HONUA LLC

August 25, 2009

Land Use Commission
State of Hawai`i
235 South Beretania Street, Suite 406
P. O. Box 2359
Honolulu, Hawai`i 96804

Re: Eleventh Annual Report for Land Use Commission (LUC) Docket No. A97-721 Makena Resort Corp.

Dear Chair and Members of the Commission:

Pursuant to Condition 19 in the Decision and Order in the above-referenced docket matter, the following is submitted as the Eleventh Annual Report on the status of this project.

As stated in the previous Annual Reports, Petitioner filed an application for change in zoning with the County of Maui affecting 603.303 acres of land in Makena, Maui, Hawai`i, including all of the 145.943 acres of the Petition Area. The majority of the change in zoning application included the zoning of approximately 437.085 acres of golf course into a new PK-4 zone that the County has established for golf courses. The change in zoning application was the subject of a public hearing before the Maui Planning Commission on July 25, 2000. Following the public hearing, the Maui Planning Commission voted to recommend to the Maui County Council approval of the change in zoning application subject to ten (10) conditions. The ten (10) conditions were set forth in Exhibit "A" attached to the Third Annual Report. On August 29, 2000, the change in zoning application and recommendation by the Maui Planning Commission was sent to the Maui County Council. The application for change in zoning was subsequently referred to the Land Use Committee of the Maui County Council which held a meeting on the application on March 12, 2001, at which time further deliberation on the application was deferred pending the annual deliberations on the County budget. Following the budget deliberations, a review of the pending change in zoning application continued in June 2001, involving an additional eight (8) committee meetings before it was reported out to the full Council in December 2001. The Council then held a public hearing on January 24, 2002. Following the public hearing, the Council referred the application to its Land Use Committee and no additional meetings were held in 2002. The Land Use Committee referred the application to the newly elected 2003-2004 County Council and in January 2003, the Council referred the application to its new Planning and Land Use Committee. No meetings were held in 2003 by the Planning and Land Use Committee. The zoning application was reviewed by the Planning and Land Use Committee in March and April 2004. On April 14, 2004, the

Planning and Land Use Committee recommended approval of the change in zoning application, subject to certain conditions. Petitioner had anticipated that the application would be reviewed by the County Council in June 2004, however, the review did not occur. By letter dated August 18, 2004, the Planning and Land Use Committee transmitted a draft bill on the change in zoning (with conditions) and requested that a Unilateral Agreement be executed. This letter was attached as Exhibit "A" to the Ninth Annual Report. A response dated September 17, 2004 was submitted to the Planning and Land Use Committee. This letter was attached as Exhibit "B" to the Ninth Annual Report. At the start of the subsequent County Council term (2005-2006), the application was referred to the new Land Use Committee. Although the Petitioner requested that the application be scheduled, no meetings were held in 2005 and 2006 by the Land Use Committee. These requests were submitted by letters dated January 11, 2005, September 19, 2005, January 12, 2006, February 7, 2006, and April 7, 2006. These letters were attached as Exhibits "C" through "G" to the Ninth Annual Report. At the start of the subsequent County Council term (2007-2008), the application was referred to the new Land Use Committee. The Land Use Committee did not review the application in 2007. In 2008, the Land Use Committee met on November 19th and November 20th, and recommended approval of the change in zoning application. The Maui County Council approved the change in zoning in December 2008. The Mayor approved the change in zoning ordinance on January 7, 2009. A copy of Ordinance No. 3613 is attached as Exhibit "A".

The following are the conditions set forth in the Decision and Order and description of efforts that are being made to comply with each stated condition:

1. Petitioner shall provide affordable housing opportunities for low, low-moderate, and gap group income residents of the State of Hawai`i in accordance with applicable laws, rules, and regulations of the County of Maui. The location and distribution of the affordable housing or other provisions for affordable housing shall be under such terms as may be mutually agreeable between Petitioner and the County of Maui.

   Response: Petitioner will comply with this condition.

2. Petitioner shall coordinate with the County of Maui Board of Water Supply to incorporate the proposed project into the County Water Use and Development Plan for the area. Prior to the granting of the first discretionary permit for the single-family and multi-family residential development described in paragraph 20 of the Decision and Order or the hotel described in paragraph 21 of the Decision and Order and by or before one year from the issuance date of this Decision and Order, Petitioner shall furnish the Commission with a letter from the County of Maui Board of Water Supply confirming that (a) the potable water allocation that will be credited

to Petitioner will be available to and sufficient for the proposed project as it is described in the Petition, (b) the availability of potable water will not be an obstacle or impediment to the development of the proposed project as described in the Petition and (c) the proposed project as it is described in the Petition has been incorporated into the County Water Use and Development Plan for the area and that this plan will prevent the continued overpumping of the sustainable yield of the Iao aquifer.

Response: As set forth in detail in the Second Annual Report, this condition was complied with as set forth in a letter from David Craddick, Director of the Department of Water Supply, County of Maui, dated February 18, 1999. This letter was attached to said Second Annual Report.

Additional letters regarding compliance with this condition, dated October 1, 2003 from Petitioner to the Department of Water Supply and the response from George Tengan, Director of Water Supply, dated October 7, 2003, were attached as Exhibit "A" and Exhibit "B" to the Sixth Annual Report.

Petitioner has complied with this condition.

3. Petitioner shall participate in the funding and construction of adequate water source, storage, and transmission facilities and improvements to accommodate the proposed project in accordance with the applicable laws, rules and regulations of the County of Maui, and consistent with the County of Maui water use and development plan.

Response: In 1976, Petitioner participated in the Central Maui Source Development Joint Venture and also the Central Maui Transmission Joint Venture which developed water sources in Waiehu, Maui and a transmission line from the newly developed water sources down to the Wailea and Makena regions. Further, in 1985, Makena Resort constructed a 1.5 million gallon water storage tank at the Makena Resort. All necessary transmission lines to service the development at Makena has been developed by Petitioner. Petitioner shall continue to participate in the funding and construction of additional adequate storage and transmission facilities and improvements to accommodate the proposed project.

4. Petitioner shall participate in the funding and construction of adequate wastewater treatment, transmission and disposal facilities to accommodate the proposed project under such terms as are agreeable between Petitioner and the County of Maui.

Response: As set forth in detail in the Second Annual Report, Petitioner has commenced the construction of a wastewater system, comprising of collection lines, pump stations and wastewater reclamation plant at Makena. Construction commenced on February 10, 2000, and the entire wastewater reclamation system was completed and operable in October 2002.

Petitioner has complied with this condition.

5. Petitioner shall contribute to the development, funding, and/or construction of school facilities, on a pro rata basis for the residential developments in the proposed project, as determined by and to the satisfaction of the State Department of Education ("DOE"). Terms of the contribution shall be agreed upon by Petitioner and DOE prior to Petitioner acquiring county rezoning or prior to Petitioner applying for building permits if county zoning is not required.

Response: Pursuant to an Educational Contribution Agreement for Makena Resort between Petitioner and the Department of Education (DOE), dated August 17, 2000, the parties have agreed upon a cash contribution by Petitioner which shall represent a fair share payment for the development, funding and/or construction of school facilities by Petitioner. A copy of said agreement was attached to the Third Annual Report.

Petitioner has complied with this condition. In addition, Petitioner is required to comply with Condition 9 of the change in zoning approval which states:

"Education

9. The developer, its successors and permitted assigns, shall pay the Department of Education $3,000 per dwelling unit upon issuance of each building permit to be used, to the extent possible, for schools serving the Kihei-Makena Community Plan area; provided that, should the State pass legislation imposing school impact fees that

apply to the Makena Resort Area, the developer, its successors and permitted assigns, shall from that point forward comply with the State requirements, or contribute $3,000 per dwelling unit, whichever is greater. Should a previous agreement exist between the Department of Education and the landowner, this condition shall prevail."

6. Petitioner shall participate in the pro rata funding and construction of adequate civil defense measures as determined by the State of Hawai`i and County of Maui civil defense agencies.

Response: Petitioner will comply with this condition. Petitioner has had discussions with the State of Hawai`i and County of Maui civil defense agencies with regard to this condition. Both agencies had previously indicated to Petitioner that no civil defense measures are warranted for the property. A siren warning simulator for civil defense is installed in the 310-room Maui Prince Hotel security department which is manned 24 hours a day.

Petitioner recently entered executed agreements with the State for the installation of new Civil Defense Sirens (Siren 157, Makena Resort and Siren 158, Big Beach-Makena). Copies of the agreements are attached as Exhibit "B" and Exhibit "C".

In addition, Petitioner is required to comply with Condition 16 of the change in zoning approval which states:

"Civil Defense

16. The developer shall participate in the pro rata funding and construction of adequate civil defense measures as determined by the State and County civil defense agencies.

7. Should any human burials or any historic sites such as artifacts, charcoal deposits, stone platforms, pavings, or walls be found, Petitioner shall stop work in the immediate vicinity and contact SHPD. The significance of these finds shall then be determined and approved by SHPD, and an acceptable mitigation plan shall be approved by SHPD. SHPD must verify that the fieldwork portion of the mitigation

plan has been successfully executed prior to work proceeding in the immediate vicinity of the find. Burials must be treated under specific provisions of Chapter 6E, Hawai`i Revised Statutes.

Response: Petitioner will comply with this condition.

8. Petitioner shall follow the State DLNR recommendations for Petition Areas 1, 2 and 3, for archaeological data recovery and preservation. An archaeological data recovery plan (scope of work) must be approved by SHPD. That plan then must be successfully executed (to be verified in writing by the SHPD), prior to any grading, clearing, grubbing or other land alteration in these areas. In Petition Area 1, three significant historic sites (1969, 2563, 2569) are committed to preservation. A preservation plan must be approved by SHPD. This plan, or minimally its interim protection plan phase, must be successfully executed (to be verified in writing by the SHPD), prior to any grading, clearing, grubbing or other land alteration in these areas.

Response: Petitioner will comply with this condition.

9. Petitioner shall implement efficient soil erosion and dust control measures during and after the development process to the satisfaction of the State Department of Health and County of Maui.

Response: Petitioner will comply with this condition.

10. Petitioner shall initiate and fund a nearshore water quality monitoring program. The monitoring program shall be approved by the State Department of Health in consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Services, and the State Division of Aquatic Resources, DLNR. Petitioner shall coordinate this consultation process with the concurrence of the State Department of Health. Mitigation measures shall be implemented by Petitioner if the results of the monitoring program warrant them. Mitigation measures shall be approved by the State Department of Health in consultation with the above mentioned agencies.

Response: Since August 1995, Petitioner has implemented and funded a nearshore water quality monitoring program. This program initially collected base line water samples and analyzed the same to determine turbidity, chemical compound contents and biota sampling. This monitoring program continues with semi-annual sampling at four separate nearshore sites. Data analysis is submitted regularly to the State Department of Health (DOH).

The first 2008 report (Report 1-2008), attached as Exhibit "D" to this Eleventh Annual Report was submitted to the Department of Health on September 9, 2008. The second 2008 report (Report 2-2008), attached as Exhibit "E" to this Eleventh Annual Report was submitted to the Department of Health on March 13, 2008. The Department of Health's review is pending.

11. Petitioner shall submit a Traffic Impact Analysis Report (TIAR) for review and approval by the State Department of Transportation and the County of Maui.

Response: As set forth in further detail in the Second Annual Report, a TIAR was prepared and submitted for review by DOT and the County of Maui as part of the above-mentioned change in zoning application. Following certain comments by DOT, revisions were made to the TIAR which DOT agreed with as set forth in a letter from Kazu Hayashida, Director of Transportation, dated May 2, 2000, a copy of which was attached to the Third Annual Report.

In addition, Petitioner prepared and submitted a Makena Resort Master Traffic Study, dated June 6, 2003 (Revised September 14, 2003), which was submitted to the State Department of Transportation and County of Maui. This Master Traffic Study was attached as Exhibit "F" to the Sixth Annual Report. The County approved the study on September 26, 2003 as noted in Exhibit "G" attached to the Sixth Annual Report.

Petitioner has complied with this condition.

12. Petitioner shall participate in the pro rata funding and construction of local and regional transportation improvements and programs including dedication of rights-of-way as determined by the State Department of Transportation ("DOT") and the County of Maui. Agreement between Petitioner and DOT as to the level of funding and participation shall be obtained prior to Petitioner acquiring county zoning or prior to Petitioner securing county building permits if county rezoning is not required.

Response: Following discussion with representatives of DOT relating to revisions to the TIAR as set forth in response to Condition No. 11 above, on May 11, 2000, Petitioner filed Petitioner Makena Resort Corp.'s Motion for First Amendment to the Findings of Fact, Conclusions of Law and Decision and Order, filed on February 19, 1998 (D&O), requesting that this Condition No. 12 be amended. Said Motion was

supported by the Affidavit of Roy Figueiroa, General Manager of then Petitioner. The County of Maui Planning Department filed a Response to Motion wherein it stated that it had no objections to the Motion. The Office of Planning (OP) filed a Response to Motion wherein it stated that DOT was satisfied by the fact that Petitioner had acknowledged responsibility for its pro rata share of the cost of the transportation improvements proposed in the Maui Long Range Land Transportation Plan for the Kihei-Makena region and that OP supported the position of DOT. Upon consideration of Petitioner's Motion, supporting affidavit, and the oral and written arguments presented by the parties, this Commission ordered that Condition No. 12 of the D&O, be amended as follows:

> "12. Petitioner shall participate in pro rata funding and the construction of local and regional transportation improvements and programs, including dedication of rights of way as determined by State Department of Transportation (DOT) and the County of Maui. Agreement between Petitioner and DOT as to the level of funding and participation shall be obtained within two (2) years from June 1, 2000."

In complying with Condition No. 12, as amended, Petitioner has and continues to engage in discussions with the DOT relating to improvements to regional transportation infrastructure, specifically, with regard to the implementation of certain interim improvements to the State Piilani Highway from Mokulele Highway to Kilohana Drive. On July 16, 2001, Petitioner entered into an agreement with DOT to fund the planning and design of the restriping and other improvements to Piilani Highway to increase travel lanes from two (2) to four (4) lanes. As noted in the Fourth Annual Report, the planning and design work was ninety percent (90%) complete and the project was scheduled to begin construction in the summer 2002 and completed within one year. The improvements were completed in 2003.

As reported in the Second Annual Report, Petitioner continued in the development of the roadway and utility improvements to portions of Makena Alanui, Honoiki Street and Makena-Keoneoio Road, all within the Makena Resort. Construction commenced on January 10, 2000, and was completed in April, 2001.

On May 7, 2002, Petitioner filed a Motion for Second Amendment to the Findings of Fact, Conclusions of Law, and Decision and Order, filed on February 19, 1998 requesting that this Condition No. 12 be further amended. Said Motion was supported by the Affidavit of Roy Figueiroa, General Manager of then Petitioner. The County of Maui Planning Department filed a Response in Support of the Petitioner's Second Amendment on June 19, 2002. On June 20, 2002, the Motion came on hearing before this commission, with appearances by Petitioner, County and Office of Planning. Upon consideration of Petitioner's Motion, supporting affidavit, and the oral and written argument presented by the parties, this commission ordered that Condition No. 12 of the Amended Decision and Order dated February 19, 1998, be amended to impose a four-year agreement deadline from June 1, 2000, to read as follows:

> "12. Petitioner shall participate in the pro rata funding and construction of local and regional transportation improvements and programs, including dedication of rights of way as determined by the State Department of Transportation ("DOT") and the County of Maui. Agreement between Petitioner and DOT as to the level of funding and participation shall be obtained within four (4) years from June 1, 2000."

