonpotable sources to meet large-scale project demands should be considered as part of future source development strategies. The use of nonpotable irrigation water for existing and proposed large landscaped areas whenever and wherever a nonpotable supply is available should also be considered, along with compliance with State DOH and County rules regarding the application of nonpotable water. Nonpotable sources, systems, reclaimed water and development of nonpotable wells are nonpotable source options for projects currently using or proposed to use potable water. SWPP projects with nonpotable demands, which plan on using a potable water source include: landscaping areas, parks, open space and schools. The abbreviation used to identify potable water planned for nonpotable needs is "potablenonpotable".

Water Conservation

Water conservation may provide significant demand side management and reduction of water requirements that delay or defer the need to develop additional water sources. Savings from water conservation measures have not been accounted for in individual SWPP project demand projections. The absence of a statewide water conservation program to establish and guide implementation of water conservation measures has limited State department efforts to reduce water consumption. The SWPP and WRPP have recommended development of a statewide water conservation program. Estimates of demand side reduction from future water conservation programs have been incorporated in the range of SWPP demand forecasts set forth in the plan. The low range demand forecast accounts for an approximate 10 percent reduction from water conservation measures. Projections of demand side reductions, however, were not incorporated in the recommended water development strategies described in the proceeding sections.

5.2.3.3. Water Development Strategy in the Short-Term (First Component)

1) Identify State projects and projected water demands that can be accommodated by existing State water systems using surplus source capacity. (Strategy option abbreviation code = EXSWS-"followed by State water system name").

2) Identify State projects accommodated within existing master plans. (Strategy option abbreviation code = MASTER PLAN-"followed by name of master plan report").

3) Identify State projects and projected water demands that can be accommodated by existing State or private sources. Existing State sources include potable ground sources, nonpotable sources and/or surface water sources, which are separate from State water systems. (Strategy option abbreviation code = EXSS).

4) Identify State projects, which are subject to County and Private water agreements. Water agreements include: projects exempt from water system facilities charges

(COUNTY-EXEMPT), projects using credits established through capital improvement investments (COUNTY-CREDIT), projects with water agreement from private water purveyor (COUNTY-PRIVATEAGREE), and projects with granted water allocation credits from the BWS (COUNTY-EXWALL) (Oahu only).

5.2.3.4. Water Development Strategy in the Short-Term (Second Component)

1) Identify State projects and projected water demands, which may be accommodated through the use of the remaining balance of State owned water allocation credits from BWS. Under this strategy a reserve base of water allocation credits will be maintained. (Strategy option abbreviation code = COUNTY-BWSWALL) (SWPP Projects on Oahu only).

2) Identify State projects and projected water demands accommodated by newly constructed and planned State sources. Reserve well capacity will be kept and maintained by DLNR to account for uncertainties and unforeseen project demands as part of this strategy. (Strategy option abbreviation code = NEWSS-"followed by well name").

3) Identify State projects and projected water demands accommodated by new State water systems. (Strategy option abbreviation code = NEWSWS).

4) Identify State projects and projected water demands accommodated by newly constructed and planned private sources. (Strategy option abbreviation code = PLANPS).

5) Summarize the remaining balance of SWPP project water demand in the Short-term without a source development scenario. DLNR will initiate cooperative source development discussions with the County to meet the remaining SWPP project water demands. Remaining SWPP project water demands to be integrated within the County WUDP's. (Strategy option abbreviation code = REMAIN).

6) Evaluate SWPP projects for Other Strategy Considerations. Assess identified State projects and projected water demands in relationship to and consistency with the Water Resource Protection Plan and Water Quality Plan. Identify State project demand for nonpotable quality water. Identify the State projects, which plan to use potable water to meet nonpotable water requirements. Identify the amount of nonpotable water demand requirements by hydrological sectors and the nonpotable sources and/or systems planned to meet the nonpotable demands. Nonpotable sources and systems include: brackish groundwater wells, shafts, surface water sources, and reclaimed water reuse. The use of lower quality water sources to match the quality of water needed for State projects should be encouraged and incorporated within future source development strategies. Similarly, demand side reductions from water conservation programs and measures should be quantified and implemented.

5.2.3.5. Water Development Strategy in the Long-Term

1) Repeat Water Development Strategy Short-Term Steps 1 through 10.

2) Summarize the remaining balance of Long Range SWPP project water demands. DLNR will coordinate with each County water department to plan for additional source development to meet long-range water demand requirements. (Strategy option abbreviation code = REMAIN).