On May 24, 2004, Petitioner filed a motion for third amendment to the Finding of Fact, Conclusions of Law, and Decision and Order requesting that Condition No. 12 be further amended to extend this agreement deadline beyond June 1, 2004. Said Motion was supported by the Affidavit of Roy Figueiroa, Vice-President of then Petitioner.

On June 4, 2004, the Motion came on hearing before this Commission with appearances by Petitioner, County of Maui, State Office of Planning and State Department of Transportation. The County of Maui stated no objections to Petitioner's request for an extension of time to satisfy Condition No. 12, however, questioned whether the two additional years would be an adequate amount of time to satisfy the condition. Upon consideration of Petitioner's Motion, supporting affidavit and written and oral argument presented by the parties, this Commission ordered that Condition No, 12 of the Amended Decision and Order dated February 19, 1998, be amended to read as follows:

> "12. Petitioner shall participate in the pro rata funding and construction of local and regional transportation improvements and programs, including dedication of rights of way as determined by the State Department of Transportation ("DOT") and the County of Maui. Agreement between Petitioner and DOT as to the level of funding and participation shall be obtained within eight (8) years from June 1, 2000."

The Commission further ordered that the State Department of Transportation file written annual status reports detailing the status of the agreement between Petitioner and DOT as to the level of funding and other participation in constructing local and regional transportation improvements and programs.

Petitioner has met with the State Department of Transportation and has agreed to participate in design and construction of the four-lane widening of Piilani Highway from Kilohana Drive to Wailea Ike Drive.

Letters from the State Department of Transportation, dated September 12, 2007 and January 25, 2007, were attached as Exhibit "C" to the Tenth Annual Report.

On May 23, 2008, Petitioner filed a motion for fourth amendment to the Finding of Fact, Conclusions of Law, and Decision and Order requesting that Condition No. 12 be further amended to extend this agreement deadline beyond June 1, 2008. Said motion was supported by the Affidavit of Roy Figueiroa, project manager of Makena Hotel, LLC and Makena Golf, LLC.

On August 21, 2008, the Motion came on hearing before this Commission with appearances by Petitioner, County of Maui, State Office of Planning and State Department of Transportation. Upon consideration of Petitioner's Motion, supporting affidavit and written and oral argument presented by the parties, this Commission ordered that Condition No. 12 of the Amended Decision and Order dated February 19, 1998, be amended to read as follows:

> "12. Petitioner shall participate in the pro rata funding and construction of local and regional

transportation improvements and programs, including dedication of rights of way as determined by the State Department of Transportation ("DOT") and the County of Maui. Agreement between Petitioner and DOT as to the level of funding and participation shall be obtained within ten (10) years from June 1, 2000."

Petitioner, together with neighboring property owners, (A&B Wailea and Honua`ula), has submitted a draft agreement to the DOT regarding pro rata funding and construction of the Pi`ilani Highway widening project.

13. Petitioner shall fund the design and construction of drainage improvements required as a result of the development of the Property to the satisfaction of the appropriate State of Hawai`i and County of Maui agencies.

Response: As part of the proposed development described in Response No. 12 above and further described in the SMA use permit discussed in Response No. 12 as set forth in the Second Annual Report, Petitioner also proposed certain drainage improvements at the Makena Resort.

As reported in the Fifth Annual Report the Petitioner was preparing a Drainage Master Plan to be submitted to the County Department of Public Works and Environmental Management and Planning Department. The Master Plan was submitted on July 1, 2003 and approved by the County on August 20, 2003. Improvements to be designed and constructed will be in accordance with the approved Master Plan. Each new project will be consistent with the approved Master Plan.

14. The Petition Areas will be developed in accordance with the Kihei-Makena Community Plan.

Response: The Petition Areas shall be developed in accordance with Kihei-Makena Community Plan.

15. Petitioner shall obtain appropriate changes in zoning from the County of Maui for the Petition Areas.

Response: As stated previously, Petitioner submitted a change in zoning application. The change in zoning was approved, effective January 7, 2009. Refer to Exhibit "A".

Petitioner has complied with this condition.

16. Petitioner shall fund, design and construct all necessary traffic improvements necessitated by development of the Petition Areas as required by the State Department of Transportation and the County of Maui Department of Public Works and Waste Management.

Response: Petitioner will comply with this condition.

17. Petitioner shall develop the Property in substantial compliance with the representations made to the Commission. Failure to so develop the Property may result in a reversion of the Property to its former classification, a change to a more appropriate classification, or other reasonable remedy as determined by the Commission.

Response: Petitioner will comply with this condition.

18. Petitioner shall give notice to the Commission of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Property, prior to development of the Property.

Response: A July 11, 2000 letter from Eric T. Maehara, Esq., attached as Exhibit "H" to the Sixth Annual Report, notified the Commission of name changes to corporations holding property in the Petition Areas.

By letter dated July 29, 2005, attached as Exhibit "D" to the Eighth Annual Report, Petitioner, through its attorney Christopher T. Kobayashi, notified the Commission of the sale of certain parcels of real property within the petition area to Keaka LLC, a Delaware limited liability company.

By letter dated March 7, 2007, attached as Exhibit "K" to the Ninth Annual Report, Petitioner, through its attorney Burt T. Lau, notified the Commission of the intent to sell the remainder of the Makena Resort properties to Honua LLC, a Delaware limited liability company.

19. Petitioner shall timely provide without any prior notice, annual reports to the Commission, the Office of Planning, and the County of Maui Planning Department

in connection with the status of the subject project and Petitioner's progress in complying with the conditions imposed herein. The annual report shall be submitted in a form prescribed by the Executive Officer of the Commission.

Response: This Eleventh Annual Report complies with this condition.

20. The commission may fully or partially release or amend the conditions provided herein as to all or any portion of the petition area upon timely motion and upon the provision of adequate assurance of satisfaction of these conditions by Petitioner.

Response: Petitioner will submit a timely motion to fully or partially release or amend the conditions upon compliance with the same.

21. Within seven (7) days of the issuance of the Commission's Decision and Order for the subject reclassification, Petitioner shall (a) record with the Bureau of Conveyances a statement that the Property is subject to conditions imposed herein by the Land Use Commission in the reclassification of the Property, and (b) shall file a copy of such recorded statement with the Commission.

Response: Petitioner has complied with this condition.

22. Petitioner shall record the conditions imposed herein by the Commission with the Bureau of Conveyances pursuant to Section 15-15-92, Hawai`i Administrative Rules.

Response: Petitioner has complied with this condition.

If you have any questions or require any further information, please contact this office.

Very truly yours,

Don Fujimoto, Vice President
HONUA LLC

cc: State of Hawai`i, Office of Planning
County of Maui, Department of Planning

ORDINANCE NO. 3613

BILL NO. 117 (2008)

A BILL FOR AN ORDINANCE TO AMEND PORTIONS OF LAND ZONING MAP NOS. 5 AND 514 TO ESTABLISH A-2 APARTMENT DISTRICT, B-2 COMMUNITY BUSINESS DISTRICT, B-R RESORT COMMERCIAL DISTRICT, H-M HOTEL DISTRICT, PK-1 NEIGHBORHOOD PARK DISTRICT, PK-4 GOLF COURSE PARK DISTRICT, R-1 AND R-3 RESIDENTIAL DISTRICT ZONING (CONDITIONAL ZONING) FOR LANDS SITUATED AT MAKENA, MAUI, HAWAII

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Pursuant to Chapters 19.08, 19.12, 19.14, 19.18, 19.22, 19.510, and 19.615, Maui County Code, portions of Land Zoning Map Nos. 5 and 514 are hereby amended for certain parcels of land located in Makena, Maui, Hawaii, identified in Table 1, comprising approximately 603.303 acres, and more particularly described in Exhibit "A", which is attached hereto and made a part hereof, and in Land Zoning Map No. L-585, on file in the Office of the County Clerk of the County of Maui and which is by reference made a part hereof.

Table 1

CHANGE IN ZONING				
TMK	Lot No.	From	To	Acres
2-1-5:por. 108, por. 120; 2-1-6:36, por. 57; 2-1-8:por. 78, por. 79, por. 81, por. 90	1, 17, 18	County Ag, A1, A2, R1, GC & OS, R-3, OZ	PK-4	437.085
2-1-5:por. 108; 2-1-8:por. 78, por. 79, por. 81, por. 90	2A, 2C, 8A, 8C, 21B	County Ag, R1, A1, R-3, OZ, GC & OS, STP	A2	119.719
2-1-8:por. 90	4,6	A1, A2	R3	3.361
2-1-7:por. 68	11B	R-2	BR	0.460
2-1-5:por. 108, por. 124; 2-1-6:por. 56, por. 57, por. 59; 2-1-7:por. 68, 93, por. 94	5, 12, 13, 14, 16	Park, R-2, GC & OS, R-1, H-M	PK-1	4.205
2-1-5:83, 84, 85, por. 108, por. 120, 2-1-7:4	15B, 19	GC & OS, B-R, A-1, OZ	HM	28.173
2-1-5:por. 108	20	A2, GC & OS, R-3	B2	9.817
2-1-5:por. 108	22A	A2	R1	0.483
Total				603.303

SECTION 2. Pursuant to Section 19.510.050, Maui County Code, the changes in zoning established by this ordinance, as set forth in Table 1 above, comprising approximately 603.303 acres and delineated on Land Zoning Map No. L-585, are subject to the conditions set forth in Exhibit "B", which is attached hereto and made a part hereof, and the Unilateral Agreement and Declaration for Conditional Zoning, which is attached hereto and made a part hereof as Exhibit "C".

SECTION 3. Existing zoning in Land Zoning Map No. 514, which is not changed by this ordinance, identified in Table 2, comprising 152.386 acres, and more particularly described in Exhibit "D", which is attached hereto and made a part hereof, is incorporated within Land Zoning Map No. L-585, remaining in full force and effect.

EXHIBIT "A"

Table 2

EXISTING ZONING (ORDINANCE NO. 832)			
TMK	*Lot No.*	*Zoning*	*Acres*
2-1-5:por. 108 2-1-8:por. 78, por. 79, por. 80, por. 90, 98, por. 99, 100, 106	2B, 3, 8B, 8D 10, 21A	A-2	97.628
2-1-7:92	7	R-3	0.420
2-1-8:por. 80, por. 99	9	R-2	2.918
2-1-7:por. 68; 2-1-8:por. 80	11A	B-R	9.062
2-1-5:86, por. 124, 125; 2-1-6:37, por. 56, por. 59	15A	H-M	38.262
2-1-5:por. 108	22B	R-1	4.096
Total			152.386 acres

SECTION 4. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:

JAMES A. GIROUX
Deputy Corporation Counsel
County of Maui
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EXHIBIT "A"

LOT 1

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being also the east corner of Lot 4, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6534.89 feet North and 5431.77 feet East and running by azimuths measured clockwise from True South:

1.	220°	49'	873.25	feet;
2.	256°	29'	84.21	feet;
3.	165°	55'	1593.43	feet;
4.	190°	24'	588.16	feet;
5.	256°	16'	455.77	feet;
6.	321°	48'	330.00	feet;
7.	225°	38'	785.00	feet;
8.	273°	10'	225.00	feet;
9.	339°	50'	455.00	feet;
10.	356°	04'	644.00	feet;
11.	24°	11'	473.24	feet;
12.	332°	54'	368.41	feet;
13.	53°	38'	476.77	feet;
14.	341°	41'	1020.78	feet;

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15. 18° 33' 508.13 feet;

16. 63° 38' 260.00 feet;

17. 109° 40' 624.94 feet;

18. 61° 11' 476.09 feet;

19. 82° 24' 697.74 feet;

20. 100° 08' 61.96 feet;

21. 93° 13' 68.47 feet;

22. 64° 06' 739.18 feet;

23. 86° 17' 183.77 feet;

24. 3° 56' 605.61 feet;

25. 333° 18' 306.94 feet;

26. 34° 32' 200.78 feet;

27. 4° 16' 1085.16 feet;

28. 338° 16' 254.87 feet;

29. 5° 38' 320.00 feet;

30. 354° 21' 819.44 feet;

31. 284° 48' 80.00 feet;

32. Thence on a curve to the left with a radius of 312.00 feet, the chord azimuths and distance being:
3° 53' 118.17 feet;

33. 352° 58' 250.50 feet;

34. 54° 12' 226.64 feet;

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35. 16° 00' 235.58 feet;

36. 86° 54' 122.98 feet;

37. Thence on a curve to the right with a radius of 200.00 feet, the chord azimuth and distance being:
133° 52' 292.38 feet;

38. 180° 50' 165.32 feet;

39. Thence on a curve to the left with a radius of 350.00 feet, the chord azimuth and distance being:
169° 55' 132.57 feet;

40. 159° 00' 269.14 feet;

41. 69° 50' 297.36 feet;

42. 346° 36' 537.96 feet;

43. 292° 30' 122.64 feet;

44. 349° 00' 112.00 feet;

45. 5° 44' 76.00 feet;

46. 298° 50' 108.00 feet;

47. 266° 30' 178.00 feet;

48. 226° 49' 125.00 feet;

49. 284° 18' 113.00 feet;

50. 335° 24' 85.00 feet;

51. 5° 16' 94.21 feet;

52. 19° 20' 296.21 feet;

53. 8° 41' 825.97 feet;

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54. 333° 56' 335.68 feet;

55. 331° 32' 60.00 feet;

56. 287° 11' 449.29 feet;

57. 79° 41' 30" 15.69 feet;

58. 339° 25' 1173.59 feet;

59. 59° 36' 994.00 feet;

60. 89° 54' 1190.00 feet;

61. 147° 59' 136.00 feet;

62. 132° 41' 297.53 feet;

63. 198° 00' 725.57 feet;

64. 176° 00' 447.36 feet;

65. Thence on a curve to the right with a radius of 330.00 feet, the chord azimuth and distance being:
242° 49' 53.5" 94.82 feet;

66. 226° 00' 60.76 feet;

67. 175° 00' 188.10 feet;

68. 203° 00' 904.81 feet;

69. 177° 00' 130.83 feet;

70. 97° 00' 49.54 feet;

71. 45° 00' 545.00 feet;

72. 82° 00' 290.00 feet;

73. 350° 00' 200.00 feet;

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74. 12° 00' 535.00 feet;

75. 27° 00' 1080.61 feet;

76. 84° 48' 40" 362.94 feet;

77. 174° 48' 40" 197.82 feet;

78. 172° 13' 30" 242.57 feet;

79. 177° 24' 40" 503.40 feet;

80. 179° 05' 40" 1118.06 feet;

81. 181° 51' 795.48 feet;

82. Thence on a curve to the right with a radius of 470.00 feet, the chord azimuth and distance being:
228° 26' 41" 539.91 feet;

83. 263° 30' 384.04 feet;

84. Thence on a curve to the left with a radius of 480.00 feet, the chord azimuth and distance being:
230° 02' 22.5" 529.31 feet;

85. 196° 34' 45" 469.73 feet;

86. Thence on a curve to the right with a radius of 520.00 feet, the chord azimuth and distance being:
214° 49' 40.5" 325.67 feet;

87. 233° 04' 36" 39.92 feet;

88. Thence on a curve to the left with a radius of 580.00 feet, the chord azimuth and distance being:
211° 34' 36" 425.14 feet;

89. 190° 04' 36" 1728.09 feet;

90. Thence on a curve to the left with a radius of 630.00 feet, the chord azimuth and distance being:
173° 01' 36" 369.44 feet;

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91.	155°	58'	36"	174.49	feet;
92.	Thence on a curve to the right with a radius of 770.00 feet, the chord azimuth and distance being: 165° 58' 36" 267.42 feet;				
93.	175°	58'	36"	632.95	feet;
94.	Thence on a curve to the right with a radius of 770.00 feet, the chord azimuth and distance being: 189° 16' 36" 354.28 feet;				
95.	202°	34'	36"	33.29	feet;
96.	278°	44'		513.03	feet;
97.	274°	40'		565.11	feet;
98.	285°	50'		611.29	feet;
99.	261°	30'		60.00	feet;
100.	250°	00'		149.21	feet;
101.	220°	49'		133.84	feet to the point of beginning and containing a gross area of 439.373 Acres, less the following described Parcel "AG," AG area of 22.100 Acres and a net area of 417.273 Acres.

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

R. M. TOWILL CORPORATION

Description Prepared by:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION
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EXHIBIT "A"

PARCEL AG

CHANGE IN ZONING -MAKENA

Beginning at a point along the southwest corner of this parcel, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6696.43 feet North and 6345.55 feet East and running by azimuths measured clockwise from True South:

1.	189°	19'	406.00	feet;
2.	160°	00'	253.95	feet;
3.	226°	00'	134.20	feet;
4.	165°	40'	676.68	feet;
5.	261°	42'	357.70	feet;
6.	203°	22'	205.00	feet;
7.	176°	36'	556.00	feet;
8.	218°	12'	418.20	feet;
9.	293°	29'	75.82	feet;
10.	353°	38'	431.00	feet;
11.	13°	46'	516.00	feet;
12.	341°	56'	128.00	feet;
13.	49°	10'	504.68	feet;
14.	341°	13'	180.33	feet;

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15.	295°	26'	189.94	feet;
16.	350°	15'	798.05	feet;
17.	31°	40'	193.57	feet;
18.	102°	03'	495.21	feet to the point of beginning and containing an area of 22.100 Acres

R. M. TOWILL CORPORATION

Description prepared by:

RYAN M. SUZUKI LICENSED PROFESSIONAL LAND SURVEYOR No. 10059 HAWAII, U.S.A.

Ryan M. Suzuki
Licensed Professional Land Surveyor
Certificate Number 10059

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Honolulu, Hawaii 96817
October 30, 2001

420 Waiakamilo Road
Suite 411
Honolulu Hawaii 96817-4941
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Fax 808 842 1937
eMail rmtowill@aol.com

EXHIBIT "A"

LOT 2-A

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being the northeast corner of Lot 2-B, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 7557.74 feet North and 5232.55 feet East, and thence running by azimuths measured clockwise from True South:

1.	277°	15'	432.02	feet;
2.	Thence on a curve to the right with a radius of 630.000 feet, the chord azimuth and distance being: 19° 53' 09" 83.82 feet;			
3.	23°	42'	216.33	feet;
4.	36°	12'	313.71	feet;
5.	167°	40'	598.39	feet to the point of beginning and containing an area of 3.065 Acres.

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Description Prepared by:

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420 Waiakamilo Rd., #411
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March 6, 2000

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EXHIBIT "A"

LOT 2-C

CHANGE IN ZONING - MAKENA

Beginning at the north corner of this piece of land, same being the northwest corner of Lot 2-B, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 7501.96 feet North and 4386.71 feet East, and thence running by azimuths measured clockwise from True South:

1. 352° 54' 447.59 feet;
2. 262° 50' 139.91 feet;
3. Thence on a curve to the right with a radius of 400.00 feet, the chord azimuth and distance being: 295° 28' 431.41 feet;
4. 328° 06' 427.44 feet;
5. Thence on a curve to the left with a radius of 770.00 feet, the chord azimuth and distance being: 356° 53' 05" 144.52 feet;
6. 81° 30' 60.00 feet;
7. 105° 50' 611.29 feet;
8. 94° 40' 565.11 feet;
9. 98° 44' 513.03 feet;
10. 202° 34' 36" 208.81 feet;

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11. Thence on a curve to the left with a radius of 480.00 feet, the chord azimuth and distance being: 163° 35' 00.5" 604.06 feet;
12. 266° 13' 36" 993.06 feet to the point of beginning and containing an area of 26.045 Acres.

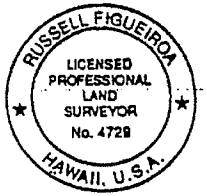

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EXHIBIT "A"

LOT 4

CHANGE IN ZONING - MAKENA

Beginning at the east corner of this piece of land, same being also the north corner of Lot 1, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6534.89 feet North and 5431.77 feet East and running by azimuths measured clockwise from True South:

1.	40°	49'	133.84	feet;
2.	70°	00'	149.21	feet;
3.	Thence on a curve to the right with a radius of 770.00 feet, the chord azimuth and distance being: 193° 51'		585.61	feet;
4.	216°	12'	27.28	feet;
5.	347°	40'	264.59	feet;
6.	355°	16'	180.40	feet to the point of beginning and containing an area of 2.047 Acres.

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RUSSELL FIGUEIROA
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No. 4729
HAWAII, U.S.A.

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March 6, 2000

EXHIBIT "A"

LOT 5

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 5881.42 feet North and 2759.80 feet East and running by azimuths measured clockwise from True South:

1.	92°	58	36"	39.43	feet;
2.	180°	58'	36"	258.00	feet;
3.	143°	58'	06"	86.83	feet;
4.	159°	08'	40"	195.00	feet;
5.	89°	58'	40"	185.00	feet;
6.	108°	35'	10"	90.10	feet;
7.	154°	06'		95.00	feet;
8.	168°	51'	10"	50.00	feet;
9.	285°	58'	40"	175.32	feet;
10.	325°	30'		28.97	feet;
11.	276°	10'		106.90	feet;
12.	267°	30'		12.18	feet;
13.	300°	28'	40"	107.65	feet;

14. 314° 18' 40" 129.85 feet;

15. 356° 42' 40" 102.65 feet;

16. 2° 58' 36" 345.20 feet to the point of beginning and containing an area of 1.753 Acres.

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March 6, 2000

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Description Prepared by:

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EXHIBIT "A"

LOT 6

CHANGE IN ZONING - MAKENA

Beginning at the northeast corner of this piece of land, same being also the southeast corner of Lot 1, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 5964.86 feet North and 5478.10 feet East and running by azimuths measured clockwise from True South:

1. Thence on a curve to the right with a radius of 800.00 feet, the chord azimuth and distance being:
   13° 47' 08" 437.11 feet;

2. 161° 14' 336.04 feet;

3. Thence on a curve to the right with a radius of 170.00 feet, the chord azimuth and distance being:
   169° 17' 47.61 feet;

4. 177° 20' 29.90 feet;

5. 262° 24' 224.49 feet to the point of beginning and containing an area of 1.314 Acres.

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Honolulu, Hawaii 96817-4941
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EXHIBIT "A"

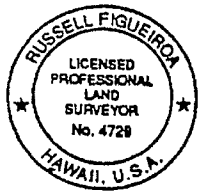
LOT 8-A

CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being the northwest corner of Water Tank Lot, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4112.28 feet North and 4961.40 feet East, and thence running by azimuths measured clockwise from True South:

1. 166° 42' 308.18 feet;
2. Thence on a curve to the right with a radius of 800.000 feet, the chord azimuth and distance being: 192° 01' 684.19 feet;
3. 217° 20' 464.61 feet;
4. Thence on a curve to the left with a radius of 800.00 feet, the chord azimuth and distance being: 213° 29' 12" 107.34 feet;
5. 341° 14' 164.46 feet;
6. 344° 28' 149.88 feet;
7. Thence on a curve to the right with a radius of 360.00 feet, the chord azimuth and distance being: 352° 43' 103.32 feet;
8. 0° 58' 40.45 feet;
9. Thence on a curve to the left with a radius of 740.00 feet, the chord azimuth and distance being: 339° 17' 50.5" 546.49 feet;

10. Thence still on a curve to the left with a radius of 30.00 feet, the chord azimuth and distance being: 293° 43' 10" 24.32 feet;
11. 41° 46' 714.65 feet;
12. 115° 14' 37" 193.40 feet;
13. 80° 43' 37" 83.59 feet to the point of beginning and containing an area of 16.019 Acres.



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Certificate Number 4729

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Honolulu, Hawaii 96817-4941
March 6, 2000

EXHIBIT "A"

LOT 8-C

CHANGE IN ZONING - MAKENA

Beginning at the west corner of this piece of land, same being the southeast corner of Lot 20, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1082.64 feet North and 4521.81 feet East, and thence running by azimuths measured clockwise from True South:

1. 169° 29' 300.08 feet;
2. 172° 58' 607.06 feet;
3. Thence on a curve to the right with a radius of 312.00 feet, the chord azimuth and distance being: 183° 53' 118.17 feet;
4. 104° 48' 80.00 feet;
5. 174° 21' 819.44 feet;
6. 185° 38' 320.00 feet;
7. 158° 16' 254.87 feet;
8. 184° 16' 1023.34 feet;
9. Thence on a curve to the right with a radius of 800.00 feet, the chord azimuth and distance being: 336° 11' 11" 646.02 feet;
10. 0° 00' 218.30 feet;
11. 1° 23' 101.39 feet;
12. 268° 25' 387.00 feet;

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13. 199° 35' 45.94 feet;
14. 185° 35' 461.50 feet;
15. 350° 43' 37" 49.50 feet;
16. Thence on a curve to the right with a radius of 390.00 feet, the chord azimuth and distance being: 0° 47' 37" 136.34 feet;
17. 290° 00' 196.45 feet;
18. 20° 00' 77.96 feet;
19. 359° 20' 271.78 feet;
20. 51° 42' 32" 102.20 feet;
21. 343° 30' 02" 608.02 feet;
22. 43° 02' 30" 316.00 feet;
23. 14° 24' 34" 152.58 feet;
24. 353° 30' 93.00 feet;
25. 67° 00' 547.80 feet;
26. 336° 30' 435.00 feet;
27. 5° 52' 30" 385.93 feet;
28. 278° 55' 20" 461.31 feet;
29. 355° 06' 45" 581.81 feet;
30. 93° 48' 30" 357.94 feet;
31. 337° 30' 02" 1229.37 feet;
32. 79° 41' 30" 658.22 feet;

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33. 107° 11' 449.29 feet;

34. 151° 32' 60.00 feet;

35. 153° 56' 273.55 feet;

36. Thence on a curve to the left with a radius of 4300.00 feet, the chord azimuth and distance being:
198° 20' 01" 1201.65 feet;

37. 273° 30' 143.50 feet to the point of beginning and containing an area of 68.048 Acres.

RUSSELL FIGUEIROA
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No. 4729
HAWAII, U.S.A.

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

EXHIBIT "A"

LOT 11-B

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being also the northeast corner of Lot 12, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4702.48 feet North and 2652.75 feet East and running by azimuths measured clockwise from True South:

1. 290° 00' 167.01 feet;
2. 20° 00' 119.98 feet;
3. 110° 00' 167.01 feet;
4. 200° 00' 119.98 feet to the point of beginning and containing an area of 0.460 Acre.

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420 Waiakamilo Rd., #411
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No. 4729
HAWAII, U.S.A.

EXHIBIT "A"

LOT 12

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4737.88 feet North and 2555.47 feet East and running by azimuths measured clockwise from True South:

1.	290°	00'	103.52	feet;
2.	20°	00'	119.98	feet;
3.	110°	00'	192.27	feet;
4.	236°	53'	123.55	feet;

5. Thence on a curve to the left with a radius of 322.00 feet, the chord azimuth and distance being: 234° 35' 45" 25.70 feet to the point of beginning and containing an area of 0.406 Acre.

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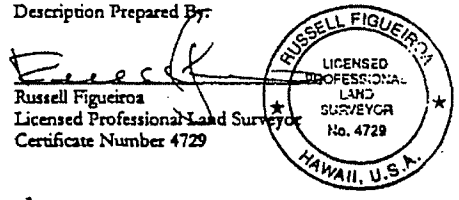
Description Prepared By:



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March 6, 2000

EXHIBIT "A"

LOT 13

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the northwest corner of Lot 15-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4227.10 feet North and 2235.27 feet East and running by azimuths measured clockwise from True South:

1.	80°	37'	62.31	feet;
2.	180°	48'	82.89	feet;
3.	144°	10'	67.92	feet;
4.	275°	11'	80.51	feet;

5. Thence on a curve to the left with a radius of 323.00 feet, the chord azimuth and distance being: 350° 53' 46" 3.15 feet;

6. 350° 37' 119.00 feet to the point of beginning and containing an area of 0.173 Acre.

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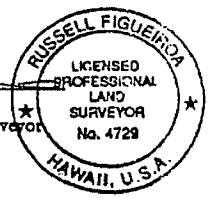
Description Prepared By:



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420 Waiakamilo Rd., #411
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March 6, 2000

EXHIBIT "A"

LOT 14

CHANGE IN ZONING - MAKENA

Beginning at the south corner of this piece of land, same being also the southwest corner of Lot 22-B, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1682.37 feet South and 2542.61 feet East and running by azimuths measured clockwise from True South:

1.	132°	41'	403.29	feet;
2.	Thence on a curve to the left with a radius of 750.00 feet, the chord azimuth and distance being: 251° 35' 05.5" 261.08 feet;			
3.	352°	12'	359.21	feet to the point of beginning and containing an area of 1.012 Acres.

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Description Prepared By:

420 Waiakamilo Rd., #411
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March 6, 2000

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RUSSELL FIGUEIROA
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No. 4729
HAWAII, U.S.A.

EXHIBIT "A"

LOT 15-B

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4070.33 feet North and 2317.94 feet East and running by azimuths measured clockwise from True South:

1.	274°	44'	70.62	feet;
2.	318°	59'	24.00	feet;
3.	272°	25'	94.80	feet;
4.	358°	50'	104.20	feet;
5.	107°	59'	125.00	feet;
6.	160°	05'	12.00	feet;
7.	27°	35'	10.00	feet;
8.	102°	45'	48.60	feet;
9.	179°	00'	12.02	feet;
10.	Thence on a curve to the left with a radius of 328.00 feet, the chord azimuth and distance being: 174° 48' 30" 47.95 feet;			
11.	170°	37'	20.88	feet to the point of beginning and containing an area of 0.353 Acres.