3) Evaluate SWPP projects for Other Strategy Considerations. Assess identified State projects and projected water demands in relationship to and consistency with the Water Resource Protection Plan and Water Quality Plan. Identify State project demand for nonpotable quality water. Identify the State projects, which plan to use potable water to meet nonpotable water requirements. Identify the amount of nonpotable water demand requirements by hydrological sectors and the nonpotable sources and/or systems planned to meet the nonpotable demands. Nonpotable sources and systems include: brackish groundwater wells, shafts, surface water sources, and reclaimed water reuse. The use of lower quality water sources to match the quality of water needed for State projects should be encouraged and incorporated within future source development strategies. Similarly, demand side reductions from water conservation programs and measures should be quantified and implemented.

5.2.3.6. Implementation of SWPP Water Development Strategy

1) Formulate Water Development Strategy for SWPP projects on each island by assigning source options for each SWPP project (provided in **Section 5.3**). Determine remaining balance of unmet SWPP project demands by island.

2) Coordinate strategies with County Water Departments for incorporation into County WUDP's. Initiate discussions to accommodate remaining State potable and nonpotable demands with County Water Departments to determine State involvement and assistance required for new source development.

3) Monitor the status of current and future SWPP projects and projected water requirements. State departments will be required to update project schedules and revise project water demand requirements every two years. Modify or adjust application of source options for SWPP projects as required.

4) Monitor the status of master plan recommendations relating to SWPP projects. Verify scheduling and construction of water system improvements and accounting of SWPP project demand requirements.
5) Maintain accounting of water allocation credit balances of each State department. Review project water demands reported to BWS, implement a system to post audit actual water use versus projected demand. Develop a plan to use remaining water

allocation credits with BWS. Maintain a reserve of water allocation credits (credits owned or classified to DLNR only) as part of the overall Water Development Strategy to allow for flexibility and as a contingency for uncertainties related to SWPP project requirements.

6) Monitor the status of water service agreements between State departments and County Water Departments and State agreements with private water purveyors.

7) Assist and encourage State departments to apply water conservation measures as may be developed (and periodically updated) as part of the Hawaii Water Plan.

8) Promote the use of nonpotable sources to meet SWPP project irrigation demands:

   a) Identify SWPP project nonpotable water demands including nonpotable project demands, which currently use potable water. To the extent feasible, water development strategies should attempt to match nonpotable water demands with available nonpotable sources.
   b) Coordinate SWPP nonpotable demands with County nonpotable demands. This coordination should be accomplished by incorporating SWPP project demands into the County WUDP's.
   c) Evaluate nonpotable source options. Recommended evaluation criteria should be developed which consider: least cost, environmental/regulatory compliance, system availability (regional system or individual project system), aquifer sustainable yield, public acceptance and service reliability. Nonpotable options may include: existing nonpotable systems, reclaimed water or development of new nonpotable sources (brackish ground water and surface water) and/or systems.

9) Initiate planning, design and construction of improvements to existing State water systems to incorporate additional SWPP project water demands.

10) New source development should be coordinated with regular updating of SWPP project water demand information and schedules, as provided by State departments. Implementation of source options should be coordinated and integrated within the County WUDP's. DLNR will be the lead agency for requesting and securing funding for State source development. Funding should be apportioned based upon projected water demands for each State agency.

5.3. SWPP WATER DEVELOPMENT STRATEGY DISCUSSION - STATEWIDE

5.3.1. Water Development Strategy - Assessment of Water Needs Statewide

The Statewide and island balance of unmet SWPP project water demands are summarized in **Table 5.1**. The remaining balance of project demands constitutes those SWPP projects without a source option. Remaining project demands were derived using the Water Development Strategy formula. These demand projections will be submitted to each County Water Department for integration with their respective WUDP supply strategies. The remaining project demands may be supplied by construction of new State sources, joint County-State source development or system improvement projects or the purchase of source facility charge credits by the State from County Water Departments.

Table 5.1
Summary of Water Development Strategy Results
Remaining Balance of Unmet SWPP Project Water Requirements

	Remaining Balance of SWPP Water Demands (mgd)							
State Water Demand Status	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
Total SWPP Project Demand Statewide	12.19	18.10	25.22	26.59	33.20	69.42	76.55	80.87
Demand Accounted for by Water Development Strategy	5.99	7.59	10.66	11.26	17.49	39.17	42.07	45.17
Remaining Balance of Unmet Demand								
Island of Hawaii	0.80	3.36	4.06	4.16	4.33	12.89	14.47	14.55
Island of Kauai	0.09	0.13	0.52	0.62	0.59	0.58	0.64	0.69
Island of Lanai	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Island of Maui	4.11	4.83	6.38	6.67	6.68	10.72	13.25	13.72
Island of Molokai	0.02	0.02	0.03	0.03	0.03	0.04	0.07	0.07
Island of Oahu	1.19	2.17	3.58	3.84	4.09	6.03	6.05	6.67
Statewide Remaining Balance Total	**6.20**	**10.51**	**14.56**	**15.33**	**15.72**	**30.25**	**34.48**	**35.71**

The remaining balance of unmet SWPP project demands were formulated into high, medium and low demand ranges, presented in **Table 5.2**. The demand forecast ranges will be integrated with other components of the Hawaii Water Plan and further refined through the IRP process. The high and low ranges were computed using a 20 percent adjustment factor to the medium range. The high and low ranges were developed to account for uncertainties and changes to projected water requirements.