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EXHIBIT "A"

LOT 16

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 3108.23 feet North and 1889.16 feet East and running by azimuths measured clockwise from True South:

1.	124°	42'	107.24	feet;
2.	101°	04'	28.00	feet;
3.	91°	12'	6.00	feet;
4.	Thence on a curve to the left with a radius of 25.00 feet, the chord azimuth and distance being: 65° 13' 30" 21.90 feet;			
5.	39°	15'	20.00	feet;
6.	305°	15'	9.00	feet;
7.	39°	40'	16.00	feet;
8.	137°	57'	13.00	feet;
9.	76°	00'	37.00	feet;
10.	Thence on a curve to the left with a radius of 250.00 feet, the chord azimuth and distance being: 136° 41' 45" 141.58 feet;			
11.	228°	50'	20.00	feet;
12.	252°	28'	53.00	feet;

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-2-

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Description Prepared By:

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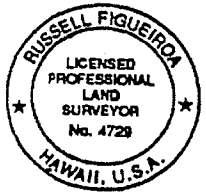
RUSSELL FIGUEROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

13.	293°	57'		53.00	feet;
14.	221°	13'		29.00	feet;
15.	129°	34'		17.00	feet;
16.	216°	13'		17.00	feet;
17.	300°	34'		57.00	feet;
18.	230°	38'		56.17	feet;
19.	248°	53'		34.90	feet;
20.	311°	36'	15"	139.84	feet;
21.	29°	20'		124.40	feet to the point of beginning and containing an area of 0.861 Acre.



420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared By:

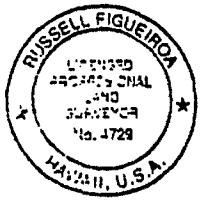
Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

EXHIBIT "A"

LOT 17
CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being also the northwest corner of Lot 19, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 2860.50 feet North and 1798.77 feet East and running by azimuths measured clockwise from True South:

1.	205°	07'		153.25	feet;
2.	207°	52'	44"	90.02	feet;
3.	258°	14'		590.87	feet;
4.	270°	00'		339.85	feet;
5.	290°	26'		441.91	feet;
6.	Thence on a curve to the right with a radius of 520.00 feet, the chord azimuth and distance being: 39° 10' 37.5" 249.83 feet;				
7.	53°	04'	36"	39.92	feet;
8.	Thence on a curve to the left with a radius of 580.00 feet, the chord azimuth and distance being: 48° 28' 31.5" 93.06 feet;				
9.	110°	29'		234.97	feet;
10.	90°	45'		960.11	feet to the point of beginning and containing an area of 9.372 Acres.



R. M. TOWILL CORPORATION

Description Prepared By:

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420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
October 22, 2000 Rev.

EXHIBIT "A"

LOT 18

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1722.80 feet North and 1532.63 feet East and running by azimuths measured clockwise from True South:

1.	112°	00'	34.98	feet;
2.	93°	30'	649.05	feet;
3.	180°	37'	109.74	feet;
4.	193°	19'	209.91	feet;
5.	197°	25'	294.96	feet;
6.	195°	35'	167.83	feet;
7.	150°	49'	112.43	feet;
8.	187°	04'	126.83	feet;
9.	165°	36'	110.87	feet;
10.	236°	33'	142.75	feet;
11.	258°	37'	105.15	feet;
12.	229°	30'	93.02	feet;
13.	291°	08'	0.16	feet;
14.	222°	30'	78.00	feet;

15. 246° 39' 136.00 feet;

16. 274° 44' 33.00 feet;

17. 182° 05' 116.00 feet;

18. 302° 34' 87.00 feet;

19. 229° 39' 53.65 feet;

20. Thence on a curve to the right with a radius of 250.00 feet, the chord azimuth and distance being:
316° 41' 45" 141.58 feet;

21. 76° 00' 12.00 feet;

22. 47° 49' 278.45 feet;

23. 40° 00' 285.81 feet;

24. 16° 30' 708.56 feet;

25. 292° 00' 503.50 feet;

26. 8° 00' 135.00 feet to the point of beginning and containing an area of 10.440 Acres.

RUSSELL FIGUEIROA
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420 Waiakamilo Rd., #411
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March 6, 2000

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EXHIBIT "A"

LOT 19
CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being also the southwest corner of Lot 17, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 2860.50 feet North and 1798.77 feet East and running by azimuths measured clockwise from True South:

1. 270° 45' 960.11 feet;

2. 290° 29' 234.97 feet;

3. Thence on a curve to the left with a radius of 580.00 feet, the chord azimuth and distance being:
30° 13' 36" 273.70 feet;

4. 16° 34' 45" 469.73 feet;

5. Thence on a curve to the right with a radius of 420.00 feet, the chord azimuth and distance being:
50° 02' 22.5" 463.14 feet;

6. 83° 30' 384.04 feet;

7. Thence on a curve to the left with a radius of 530.00 feet, the chord azimuth and distance being:
64° 36' 48.5" 343.12 feet;

8. Thence still on a curve to the right with a radius of 20.00 feet, the chord azimuth and distance being:
88° 22' 23.5" 27.10 feet;

9. Still on a curve to the right with a radius of 128.00 feet, the chord azimuth and distance being:
157° 16' 50" 113.27 feet;

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EXHIBIT "A"

LOT 20

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the west corner of Lot 8-C, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1082.64 feet North and 4521.81 feet East and running by azimuths measured clockwise from True South:

1.	93°	30'		326.35	feet;
2.	185°	16'		94.21	feet;
3.	155°	24'		85.00	feet;
4.	104°	18'		113.00	feet;
5.	46°	49'		125.00	feet;
6.	86°	30'		178.00	feet;
7.	118°	50'		108.00	feet;
8.	185°	44'		76.00	feet;
9.	169°	00'		112.00	feet;
10.	112°	30'		122.64	feet;
11.	166°	36'		537.96	feet;
12.	249°	50'		297.36	feet;
13.	339°	00'		269.14	feet;

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10.	186°	50'	20"	333.75	feet;
11.	188°	23'	20"	251.10	feet;
12.	185°	03'		142.40	feet;
13.	190°	10'		131.42	feet;
14.	197°	07'		297.40	feet;
15.	197°	07'	03"	32.00	feet to the point of beginning and containing an area of 27.820 Acres.

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420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
October 22, 2000 Rev.

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

EXHIBIT "A"

LOT 21-B

CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being also the southwest corner of Lot 21-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 621.97 feet South and 2447.61 feet East and running by azimuths measured clockwise from True South:

1. 305° 18' 317.33 feet;
2. Thence on a curve to the left with a radius of 330.00 feet, the chord azimuth and distance being: 14° 45' 03" 27.46 feet;
3. 12° 22' 233.89 feet;
4. Thence on a curve to the right with a radius of 500.00 feet, the chord azimuth and distance being: 30° 19' 22" 308.29 feet;
5. Thence still on a curve to the right with a radius of 750.00 feet, the chord azimuth and distance being: 71° 35' 05.5" 261.08 feet;
6. 65° 15' 204.55 feet;
7. 84° 48' 40" 60.44 feet;
8. 207° 00' 985.50 feet to the point of beginning and containing an area of 6.542 Acres.

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14. Thence on a curve to the right with a radius of 350.00 feet, the chord azimuth and distance being: 349° 55' 132.37 feet;
15. 0° 50' 165.32 feet;
16. Thence on a curve to the left with a radius of 200.00 feet, the chord azimuth and distance being: 313° 52' 292.38 feet;
17. 266° 54' 122.98 feet;
18. 196° 00' 235.58 feet;
19. 234° 12' 226.64 feet;
20. 352° 58' 356.56 feet;
21. 349° 29' 300.08 feet to the point of beginning and containing an area of 9.817 Acres.

RUSSELL FIGUEIROA
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HAWAII, U.S.A.

R. M. TOWILL CORPORATION

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420 Waiakamilo Rd., #411
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March 6, 2000

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EXHIBIT "A"

LOT 22-A

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the northeast corner of Lot 22-B, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 906.70 feet South and 2849.74 feet East and running by azimuths measured clockwise from True South:

1. 125° 18' 175.40 feet;
2. Thence on a curve to the right with a radius of 330.00 feet, the chord azimuth and distance being: 215° 51' 12" 211.80 feet;
3. 356° 00' 273.69 feet to the point of beginning and containing an an area of 0.483 Acres.

R. M. TOWILL CORPORATION

Description Prepared By:

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Certificate Number 4729

420 Waiakamilo Rd., #411
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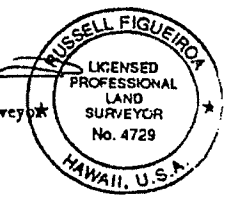
March 6, 2000



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March 6, 2000

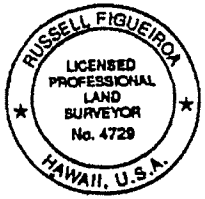

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EXHIBIT "B"

Conditions of Zoning

INTRODUCTORY NOTES:

A. Unless otherwise specified, each condition applies to each project.

B. The following definitions shall apply to these conditions:

"County" means the County of Maui.

"Developer" means Keaka LLC; Makena Golf, LLC; Makena Hotel, LLC; Makena MF-2&3, LLC; and Makena Resort Services LLC; their successors and permitted assigns; and any future developer or owner of any property that is the subject of this Change in Zoning.

"Project" means each development that requires an SMA permit from the Maui Planning Commission.

"SMA" means Special Management Area.

"State" means the State of Hawaii.

Density and Height Restrictions

1. In the R-1, R-2, and R-3 Residential District zoned areas, the density shall not exceed 2.5 single-family dwelling units per acre.

2. In the A-2 Apartment District zoned areas, the density shall not exceed eight units per acre, and the building height shall not exceed 45 feet. Height shall be measured from the natural or finish grade, whichever is lower.

3. In the B-2 Community Business District zoned areas, the gross floor area of each building shall not exceed 60 percent of the total lot area.

4. On Lot 19 (H-M Hotel District), the building height shall not exceed 45 feet and shall be consistent with the Urban Design Standards for Building Form in the Kihei-Makena Community Plan; no more than 89 units shall be developed; and no lockout units shall be allowed. Height shall be measured from the natural or finish grade, whichever is lower.

5. The developer shall preserve Makena's significant views of the Pacific Ocean and the broad vista to the Central Maui and Upcountry regions. The use of walls higher than four feet in frontyard setbacks shall be prohibited.

Noise Mitigation

6. In the B-2 Community Business District zoned areas, the following permitted uses shall incorporate acoustical measures into the facility to mitigate potential noise impacts: amusement enterprises, including billiard and pool halls; auditoriums and theaters; baseball and football stadiums and other sport activities and amusements; bowling alleys; dancing and hula studios; gymnasiums; miniature golf courses; music conservatories and music studios; physical-culture studios; and printing, lithography, and publishing shops.

Lighting Standards

7. All exterior lighting shall be shielded from adjacent residential properties and nearshore waters, and shall be fully shielded to prevent uplight. Lighting requirements in force at the time of building permit application shall be applied.

Screening of Certain Uses

8. In the B-2 Community Business District zoned areas, merchandise, equipment, and supplies shall be stored within enclosed buildings or enclosed areas that are appropriately screened with fencing and landscape planting for the following permitted uses: equipment rental and sales yards; hardware and garden supply

stores; parcel delivery stations; and printing, lithography, and publishing shops.

Education

9. The developer, its successors and permitted assigns, shall pay the Department of Education $3,000 per dwelling unit upon issuance of each building permit to be used, to the extent possible, for schools serving the Kihei-Makena Community Plan area; provided that, should the State pass legislation imposing school impact fees that apply to the Makena Resort Area, the developer, its successors and permitted assigns, shall from that point forward comply with the State requirements, or contribute $3,000 per dwelling unit, whichever is greater. Should a previous agreement exist between the Department of Education and the landowner, this condition shall prevail.

Transportation

10. The developer shall provide pedestrian and bicycle access ways within the roadways throughout and fronting the Makena Resort Area. A schematic plan for pedestrian and bicycle access ways throughout and fronting the Makena Resort Area shall be submitted to the Department of Planning for consideration by the Maui Planning Commission in conjunction with SMA permit applications.

11. The developer shall make a contribution to the County for traffic improvements in an amount equal to $5,000 per unit. The contribution shall be paid to the County prior to issuance of the initial building permit. Upon adoption of a traffic impact fee ordinance, the developer shall comply with the ordinance in lieu of this voluntary contribution. Should a traffic impact fee ordinance be adopted prior to the collection of this contribution, the applicable amount shall be the greater of the two. Such contributions or fees shall not be counted towards Condition No. 12 below.

12. Upon commencement of the first phase of construction, the developer shall pay its pro-rata share to upgrade

Piilani Highway from Kilohana Drive to Wailea Ike Drive to four lanes of traffic, and shall cooperate with the State Department of Transportation and other area developers to implement such improvements concurrent with development.

13. The developer shall provide construction access roads from Piilani Highway to the construction sites. Construction traffic shall be prohibited on Kilohana Drive, Wailea Ike Drive, Wailea Alanui Drive, and Makena Alanui Drive to the extent practicable.

14. The developer shall develop and submit a Transportation Management Plan ("TMP"), to be reviewed and approved by the State Department of Transportation, the County Department of Public Works, and the County Department of Transportation. The purpose of the TMP shall be to reduce traffic generated by construction activity related to the Makena Resort Area. The TMP shall provide for programs such as park and ride, shuttles, and/or restrictions on worker access to ongoing construction activity during peak hour traffic. Upon approval, project contractors shall implement the TMP during construction activities. The developer shall submit an annual report to the State Department of Transportation, the County Department of Public Works, the County Department of Transportation, and the Maui County Council to document the success of the TMP in meeting its benchmarks of reducing traffic during project construction.

    The TMP shall be reviewed and approved by the State Department of Transportation, the County Department of Public Works, and the County Department of Transportation prior to issuance of each SMA permit within the Makena Resort Area.

15. As part of the first SMA application, the developer shall submit a TMP to reduce the dependency on individual vehicular transportation modes. The TMP shall be reviewed and approved by the State Department of Transportation, the County Department of Public Works, and the County Department of Transportation to address post-construction traffic issues.

Civil Defense

16. The developer shall participate in the pro rata funding and construction of adequate civil defense measures as determined by the State and County civil defense agencies.

Historical and Cultural Resources

17. Should any human burials or any historic sites such as artifacts, charcoal deposits, stone platforms, pavings, or walls be found, the developer shall stop construction work in the immediate vicinity and notify the State Historic Preservation Division (SHPD), the Maui/Lanai Island Burial Council (MLIBC), and the Maui County Cultural Resources Commission (CRC).

18. The developer, its successors and permitted assigns, shall provide a comprehensive preservation/mitigation plan pursuant to Chapter 6E, Hawaii Revised Statutes, that has been approved by the State Historic Preservation Division, Department of Land and Natural Resources, and the Office of Hawaiian Affairs prior to any grading within the project area.

Nearshore Water Quality

19. Marine monitoring programs shall be conducted which include monitoring and assessment of coastal water resources (groundwater and surface water) that receive surface water or groundwater discharges from the hydrologic unit where the project is located. Monitoring programs shall include both water quality and ecological monitoring.

    Water Quality Monitoring shall provide water quality data adequate to assess compliance with applicable State water quality standards at Hawaii Administrative Rules Chapter 11-54. Assessment procedures shall be in accordance with the current Hawaii Department of Health ("HIDOH") methodology for Clean Water Act Section 305(b) water quality assessment, including use of approved analytical methods and quality control/quality assurance measures. The water quality

data shall be submitted biannually, or every six months, to HIDOH for use in the State's Integrated Report of Assessed Waters prepared under Clean Water Act Sections 303(d) and 305(b). If this report lists the receiving waters as impaired and requiring a Total Maximum Daily Load ("TMDL") study, then the monitoring program shall be amended to evaluate land-based pollutants, including: (1) monitoring of surface water and groundwater quality for the pollutants identified as the source of the impairment; and (2) providing estimates of total mass discharge of those pollutants on a daily and annual basis from all sources, including infiltration, injection, and runoff. The results of the land-based pollution water quality monitoring and loading estimate shall be submitted to the HIDOH Environmental Planning Office, TMDL Program.

The ecological monitoring shall include ecological assessment in accordance with the Coral Reef Assessment and Monitoring Program protocols used by the Department of Land and Natural Resources. The initial assessment shall use the full protocol. Subsequent biannual assessments can use the Rapid Assessment Techniques. Results shall be reported biannually to the Aquatic Resources Division, Department of Land and Natural Resources.

The monitoring and assessments shall be conducted by degreed scientists experienced with Clean Water Act programs, water quality monitoring, water quality assessment, water quality-based permitting, water quality modeling, watershed planning, and TMDL. Study design should be made available for both public review and peer review by the State Department of Health, Department of Aquatic Resources, and the University of Hawaii researchers. Results of monitoring shall be published and publicly available online.

20. The developer shall implement efficient soil-erosion and dust-control measures during and after development to the satisfaction of DOH and the County.

Transfer of Ownership

21. The developer shall give notice to the Department of Planning and the Council of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Makena Resort Area, prior to any development.

Compliance with Conditions

22. The developer shall provide timely annual compliance reports to the Planning Director and the Council. The compliance reports shall include: (a) the status of the developer's compliance with each of these conditions; and (b) a reasonable estimate of the time needed for full compliance.

23. Failure to fulfill any condition may result in a reversion to former or more appropriate zoning or community plan designations or other remedies.

24. If any of the property subject to this Change in Zoning is consolidated with other property for purposes of an SMA permit application, these conditions shall apply to the entirety of the consolidated property.

Residential Workforce Housing

25. The developer shall comply with the County's Residential Workforce Housing Policy as provided in Chapter 2.96, Maui County Code.

Water

26. The developer shall comply with all applicable County water ordinances.

    The water rates for the residential workforce housing units shall be no higher than the general water consumer rates set by the County in its annual budget, for as long as the units are subject to Chapter 2.96, Maui County Code.

27. The developer shall provide a water conservation plan for the Makena Resort Area, approved by the Department of Water Supply, prior to the issuance of any SMA permits. For each project, the developer shall construct a dual waterline system to accommodate the use of non-potable water for landscaping and irrigation purposes prior to the issuance of any building permits.

Energy

28. All energy systems for all residential, commercial, and hotel units shall be designed and constructed to meet all applicable ENERGY STAR® requirements established by the Climate Protection Division of the United States Environmental Protection Agency in effect at the time of construction. For purposes of this condition, energy systems shall include all hot-water systems, roof and attic areas, outside walls, windows, air-cooling systems, and heating systems.

29. All residential, commercial, and hotel units shall comply with Chapter 16.16, Maui County Code.

30. All air-cooling systems and all heating systems for laundry facilities, swimming pools, and spa areas shall make maximum use of energy-efficient construction and technology.

Access for Parks and Recreation

31. The developer shall construct a minimum of 60 new parking stalls at Maluaka Beach, including at least 10 at the north end, within one year of the issuance to the developer of any SMA permit by the Maui Planning Commission relating to a parcel or a portion thereof that is a subject of this Change in Zoning. Unless necessary to protect public safety or to comply with State or Federal law, the required parking stalls need not be asphalt surfaced. Development costs and land shall not satisfy park dedication requirements.

32. The developer shall develop an expansion of the beach park at the south end of Maluaka Beach, such that the beach park shall comprise at least 1.5 acres of land

area for public use and beach access. The developer shall submit the necessary applications required for the expansion within six months of the approval of this Change in Zoning. The land area of the expansion of the existing park shall be applied as credit toward satisfying a portion of any applicable park dedication requirements.

33. To the extent practicable, the developer shall provide, in perpetuity, traversable lateral shoreline access in the area between the shoreward boundary and the mauka boundary of the Makena Resort Area. Costs associated with this condition shall not satisfy park dedication requirements.

34. Within one year of the approval of this Change in Zoning, the developer shall initiate and fund a plan for the development of the State Park at Makena for the State Department of Land and Natural Resources and the Department of Parks and Recreation, soliciting and taking into consideration the comments of various user groups, including Surfrider Foundation, Savemakena.org, Maui Tomorrow, the Kihei Community Association, and the Makena Homeowner's Association. The plan shall incorporate recreational, landscaping, parking, and facility concepts as a guide for future development of the park. Costs associated with this condition shall not satisfy park dedication requirements.

35. The developer shall renovate and beautify Makena Landing (TMK: 2-1-007:094), see attached map, in coordination with the Department of Parks and Recreation and the State Department of Land and Natural Resources. Costs associated with this condition shall not satisfy park dedication requirements.

36. The developer shall maintain Makena Landing (TMK: 2-1-007:094), North Maluaka (TMK: 2-1-007:068), and South Maluaka (TMK: 2-1-005:124), see attached map, and all future parklands within the Makena Resort Area.

Hawaiian Island Architecture

37. To exhibit respect for the Hawaiian culture and a Hawaiian sense of place, structures within the Makena Resort Area shall be based on or inspired by principles of Hawaiian island architecture in design and construction.

Native Forests and Species

38. The developer shall provide a baseline study survey of flora and fauna as part of each SMA permit application within the Makena Resort Area; the study shall be conducted by recognized independent experts on Hawaiian flora and fauna and list all endemic, indigenous, and endangered species, their distribution in the Makena Resort Area and adjacent shorelines. This study shall also include a preservation/mitigation plan and comments from the State Department of Land and Natural Resources, the U.S. Fish and Wildlife Service, and the U.S. Corps of Engineers, and the Maui representative of the Hawaii Wildlife Fund and The Nature Conservancy.

Transient Vacation Rentals/Time Shares

39. No transient vacation rentals or time shares shall be allowed within this Makena Resort rezoning application area; and further, no special use permit or conditional permit for such accommodations shall be accepted by the Department of Planning.

Hotel Limitation

40. A second hotel shall not be constructed within the Makena Resort Area.

LEED Certified Buildings

41. All buildings constructed within the Makena Resort Area shall be LEED (Leadership in Energy and Environmental Design) certified if they are 500 square feet or larger.

Dwelling Units

42. New dwelling units shall not exceed 800, excluding residential workforce housing.

Police

43. The developer, its successors and permitted assigns, shall contribute $1,000 per market-priced unit, collected at issuance of building permit, to the County, for the development and maintenance of a police station in South Maui.

Emergency Evacuation

44. The developer shall provide Driveway "D" from Makena Alanui Road to Makena Resort Sewage Treatment Plant and beyond as an emergency evacuation route for the area.

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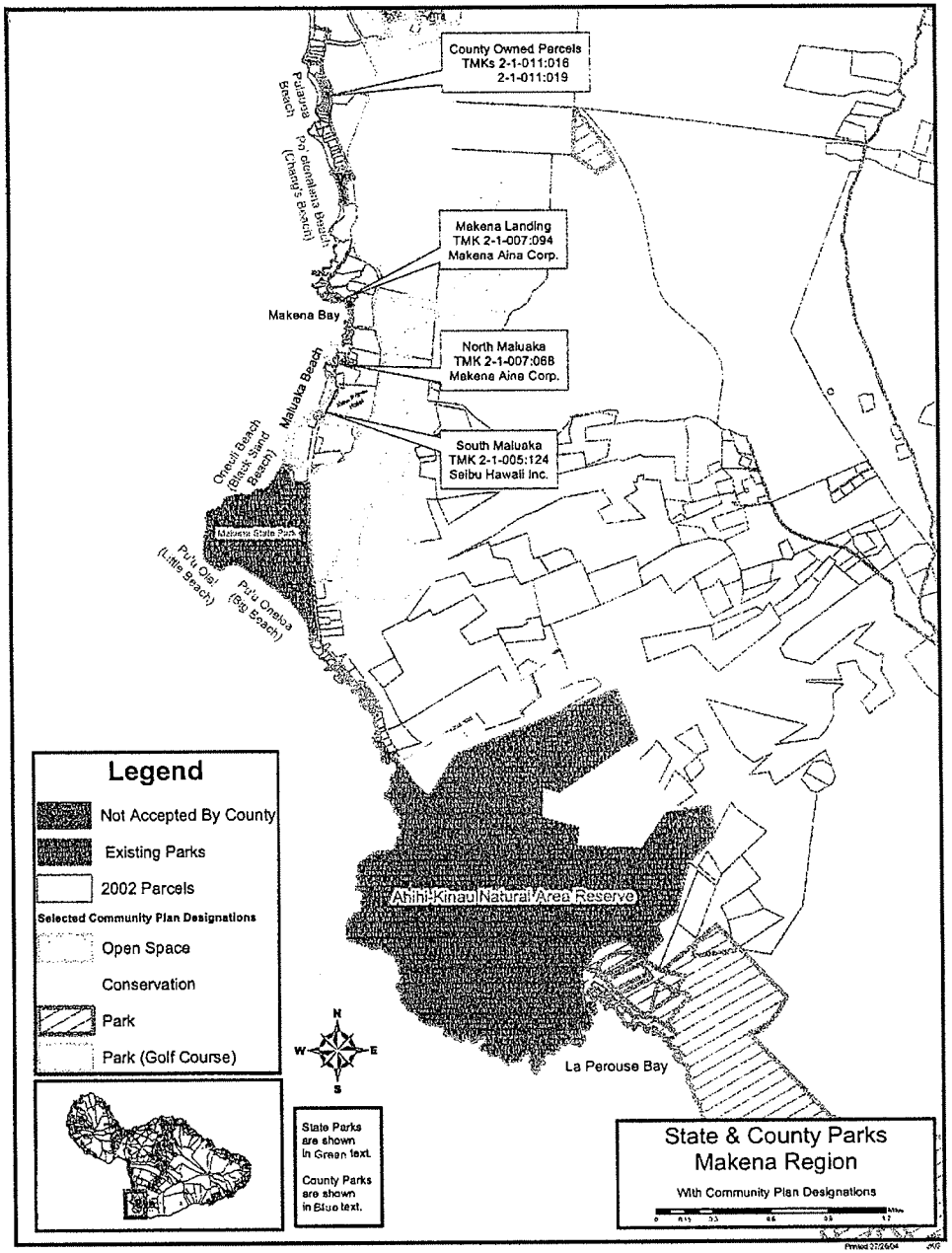

I hereby certify that this is
a true copy from the records
of the Bureau of Conveyances,
as

Registrar of Conveyances
Assistant Registrar, Land Court
State of Hawaii

Doc 3813077
CTN AS LISTED HEREIN
DEC 15, 2008 09:00 AM

Doc 2008-187619
DEC 15, 2008 09:00 AM

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COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, HI 96793

Total No. of Pages: 64

UNILATERAL AGREEMENT AND
DECLARATION FOR CONDITIONAL ZONING

DECLARANTS	AFFECTS TAX KEY NOS.	DECLARANTS' INTERESTS ACQUIRED BY DOCUMENT NOS.
KEAKA LLC	(2) 2-1-5:83, 84, 85, 108 (por), 120 (por)	2005-083571
MAKENA GOLF, LLC	(2) 2-1-6:36, 57; (2) 2-1-8:81, 90; (2) 2-1-5:120 (por), 108 (por)	2007-114462
	(2) 2-1-8:78	3620072, TCT 864,773
MAKENA HOTEL, LLC	(2) 2-1-6:59; (2) 2-1-7:4; (2) 2-1-5:124	2007-114461
MAKENA RESORT SERVICES LLC	(2) 2-1-7:68, 94; (2) 2-1-6:56	2007-114464
	(2) 2-1-7:93	3620074, TCT 864,775
MAKENA MF-2&3, LLC	(2) 2-1-8:79	3620075, TCT 864,776

EXHIBIT "C"

UNILATERAL AGREEMENT AND
DECLARATION FOR CONDITIONAL ZONING

THIS INDENTURE made this 11th day of December, 2008, by all of the following entities (each referred to hereinafter as a "Declarant" and collectively as "Declarants"), each of which is a Delaware limited liability company and each of which has its principal place of business at 2005 Main Street, Wailuku, Hawaii 96793, and each of which owns the land areas situate at Makena, Kihei, Maui, Hawaii, identified for real property tax purposes by Tax Map Key No(s). listed below:

KEAKA LLC, owner of Tax Map Keys (2) 2-1-5:83, 84, 85, 108 (por.) and 120 (por.);

MAKENA GOLF, LLC, owner of Tax Map Keys (2) 2-1-6:36 and 57; (2) 2-1-8:81 and 90; (2) 2-1-5:120 (por.); (2) 2-1-5:108 (por.); and (2) 2-1-8:78 (being Lot 1-A shown on Map 5 of Land Court Application 1846 and noted on Transfer Certificate of Title No. 864,773);

MAKENA HOTEL, LLC, owner of Tax Map Keys (2) 2-1-6:59; (2) 2-1-7:4; and (2) 2-1-5:124;

MAKENA RESORT SERVICES LLC, owner of Tax Map Keys (2) 2-1-7:68 and 94; (2) 2-1-6:56; and (2) 2-1-7:93 (being Lot 2-B shown on Map 1 of Land Court Application 1846 and noted on Transfer Certificate of Title No. 864,775);

MAKENA MF-2&3, LLC, owner of Tax Map Key (2) 2-1-8:79 (being Lot 7-A shown on Map 4 of Land Court Application 1846 and noted on Transfer Certificate of Title No. 864,776).