Table 5.2
Demand Forecast Ranges of Unmet SWPP Project Water Requirements

	Total Yearly Projected Cumulative Average Day Demand (mgd)							
Forecast Range	**2001**	**2002**	**2003**	**2004**	**2005**	**2010**	**2015**	**2020**
High Demand Range	7.44	12.61	17.47	18.39	18.86	36.30	41.38	42.85
Medium Demand Range	6.20	10.51	14.56	15.33	15.72	30.25	34.48	35.71
Low Demand Range	4.96	8.41	11.65	12.26	12.57	24.20	27.58	28.57

5.4. SWPP WATER DEVELOPMENT STRATEGY RECOMMENDATIONS

1) SWPP water development strategy recommendations should be coordinated and integrated with WUDP supply planning efforts. Further analysis of supply strategies is required to incorporate the State water demand component with other County demand components. Water demand calculation methodologies should be reviewed for consistency. The IRP process should clearly define the evaluation criteria source options. The criteria should consider: benefit cost analysis, least cost analysis, ranking of source options, system reliability, system availability, regulatory compliance, aquifer sustainable yield, environmental factors, demand-side management, water conservation programs and public acceptance. The task of ranking, evaluating and selecting island-wide source development options should be performed and integrated at the County level incorporating State project water demands and available source development options.

2) All State departments should regularly update and inform DLNR Engineering Branch as to water source planning/development and water service agreements for State projects. Individual State department water source planning and development efforts should be coordinated through DLNR, Engineering Branch.

3) A written notification to State departments informing departments of inadequacies of current source credits to meet new SWPP project demand projections on Oahu should be issued to DLNR, Engineering Branch. The notification would serve as an alarm to begin water source planning and secure additional source credits for future projects. It is anticipated that available department source credits will be fully allocated for project water demands by: DHHL (2010), DLNR (2001), DOE (2001), HCDA (2003), HFDC (2010), UH (2001) and UH-WCC (2002).

   Source water credits are sold in advance by the Honolulu Board of Water Supply to insure source water for future State projects. Other County water departments typically do not have source water credits available for advanced purchase, however may provide source planning through project agreements or system improvements. The Honolulu BWS and DLNR, Engineering Branch has begun discussions concerning issues of source development on Oahu and source planning for future State project demands.

4) Recommendations for future updates to the SWPP include:

   a) DLNR Engineering branch should monitor, track and maintain current SWPP project information and database. DLNR, Engineering Branch should establish a procedure and outline responsibilities for all departments to review, update and submit project water requirements on a regular basis.

   b) SWPP project water demand projections should be based on Water System Standard unit rates and methodology provided in the SWPP (section 3.2.2). Unit rates should be verified and updated as required. Consistency of water demand calculation methodology between the SWPP and other components of the HWP should be established.

   c) The status of master plan water system improvement projects should be tracked by DLNR, Engineering Branch to insure supply of water service to SWPP projects within master plan boundaries.

   d) The status of source agreements between State departments and County and Private water purveyors should be tracked by DLNR, Engineering Branch.

   e) Future updates to the SWPP should incorporate inputs from the HWP framework guidelines, Agricultural Water Use and Development Plan, WRPP and WQP.

   f) State departments should be surveyed as to existing water usages of all State facilities to establish the current Statewide water consumption and to collect baseline data necessary to develop a State agency water conservation program.

g) DLNR, Engineering Branch should monitor and review water demand calculations submitted by State departments for use of existing water allocation credits from BWS during the permitting process. Recommend an alternative to meter new facilities with large-scale demand requirements to perform a post audit of actual water consumption. Metering of water consumption will allow comparison of actual water consumption against demand projections.

h) Findings of this and future updates to the SWPP should be incorporated within the County WUDP's. Coordination of State and County source development strategies should be established.

i) A comprehensive Water Conservation Program should be developed for implementation by all State departments/agencies, including the use of alternative resources to meet nonpotable water demands.

j) Conduct a review of SWPP project water demands, if project demands are used to support water use permits. DLNR should contact departments to investigate project water use and water demand projections within existing facilities to eliminate or avoid water demand double counting.

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APPENDICES