WITNESSETH:

WHEREAS, the Council of the County of Maui, State of Hawaii, hereinafter referred to as "Council", is considering the establishment of zoning for said land areas or portions thereof, comprised of approximately 603.303 acres (hereinafter referred to as the "Property"), which are more particularly described in Exhibit "1" which is attached hereto and made a part hereof, and which are also listed on Exhibit "2" which is attached hereto and made a part hereof, and which are more particularly identified in Land Zoning Map No. L-585 which is on file in the Office of the County Clerk of the County of Maui; and

WHEREAS, the Council recommends through its Land Use Committee, Committee Report No. 08-154, that said establishment of zoning be approved for passage on first reading subject to certain conditions pursuant to Maui County Code, Section 19.510.050; and

WHEREAS, Declarants have agreed to execute this instrument pursuant to the conditional zoning provisions of Maui County Code Section 19.510.050;

NOW THEREFORE, Declarants hereby make the following Declaration:

1. That this Declaration is made pursuant to the provisions of Section 19.510.050, Maui County Code, relating to conditional zoning;

2. That until written release by the County of Maui, the Property, and all parts thereof, is and shall be held subject to the covenants, conditions, and restrictions contained herein and that all of such covenants, conditions, and restrictions shall be effective as to and shall run with the land as to the Property, from and after the recording of this Declaration with the Bureau of Conveyances or Land Court of the State of Hawaii, without the execution, delivery or recordation of any further deed, instrument, document, agreement, declaration, covenant or the like with respect thereto by any Declarant, the County of Maui, or any heir, devisee, executor, administrator, personal representative, successor or assign; that the acquisition of any right, title or interest in or with respect to all or any portion of the Property by any person or persons, entity or entities, whomsoever, shall be deemed to constitute the acceptance of all of the covenants, conditions, and restrictions of this Declaration by such person or persons, entity or entities, and that upon any transfer of any right, title or interest in or with respect to all or any portion of the Property the same shall be subject to, and the transferee shall assume and be bound and obligated to observe and perform, all of the covenants, conditions, and restrictions of this Declaration;

3. This Declaration and all of the covenants, conditions, and restrictions contained herein shall continue to be effective as to and run with the land in perpetuity, or until a Declarant notifies the appropriate County Department that any of said covenants, conditions and restrictions are satisfied by the Declarants and the appropriate County Department verifies the satisfaction and provides a written release of the covenant, condition or restriction;

4. The term "Declarant" and any pronoun in reference thereto, wherever used herein, shall be construed to mean the singular or the plural, the masculine or the feminine or the neuter, and vice versa, and shall include any corporation, and shall be held to mean and include each "Declarant", its heirs, devisees, executors, administrators, personal representatives, successors, and assigns;

5. That the Declaration shall become fully effective on the effective date of the zoning ordinance approving the establishment of the zoning districts described on Exhibit "2" attached hereto and made a part hereof, and this Declaration shall be recorded in the Bureau of Conveyances or Land Court of the State of Hawaii;

6. That Declarants agree to develop the Property in conformance with the conditions set forth in Exhibit "3", which is attached hereto and made a part hereof and which shall be made a part of the zoning ordinance; and

7. That the conditions imposed are reasonable and rationally relate to the objective of preserving public health, safety and general welfare and such conditions fulfill the need for the public service demands created by the proposed uses;

AND IT IS EXPRESSLY UNDERSTOOD AND AGREED that until released in writing by the County, the conditions imposed in this Declaration shall run with the land identified hereinabove and shall bind and constitute notice to all subsequent lessees, grantees, assignees,

mortgagees, lienors and any other persons who claim an interest in said land, and the County of Maui shall have the right to enforce this Declaration by appropriate action at law or suit in equity against all such persons, provided that Declarants or their successors and assigns may at any time file a petition for the removal of the conditions and terminate this Unilateral Agreement, such petition to be processed in the same manner as petitions for change in zoning.

IN WITNESS WHEREOF, the undersigned has executed this Declaration the day and year first above written.

DECLARANTS:

KEAKA LLC

By MAKENA INVESTORS LLC
Its Managing Member

By DOWLING COMPANY, INC.
Its Manager

By _____
EVERETT R. DOWLING
Its President

MAKENA GOLF, LLC

By HONUA LLC
Its Managing Member

By HONUA MEZZ 2, LLC
Its Managing Member

By HONUA MEZZ 3, LLC
Its Managing Member

By HONUA MEZZ 4, LLC
Its Managing Member

By NAMALU LLC
Its Managing Member

By _____
EVERETT R. DOWLING
Its Manager

APPROVED AS TO FORM
AND LEGALITY:

_____
JAMES A. GIROUX
Corporation Counsel
County of Maui

MAKENA HOTEL, LLC

By HONUA LLC
Its Managing Member

By HONUA MEZZ 2, LLC
Its Managing Member

By HONUA MEZZ 3, LLC
Its Managing Member

By HONUA MEZZ 4, LLC
Its Managing Member

By NAMALU LLC
Its Managing Member

By _____
EVERETT R. DOWLING
Its Manager

MAKENA RESORT SERVICES LLC

By HONUA LLC
Its Managing Member

By HONUA MEZZ 2, LLC
Its Managing Member

By HONUA MEZZ 3, LLC
Its Managing Member

By HONUA MEZZ 4, LLC
Its Managing Member

By NAMALU LLC
Its Managing Member

By _____
EVERETT R. DOWLING
Its Manager

MAKENA MF-2&3, LLC

By MAKENA LAND, LLC
Its Managing Member

By HONUA LLC
Its Managing Member

By HONUA MEZZ 2, LLC
Its Managing Member

By HONUA MEZZ 3, LLC
Its Managing Member

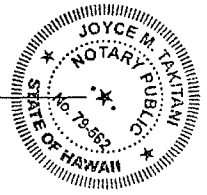
By HONUA MEZZ 4, LLC
Its Managing Member

By NAMALU LLC
Its Managing Member

By _____
EVERETT R. DOWLING
Its Manager

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 11th day of December, 2008, before me personally appeared EVERETT R. DOWLING, to me personally known, who, being by me duly sworn, did say that he is the President of Dowling Company, Inc., a Hawaii corporation, the Manager of Makena Investors LLC, a Hawaii limited liability company, the Managing Member of Keaka LLC, a Delaware limited liability company, and that the foregoing instrument was signed on behalf of said corporation by authority of its Board of Directors, and on behalf of said limited liability companies, and the said EVERETT R. DOWLING acknowledged said instrument to be the free act and deed of said corporation and said limited liability companies.



Print Name: Joyce M. Takitani
Notary Public, State of Hawaii.

My commission expires: 8/16/11

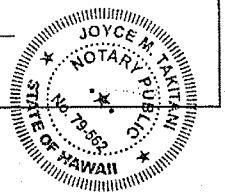
Date of Doc: 12/11/08 # Pages: 64

Name: Joyce M. Takitani Second Circuit

Doc. Description: Unilateral Agreement and Declaration for Conditional Zoning

Notary Signature

NOTARY CERTIFICATION



STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 11th day of December, 2008, before me personally appeared EVERETT R. DOWLING, to me personally known, who, being by me duly sworn, did say that he is the Manager of Namalu LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 4, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 3, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 2, LLC, a Delaware limited liability company, the Managing Member of Honua LLC, a Delaware limited liability company, the Managing Member of Makena Golf, LLC, a Delaware limited liability company, and that the foregoing instrument was signed on behalf of said limited liability companies, and the said EVERETT R. DOWLING acknowledged said instrument to be the free act and deed of said limited liability companies.

Joyce M. Takitani
Print Name: Joyce M. Takitani
Notary Public, State of Hawaii.

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

My commission expires: 8/16/11

Date of Doc: 12/11/08 # Pages: 64

Name: Joyce M. Takitani Second Circuit

Doc. Description: Unilateral Agreement and Declaration for Conditional Zoning

Joyce M. Takitani
Notary Signature

NOTARY CERTIFICATION

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 11th day of December, 2008, before me personally appeared EVERETT R. DOWLING, to me personally known, who, being by me duly sworn, did say that he is the Manager of Namalu LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 4, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 3, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 2, LLC, a Delaware limited liability company, the Managing Member of Honua LLC, a Delaware limited liability company, the Managing Member of Makena Hotel, LLC, a Delaware limited liability company, and that the foregoing instrument was signed on behalf of said limited liability companies, and the said EVERETT R. DOWLING acknowledged said instrument to be the free act and deed of said limited liability companies.

Joyce M. Takitani
Print Name: Joyce M. Takitani
Notary Public, State of Hawaii.

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

My commission expires: 8/16/11

Date of Doc: 12/11/08 # Pages: 64

Name: Joyce M. Takitani Second Circuit

Doc. Description: Unilateral Agreement and Declaration for Conditional Zoning

Joyce M. Takitani
Notary Signature

NOTARY CERTIFICATION

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 11th day of December, 2008, before me personally appeared EVERETT R. DOWLING, to me personally known, who, being by me duly sworn, did say that he is the Manager of Namalu LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 4, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 3, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 2, LLC, a Delaware limited liability company, the Managing Member of Honua LLC, a Delaware limited liability company, the Managing Member of Makena Resort Services LLC, a Delaware limited liability company, and that the foregoing instrument was signed on behalf of said limited liability companies, and the said EVERETT R. DOWLING acknowledged said instrument to be the free act and deed of said limited liability companies.

Joyce M Takitani
Print Name: Joyce M. Takitani
Notary Public, State of Hawaii.

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

My commission expires: 8/16/11

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Name: Joyce M. Takitani Second Circuit

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Joyce M Takitani
Notary Signature

NOTARY CERTIFICATION

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 11th day of December, 2008, before me personally appeared EVERETT R. DOWLING, to me personally known, who, being by me duly sworn, did say that he is the Manager of Namalu LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 4, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 3, LLC, a Delaware limited liability company, the Managing Member of Honua Mezz 2, LLC, a Delaware limited liability company, the Managing Member of Honua LLC, a Delaware limited liability company, the Managing Member of Makena Land, LLC, a Delaware limited liability company, the Managing Member of Makena MF-2&3, LLC, a Delaware limited liability company, and that the foregoing instrument was signed on behalf of said limited liability companies, and the said EVERETT R. DOWLING acknowledged said instrument to be the free act and deed of said limited liability companies.

Joyce M Takitani
Print Name: Joyce M. Takitani
Notary Public, State of Hawaii.

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

My commission expires: 8/16/11

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Name: Joyce M. Takitani Second Circuit

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Joyce M Takitani
Notary Signature

NOTARY CERTIFICATION

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

LOT 1

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being also the east corner of Lot 4, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6534.89 feet North and 5431.77 feet East and running by azimuths measured clockwise from True South:

1.	220°	49'	873.25	feet;
2.	256°	29'	84.21	feet;
3.	165°	55'	1593.43	feet;
4.	190°	24'	588.16	feet;
5.	256°	16'	455.77	feet;
6.	321°	48'	330.00	feet;
7.	225°	38'	785.00	feet;
8.	273°	10'	225.00	feet;
9.	339°	50'	455.00	feet;
10.	356°	04'	644.00	feet;
11.	24°	11'	473.24	feet;
12.	332°	54'	368.41	feet;
13.	53°	38'	476.77	feet;
14.	341°	41'	1020.78	feet;

15.	18°	33'	508.13	feet;
16.	63°	38'	260.00	feet;
17.	109°	40'	624.94	feet;
18.	61°	11'	476.09	feet;
19.	82°	24'	697.74	feet;
20.	100°	08'	61.96	feet;
21.	93°	13'	68.47	feet;
22.	64°	06'	739.18	feet;
23.	86°	17'	183.77	feet;
24.	3°	56'	605.61	feet;
25.	333°	18'	306.94	feet;
26.	34°	32'	200.78	feet;
27.	4°	16'	1085.16	feet;
28.	338°	16'	254.87	feet;
29.	5°	38'	320.00	feet;
30.	354°	21'	819.44	feet;
31.	284°	48'	80.00	feet;
32.	Thence on a curve to the left with a radius of 312.00 feet, the chord azimuths and distance being:			
	3°	53'	118.17	feet;
33.	352°	58'	250.50	feet;
34.	54°	12'	226.64	feet;

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35. 16° 00' 235.58 feet;

36. 86° 54' 122.98 feet;

37. Thence on a curve to the right with a radius of 200.00 feet, the chord azimuth and distance being:
133° 52' 292.38 feet;

38. 180° 50' 165.32 feet;

39. Thence on a curve to the left with a radius of 350.00 feet, the chord azimuth and distance being:
169° 55' 132.57 feet;

40. 159° 00' 269.14 feet;

41. 69° 50' 297.36 feet;

42. 346° 36' 537.96 feet;

43. 292° 30' 122.64 feet;

44. 349° 00' 112.00 feet;

45. 5° 44' 76.00 feet;

46. 298° 50' 108.00 feet;

47. 266° 30' 178.00 feet;

48. 226° 49' 125.00 feet;

49. 284° 18' 113.00 feet;

50. 335° 24' 85.00 feet;

51. 5° 16' 94.21 feet;

52. 19° 20' 296.21 feet;

53. 8° 41' 825.97 feet;

54. 333° 56' 335.68 feet;

55. 331° 32' 60.00 feet;

56. 287° 11' 449.29 feet;

57. 79° 41' 30" 15.69 feet;

58. 339° 25' 1173.59 feet;

59. 59° 36' 994.00 feet;

60. 89° 54' 1190.00 feet;

61. 147° 59' 136.00 feet;

62. 132° 41' 297.53 feet;

63. 198° 00' 725.57 feet;

64. 176° 00' 447.36 feet;

65. Thence on a curve to the right with a radius of 330.00 feet, the chord azimuth and distance being:
242° 49' 53.5" 94.82 feet;

66. 226° 00' 60.76 feet;

67. 175° 00' 188.10 feet;

68. 203° 00' 904.81 feet;

69. 177° 00' 130.83 feet;

70. 97° 00' 49.54 feet;

71. 45° 00' 545.00 feet;

72. 82° 00' 290.00 feet;

73. 350° 00' 200.00 feet;

74. 12° 00' 535.00 feet;

75. 27° 00' 1080.61 feet;

76. 84° 48' 40" 362.94 feet;

77. 174° 48' 40" 197.82 feet;

78. 172° 13' 30" 242.57 feet;

79. 177° 24' 40" 503.40 feet;

80. 179° 05' 40" 1118.06 feet;

81. 181° 51' 795.48 feet;

82. Thence on a curve to the right with a radius of 470.00 feet, the chord azimuth and distance being:
228° 26' 41" 539.91 feet;

83. 263° 30' 384.04 feet;

84. Thence on a curve to the left with a radius of 480.00 feet, the chord azimuth and distance being:
230° 02' 22.5" 529.31 feet;

85. 196° 34' 45" 469.73 feet;

86. Thence on a curve to the right with a radius of 520.00 feet, the chord azimuth and distance being:
214° 49' 40.5" 325.67 feet;

87. 233° 04' 36" 39.92 feet;

88. Thence on a curve to the left with a radius of 580.00 feet, the chord azimuth and distance being:
211° 34' 36" 425.14 feet;

89. 190° 04' 36" 1728.09 feet;

90. Thence on a curve to the left with a radius of 630.00 feet, the chord azimuth and distance being:
173° 01' 36" 369.44 feet;

91. 155° 58' 36" 174.49 feet;

92. Thence on a curve to the right with a radius of 770.00 feet, the chord azimuth and distance being:
165° 58' 36" 267.42 feet;

93. 175° 58' 36" 632.95 feet;

94. Thence on a curve to the right with a radius of 770.00 feet, the chord azimuth and distance being:
189° 16' 36" 354.28 feet;

95. 202° 34' 36" 33.29 feet;

96. 278° 44' 513.03 feet;

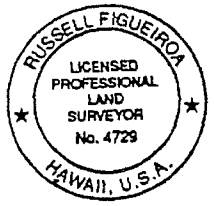
97. 274° 40' 565.11 feet;

98. 285° 50' 611.29 feet;

99. 261° 30' 60.00 feet;

100. 250° 00' 149.21 feet;

101. 220° 49' 133.84 feet to the point of beginning and containing a gross area of 439.373 Acres, less the following described Parcel "AG," AG area of 22.100 Acres and a net area of 417.273 Acres.



R. M. TOWILL CORPORATION

Description Prepared by:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

PARCEL AG
CHANGE IN ZONING -MAKENA

Beginning at a point along the southwest corner of this parcel, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6696.43 feet North and 6345.55 feet East and running by azimuths measured clockwise from True South:

1.	189°	19'	406.00	feet;
2.	160°	00'	253.95	feet;
3.	226°	00'	134.20	feet;
4.	165°	40'	676.68	feet;
5.	261°	42'	357.70	feet;
6.	203°	22'	205.00	feet;
7.	176°	36'	556.00	feet;
8.	218°	12'	418.20	feet;
9.	293°	29'	75.82	feet;
10.	353°	38'	431.00	feet;
11.	13°	46'	516.00	feet;
12.	341°	56'	128.00	feet;
13.	49°	10'	504.68	feet;
14.	341°	13'	180.33	feet;

420 Waiakamilo Road
Suite 411
Honolulu Hawaii 96817-4941
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hotmail.com

15.	295°	26'	189.94	feet;
16.	350°	15'	798.05	feet;
17.	31°	40'	193.57	feet;
18.	102°	03'	495.21	feet to the point of beginning and containing an area of 22.100 Acres

R. M. TOWILL CORPORATION

RYAN M. SUZUKI
LICENSED PROFESSIONAL LAND SURVEYOR
No. 10059
HAWAII, U.S.A.

Description prepared by:

420 Waiakamilo Road
Honolulu, Hawaii 96817
October 30, 2001

Ryan M. Suzuki
Licensed Professional Land Surveyor
Certificate Number 10059

420 Waiakamilo Road
Suite 411
Honolulu Hawaii 96817-4941
Telephone 808 842 1133
Fax 808 842 1937
eMail rmtowill@hotmail.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

LOT 2-A

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being the northeast corner of Lot 2-B, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 7557.74 feet North and 5232.55 feet East, and thence running by azimuths measured clockwise from True South:

1. 277° 15' 432.02 feet;
2. Thence on a curve to the right with a radius of 630.000 feet, the chord azimuth and distance being: 19° 53' 09" 83.82 feet;
3. 23° 42' 216.33 feet;
4. 36° 12' 313.71 feet;
5. 167° 40' 598.39 feet to the point of beginning and containing an area of 3.065 Acres.

R. M. TOWILL CORPORATION

Description Prepared by:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

LOT 2-C

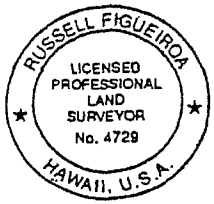
CHANGE IN ZONING - MAKENA

Beginning at the north corner of this piece of land, same being the northwest corner of Lot 2-B, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 7501.96 feet North and 4386.71 feet East, and thence running by azimuths measured clockwise from True South:

1. 352° 54' 447.59 feet;
2. 262° 50' 139.91 feet;
3. Thence on a curve to the right with a radius of 400.00 feet, the chord azimuth and distance being: 295° 28' 431.41 feet;
4. 328° 06' 427.44 feet;
5. Thence on a curve to the left with a radius of 770.00 feet, the chord azimuth and distance being: 356° 53' 05" 144.52 feet;
6. 81° 30' 60.00 feet;
7. 105° 50' 611.29 feet;
8. 94° 40' 565.11 feet;
9. 98° 44' 513.03 feet;
10. 202° 34' 36" 208.81 feet;

11. Thence on a curve to the left with a radius of 480.00 feet, the chord azimuth and distance being:
163° 35' 00.5" 604.06 feet;

12. 266° 13' 36" 993.06 feet to the point of beginning and containing an area of 26.045 Acres.



420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared by:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

LOT 4

CHANGE IN ZONING - MAKENA

Beginning at the east corner of this piece of land, same being also the north corner of Lot 1, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6534.89 feet North and 5431.77 feet East and running by azimuths measured clockwise from True South:

1. 40° 49' 133.84 feet;

2. 70° 00' 149.21 feet;

3. Thence on a curve to the right with a radius of 770.00 feet, the chord azimuth and distance being:
193° 51' 585.61 feet;

4. 216° 12' 27.28 feet;

5. 347° 40' 264.59 feet;

6. 355° 16' 180.40 feet to the point of beginning and containing an area of 2.047 Acres.

R. M. TOWILL CORPORATION
Description Prepared by:

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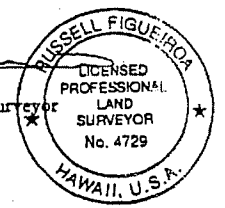
Honolulu, Hawaii 96817-4941
March 6, 2000

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729



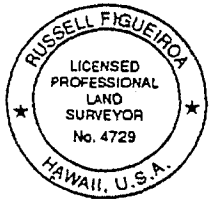
LOT 5

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 5881.42 feet North and 2759.80 feet East and running by azimuths measured clockwise from True South:

1.	92°	58	36"	39.43	feet;
2.	180°	58'	36"	258.00	feet;
3.	143°	58'	06"	86.83	feet;
4.	159°	08'	40"	195.00	feet;
5.	89°	58'	40"	185.00	feet;
6.	108°	35'	10"	90.10	feet;
7.	154°	06'		95.00	feet;
8.	168°	51'	10"	50.00	feet;
9.	285°	58'	40"	175.32	feet;
10.	325°	30'		28.97	feet;
11.	276°	10'		106.90	feet;
12.	267°	30'		12.18	feet;
13.	300°	28'	40"	107.65	feet;

14.	314°	18'	40"	129.85	feet;
15.	356°	42'	40"	102.65	feet;
16.	2°	58'	36"	345.20	feet to the point of beginning and containing an area of 1.753 Acres.



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March 6, 2000

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LOT 6

CHANGE IN ZONING - MAKENA

Beginning at the northeast corner of this piece of land, same being also the southeast corner of Lot 1, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 5964.86 feet North and 5478.10 feet East and running by azimuths measured clockwise from True South:

1. Thence on a curve to the right with a radius of 800.00 feet, the chord azimuth and distance being:
   13° 47' 08" 437.11 feet;
2. 161° 14' 336.04 feet;
3. Thence on a curve to the right with a radius of 170.00 feet, the chord azimuth and distance being:
   169° 17' 47.61 feet;
4. 177° 20' 29.90 feet;
5. 262° 24' 224.49 feet to the point of beginning and containing an area of 1.314 Acres.

R. M. TOWILL CORPORATION

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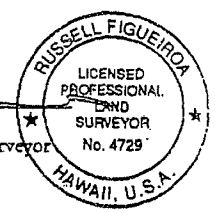

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March 6, 2000

LOT 8-A

CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being the northwest corner of Water Tank Lot, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4112.28 feet North and 4961.40 feet East, and thence running by azimuths measured clockwise from True South:

1. 166° 42' 308.18 feet;
2. Thence on a curve to the right with a radius of 800.000 feet, the chord azimuth and distance being:
   192° 01' 684.19 feet;
3. 217° 20' 464.61 feet;
4. Thence on a curve to the left with a radius of 800.00 feet, the chord azimuth and distance being:
   213° 29' 12" 107.34 feet;
5. 341° 14' 164.46 feet;
6. 344° 28' 149.88 feet;
7. Thence on a curve to the right with a radius of 360.00 feet, the chord azimuth and distance being:
   352° 43' 103.32 feet;
8. 0° 58' 40.45 feet;
9. Thence on a curve to the left with a radius of 740.00 feet, the chord azimuth and distance being:
   339° 17' 50.5" 546.49 feet;

10. Thence still on a curve to the left with a radius of 30.00 feet, the chord azimuth and distance being:

293° 43' 10" 24.32 feet;

11. 41° 46' 714.65 feet;

12. 115° 14' 37" 193.40 feet;

13. 80° 43' 37" 83.59 feet to the point of beginning and containing an area of 16.019 Acres.

RUSSELL FIGUEIROA
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420 Waiakamilo Rd., #411
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March 6, 2000

LOT 8-C

CHANGE IN ZONING - MAKENA

Beginning at the west corner of this piece of land, same being the southeast corner of Lot 20, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1082.64 feet North and 4521.81 feet East, and thence running by azimuths measured clockwise from True South:

1. 169° 29' 300.08 feet;

2. 172° 58' 607.06 feet;

3. Thence on a curve to the right with a radius of 312.00 feet, the chord azimuth and distance being:
183° 53' 118.17 feet;

4. 104° 48' 80.00 feet;

5. 174° 21' 819.44 feet;

6. 185° 38' 320.00 feet;

7. 158° 16' 254.87 feet;

8. 184° 16' 1023.34 feet;

9. Thence on a curve to the right with a radius of 800.00 feet, the chord azimuth and distance being:
336° 11' 11" 646.02 feet;

10. 0° 00' 218.30 feet;

11. 1° 23' 101.39 feet;

12. 268° 25' 387.00 feet;

13. 199° 35' 45.94 feet;

14. 185° 35' 461.50 feet;

15. 350° 43' 37" 49.50 feet;

16. Thence on a curve to the right with a radius of 390.00 feet, the chord azimuth and distance being:
0° 47' 37" 136.34 feet;

17. 290° 00' 196.45 feet;

18. 20° 00' 77.96 feet;

19. 359° 20' 271.78 feet;

20. 51° 42' 32" 102.20 feet;

21. 343° 30' 02" 608.02 feet;

22. 43° 02' 30" 316.00 feet;

23. 14° 24' 34" 152.58 feet;

24. 353° 30' 93.00 feet;

25. 67° 00' 547.80 feet;

26. 336° 30' 435.00 feet;

27. 5° 52' 30" 385.93 feet;

28. 278° 55' 20" 461.31 feet;

29. 355° 06' 45" 581.81 feet;

30. 93° 48' 30" 357.94 feet;

31. 337° 30' 02" 1229.37 feet;

32. 79° 41' 30" 658.22 feet;

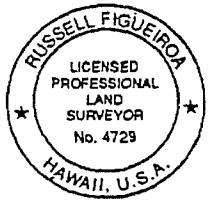
33. 107° 11' 449.29 feet;

34. 151° 32' 60.00 feet;

35. 153° 56' 273.55 feet;

36. Thence on a curve to the left with a radius of 4300.00 feet, the chord azimuth and distance being:
198° 20' 01" 1201.65 feet;

37. 273° 30' 143.50 feet to the point of beginning and containing an area of 68.048 Acres.



R. M. TOWILL CORPORATION

Description Prepared By:

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420 Waiakamilo Rd., #411
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March 6, 2000

LOT 11-B

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being also the northeast corner of Lot 12, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4702.48 feet North and 2652.75 feet East and running by azimuths measured clockwise from True South:

1.	290°	00'	167.01	feet;
2.	20°	00'	119.98	feet;
3.	110°	00'	167.01	feet;
4.	200°	00'	119.98	feet to the point of beginning and containing an area of 0.460 Acre.

R. M. TOWILL CORPORATION

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RUSSELL FIGUEIROA
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March 6, 2000

LOT 12

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4737.88 feet North and 2555.47 feet East and running by azimuths measured clockwise from True South:

1.	290°	00'	103.52	feet;
2.	20°	00'	119.98	feet;
3.	110°	00'	192.27	feet;
4.	236°	53'	123.55	feet;

5. Thence on a curve to the left with a radius of 322.00 feet, the chord azimuth and distance being:
234° 35' 45" 25.70 feet to the point of beginning and containing an area of 0.406 Acre.

R. M. TOWILL CORPORATION

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420 Waiakamilo Rd., #411
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March 6, 2000

LOT 13

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the northwest corner of Lot 15-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4227.10 feet North and 2235.27 feet East and running by azimuths measured clockwise from True South:

1.	80°	37'	62.31	feet;
2.	180°	48'	82.89	feet;
3.	144°	10'	67.92	feet;
4.	275°	11'	80.51	feet;
5.	Thence on a curve to the left with a radius of 323.00 feet, the chord azimuth and distance being: 350° 53' 46" 3.15 feet;			
6.	350°	37'	119.00	feet to the point of beginning and containing an area of 0.173 Acre.

R. M. TOWILL CORPORATION

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March 6, 2000

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HAWAII, U.S.A.

LOT 14

CHANGE IN ZONING - MAKENA

Beginning at the south corner of this piece of land, same being also the southwest corner of Lot 22-B, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1682.37 feet South and 2542.61 feet East and running by azimuths measured clockwise from True South:

1.	132°	41'	403.29	feet;
2.	Thence on a curve to the left with a radius of 750.00 feet, the chord azimuth and distance being: 251° 35' 05.5" 261.08 feet;			
3.	352°	12'	359.21	feet to the point of beginning and containing an area of 1.012 Acres.

R. M. TOWILL CORPORATION

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Honolulu, Hawaii 96817-4941
March 6, 2000

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HAWAII, U.S.A.

LOT 15-B

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4070.33 feet North and 2317.94 feet East and running by azimuths measured clockwise from True South:

1.	274°	44'	70.62	feet;
2.	318°	59'	24.00	feet;
3.	272°	25'	94.80	feet;
4.	358°	50'	104.20	feet;
5.	107°	59'	125.00	feet;
6.	160°	05'	12.00	feet;
7.	27°	35'	10.00	feet;
8.	102°	45'	48.60	feet;
9.	179°	00'	12.02	feet;
10.	Thence on a curve to the left with a radius of 328.00 feet, the chord azimuth and distance being: 174° 48' 30" 47.95 feet;			
11.	170°	37'	20.88	feet to the point of beginning and containing an area of 0.353 Acres.

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March 6, 2000

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Description Prepared By:

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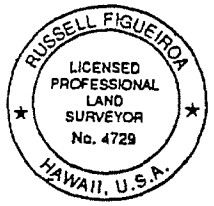
LOT 16

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 3108.23 feet North and 1889.16 feet East and running by azimuths measured clockwise from True South:

1.	124°	42'	107.24	feet;
2.	101°	04'	28.00	feet;
3.	91°	12'	6.00	feet;
4.	Thence on a curve to the left with a radius of 25.00 feet, the chord azimuth and distance being: 65° 13' 30" 21.90 feet;			
5.	39°	15'	20.00	feet;
6.	305°	15'	9.00	feet;
7.	39°	40'	16.00	feet;
8.	137°	57'	13.00	feet;
9.	76°	00'	37.00	feet;
10.	Thence on a curve to the left with a radius of 250.00 feet, the chord azimuth and distance being: 136° 41' 45" 141.58 feet;			
11.	228°	50'	20.00	feet;
12.	252°	28'	53.00	feet;

13.	293°	57'	53.00	feet;
14.	221°	13'	29.00	feet;
15.	129°	34'	17.00	feet;
16.	216°	13'	17.00	feet;
17.	300°	34'	57.00	feet;
18.	230°	38'	56.17	feet;
19.	248°	53'	34.90	feet;
20.	311°	36' 15"	139.84	feet;
21.	29°	20'	124.40	feet to the point of beginning and containing an area of 0.861 Acre.



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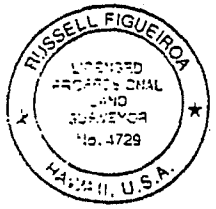
420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

LOT 17
CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being also the northwest corner of Lot 19, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 2860.50 feet North and 1798.77 feet East and running by azimuths measured clockwise from True South:

1. 205° 07' 153.25 feet;
2. 207° 52' 44" 90.02 feet;
3. 258° 14' 590.87 feet;
4. 270° 00' 339.85 feet;
5. 290° 26' 441.91 feet;
6. Thence on a curve to the right with a radius of 520.00 feet, the chord azimuth and distance being: 39° 10' 37.5" 249.83 feet;
7. 53° 04' 36" 39.92 feet;
8. Thence on a curve to the left with a radius of 580.00 feet, the chord azimuth and distance being: 48° 28' 31.5" 93.06 feet;
9. 110° 29' 234.97 feet;
10. 90° 45' 960.11 feet to the point of beginning and containing an area of 9.372 Acres.



R. M. TOWILL CORPORATION

Description Prepared By:

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
October 22, 2000 Rev.

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R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

LOT 18

CHANGE IN ZONING - MAKENA

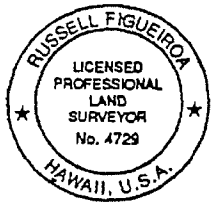
Beginning at the southeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1722.80 feet North and 1532.63 feet East and running by azimuths measured clockwise from True South:

1.	112°	00'	34.98	feet;
2.	93°	30'	649.05	feet;
3.	180°	37'	109.74	feet;
4.	193°	19'	209.91	feet;
5.	197°	25'	294.96	feet;
6.	195°	35'	167.83	feet;
7.	150°	49'	112.43	feet;
8.	187°	04'	126.83	feet;
9.	165°	36'	110.87	feet;
10.	236°	33'	142.75	feet;
11.	258°	37'	105.15	feet;
12.	229°	30'	93.02	feet;
13.	291°	08'	0.16	feet;
14.	222°	30'	78.00	feet;

15.	246°	39'	136.00	feet;
16.	274°	44'	33.00	feet;
17.	182°	05'	116.00	feet;
18.	302°	34'	87.00	feet;
19.	229°	39'	53.65	feet;

20. Thence on a curve to the right with a radius of 250.00 feet, the chord azimuth and distance being:
316° 41' 45" 141.58 feet;

21.	76°	00'	12.00	feet;
22.	47°	49'	278.45	feet;
23.	40°	00'	285.81	feet;
24.	16°	30'	708.56	feet;
25.	292°	00'	503.50	feet;
26.	8°	00'	135.00	feet to the point of beginning and containing an area of 10.440 Acres.



420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

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Description Prepared By:

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LOT 19
CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being also the southwest corner of Lot 17, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 2860.50 feet North and 1798.77 feet East and running by azimuths measured clockwise from True South:

1. 270° 45' 960.11 feet;
2. 290° 29' 234.97 feet;
3. Thence on a curve to the left with a radius of 580.00 feet, the chord azimuth and distance being:
   30° 13' 36" 273.70 feet;
4. 16° 34' 45" 469.73 feet;
5. Thence on a curve to the right with a radius of 420.00 feet, the chord azimuth and distance being:
   50° 02' 22.5" 463.14 feet;
6. 83° 30' 384.04 feet;
7. Thence on a curve to the left with a radius of 530.00 feet, the chord azimuth and distance being:
   64° 36' 48.5" 343.12 feet;
8. Thence still on a curve to the right with a radius of 20.00 feet, the chord azimuth and distance being:
   88° 22' 23.5" 27.10 feet;
9. Still on a curve to the right with a radius of 128.00 feet, the chord azimuth and distance being:
   157° 16' 50" 113.27 feet;

10. 186° 50' 20" 333.75 feet;
11. 188° 23' 20" 251.10 feet;
12. 185° 03' 142.40 feet;
13. 190° 10' 131.42 feet;
14. 197° 07' 297.40 feet;
15. 197° 07' 03" 32.00 feet to the point of beginning and containing an area of 27.820 Acres.

RUSSELL FIGUEIROA
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420 Waiakamilo Rd., #411
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October 22, 2000 Rev.

R. M. TOWILL CORPORATION

Description Prepared By:

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Certificate Number 4729

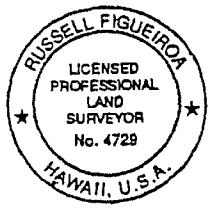
LOT 20

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the west corner of Lot 8-C, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1082.64 feet North and 4521.81 feet East and running by azimuths measured clockwise from True South:

1.	93°	30'	326.35	feet;
2.	185°	16'	94.21	feet;
3.	155°	24'	85.00	feet;
4.	104°	18'	113.00	feet;
5.	46°	49'	125.00	feet;
6.	86°	30'	178.00	feet;
7.	118°	50'	108.00	feet;
8.	185°	44'	76.00	feet;
9.	169°	00'	112.00	feet;
10.	112°	30'	122.64	feet;
11.	166°	36'	537.96	feet;
12.	249°	50'	297.36	feet;
13.	339°	00'	269.14	feet;

14.	Thence on a curve to the right with a radius of 350.00 feet, the chord azimuth and distance being: 349° 55'		132.57	feet;
15.	0°	50'	165.32	feet;
16.	Thence on a curve to the left with a radius of 200.00 feet, the chord azimuth and distance being: 313° 52'		292.38	feet;
17.	266°	54'	122.98	feet;
18.	196°	00'	235.58	feet;
19.	234°	12'	226.64	feet;
20.	352°	58'	356.56	feet;
21.	349°	29'	300.08	feet to the point of beginning and containing an area of 9.817 Acres.



R. M. TOWILL CORPORATION

Description Prepared By:

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

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LOT 21-B

CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being also the southwest corner of Lot 21-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 621.97 feet South and 2447.61 feet East and running by azimuths measured clockwise from True South:

1. 305° 18' 317.33 feet;
2. Thence on a curve to the left with a radius of 330.00 feet, the chord azimuth and distance being: 14° 45' 03" 27.46 feet;
3. 12° 22' 233.89 feet;
4. Thence on a curve to the right with a radius of 500.00 feet, the chord azimuth and distance being: 30° 19' 22" 308.29 feet;
5. Thence still on a curve to the right with a radius of 750.00 feet, the chord azimuth a distance being: 71° 35' 05.5" 261.08 feet;
6. 65° 15' 204.55 feet;
7. 84° 48' 40" 60.44 feet;
8. 207° 00' 985.50 feet to the point of beginning and containing an area of 6.542 Acres.

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LOT 22-A

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the northeast corner of Lot 22-B, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 906.70 feet South and 2849.74 feet East and running by azimuths measured clockwise from True South:

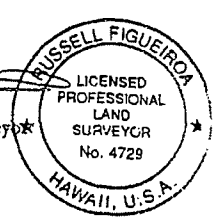
1. 125° 18' 175.40 feet;

2. Thence on a curve to the right with a radius of 330.00 feet, the chord azimuth and distance being:
215° 51' 12" 211.80 feet;

3. 356° 00' 273.69 feet to the point of beginning and containing an an area of 0.483 Acres.

R. M. TOWILL CORPORATION

Description Prepared By:



Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

END OF EXHIBIT "1"

EXHIBIT "2"

Table 1

CHANGE IN ZONING				
TMK	**Lot No.**	**From**	**To**	**Acres**
2-1-5:por. 108, por. 120; 2-1-6:36, por. 57; 2-1-8: por. 78, por. 79, por. 81, por. 90	1, 17, 18	County Ag, A1, A2, R1, GC & OS, R-3, OZ	PK-4	437.085
2-1-5:por. 108; 2-1-8: por. 78, por. 79, por. 81, por. 90	2A, 2C, 8A, 8C, 21B	County Ag, R1, A1, R-3, OZ, GC & OS, STP	A2	119.719
2-1-8:por. 90	4, 6	A1, A2	R3	3.361
2-1-7:por. 68	11B	R-2	BR	0.460
2-1-5:por. 108, por. 124; 2-1-6:por. 56, por. 57, por. 59; 2-1-7:por. 68, 93, por. 94	5, 12, 13, 14, 16	Park, R-2, GC & OS, R-1, H-M	PK-1	4.205
2-1-5:83, 84, 85, por. 108, por. 120; 2-1-7:4	15B, 19	GC & OS, B-R, A-1, OZ	HM	28.173
2-1-5:por. 108	20	A2, GC & OS, R-3	B2	9.817
2-1-5:por. 108	22A	A2	R1	0.483
TOTAL				603.303

EXHIBIT "3"

Conditions of Zoning

INTRODUCTORY NOTES:

A. Unless otherwise specified, each condition applies to each project.

B. The following definitions shall apply to these conditions:

"County" means the County of Maui.

"Developer" means Keaka LLC; Makena Golf, LLC; Makena Hotel, LLC; Makena MF-2&3, LLC; and Makena Resort Services LLC; their successors and permitted assigns; and any future developer or owner of any property that is the subject of this Change in Zoning.

"Project" means each development that requires an SMA permit from the Maui Planning Commission.

"SMA" means Special Management Area.

"State" means the State of Hawaii.

Density and Height Restrictions

1. In the R-1, R-2, and R-3 Residential District zoned areas, the density shall not exceed 2.5 single-family dwelling units per acre.

2. In the A-2 Apartment District zoned areas, the density shall not exceed eight units per acre, and the building height shall not exceed 45 feet. Height shall be measured from the natural or finish grade, whichever is lower.

3. In the B-2 Community Business District zoned areas, the gross floor area of each building shall not exceed 60 percent of the total lot area.

4. On Lot 19 (H-M Hotel District), the building height

shall not exceed 45 feet and shall be consistent with the Urban Design Standards for Building Form in the Kihei-Makena Community Plan; no more than 89 units shall be developed; and no lockout units shall be allowed. Height shall be measured from the natural or finish grade, whichever is lower.

5. The developer shall preserve Makena's significant views of the Pacific Ocean and the broad vista to the Central Maui and Upcountry regions. The use of walls higher than four feet in frontyard setbacks shall be prohibited.

Noise Mitigation

6. In the B-2 Community Business District zoned areas, the following permitted uses shall incorporate acoustical measures into the facility to mitigate potential noise impacts: amusement enterprises, including billiard and pool halls; auditoriums and theaters; baseball and football stadiums and other sport activities and amusements; bowling alleys; dancing and hula studios; gymnasiums; miniature golf courses; music conservatories and music studios; physical-culture studios; and printing, lithography, and publishing shops.

Lighting Standards

7. All exterior lighting shall be shielded from adjacent residential properties and nearshore waters, and shall be fully shielded to prevent uplight. Lighting requirements in force at the time of building permit application shall be applied.

Screening of Certain Uses

8. In the B-2 Community Business District zoned areas, merchandise, equipment, and supplies shall be stored within enclosed buildings or enclosed areas that are appropriately screened with fencing and landscape planting for the following permitted uses: equipment rental and sales yards; hardware and garden supply stores; parcel delivery stations; and printing, lithography, and publishing shops.

Education

9. The developer, its successors and permitted assigns, shall pay the Department of Education $3,000 per dwelling unit upon issuance of each building permit to be used, to the extent possible, for schools serving the Kihei-Makena Community Plan area; provided that, should the State pass legislation imposing school impact fees that apply to the Makena Resort Area, the developer, its successors and permitted assigns, shall from that point forward comply with the State requirements, or contribute $3,000 per dwelling unit, whichever is greater. Should a previous agreement exist between the Department of Education and the landowner, this condition shall prevail.

Transportation

10. The developer shall provide pedestrian and bicycle access ways within the roadways throughout and fronting the Makena Resort Area. A schematic plan for pedestrian and bicycle access ways throughout and fronting the Makena Resort Area shall be submitted to the Department of Planning for consideration by the Maui Planning Commission in conjunction with SMA permit applications.

11. The developer shall make a contribution to the County for traffic improvements in an amount equal to $5,000 per unit. The contribution shall be paid to the County prior to issuance of the initial building permit. Upon adoption of a traffic impact fee ordinance, the developer shall comply with the ordinance in lieu of this voluntary contribution. Should a traffic impact fee ordinance be adopted prior to the collection of this contribution, the applicable amount shall be the greater of the two. Such contributions or fees shall not be counted towards Condition No. 12 below.

12. Upon commencement of the first phase of construction, the developer shall pay its pro-rata share to upgrade Piilani Highway from Kilohana Drive to Wailea Ike Drive to four lanes of traffic, and shall cooperate with the State Department of Transportation and other area

developers to implement such improvements concurrent with development.

13. The developer shall provide construction access roads from Piilani Highway to the construction sites. Construction traffic shall be prohibited on Kilohana Drive, Wailea Ike Drive, Wailea Alanui Drive, and Makena Alanui Drive to the extent practicable.

14. The developer shall develop and submit a Transportation Management Plan ("TMP"), to be reviewed and approved by the State Department of Transportation, the County Department of Public Works, and the County Department of Transportation. The purpose of the TMP shall be to reduce traffic generated by construction activity related to the Makena Resort Area. The TMP shall provide for programs such as park and ride, shuttles, and/or restrictions on worker access to ongoing construction activity during peak hour traffic. Upon approval, project contractors shall implement the TMP during construction activities. The developer shall submit an annual report to the State Department of Transportation, the County Department of Public Works, the County Department of Transportation, and the Maui County Council to document the success of the TMP in meeting its benchmarks of reducing traffic during project construction.

    The TMP shall be reviewed and approved by the State Department of Transportation, the County Department of Public Works, and the County Department of Transportation prior to issuance of each SMA permit within the Makena Resort Area.

15. As part of the first SMA application, the developer shall submit a TMP to reduce the dependency on individual vehicular transportation modes. The TMP shall be reviewed and approved by the State Department of Transportation, the County Department of Public Works, and the County Department of Transportation to address post-construction traffic issues.

Civil Defense

16. The developer shall participate in the pro rata funding

and construction of adequate civil defense measures as determined by the State and County civil defense agencies.

Historical and Cultural Resources

17. Should any human burials or any historic sites such as artifacts, charcoal deposits, stone platforms, pavings, or walls be found, the developer shall stop construction work in the immediate vicinity and notify the State Historic Preservation Division (SHPD), the Maui/Lanai Island Burial Council (MLIBC), and the Maui County Cultural Resources Commission (CRC).

18. The developer, its successors and permitted assigns, shall provide a comprehensive preservation/mitigation plan pursuant to Chapter 6E, Hawaii Revised Statutes, that has been approved by the State Historic Preservation Division, Department of Land and Natural Resources, and the Office of Hawaiian Affairs prior to any grading within the project area.

Nearshore Water Quality

19. Marine monitoring programs shall be conducted which include monitoring and assessment of coastal water resources (groundwater and surface water) that receive surface water or groundwater discharges from the hydrologic unit where the project is located. Monitoring programs shall include both water quality and ecological monitoring.

    Water Quality Monitoring shall provide water quality data adequate to assess compliance with applicable State water quality standards at Hawaii Administrative Rules Chapter 11-54. Assessment procedures shall be in accordance with the current Hawaii Department of Health ("HIDOH") methodology for Clean Water Act Section 305(b) water quality assessment, including use of approved analytical methods and quality control/quality assurance measures. The water quality data shall be submitted biannually, or every six months, to HIDOH for use in the State's Integrated Report of Assessed Waters prepared under Clean Water Act Sections 303(d) and 305(b). If this report lists the receiving waters as

impaired and requiring a Total Maximum Daily Load ("TMDL") study, then the monitoring program shall be amended to evaluate land-based pollutants, including: (1) monitoring of surface water and groundwater quality for the pollutants identified as the source of the impairment; and (2) providing estimates of total mass discharge of those pollutants on a daily and annual basis from all sources, including infiltration, injection, and runoff. The results of the land-based pollution water quality monitoring and loading estimate shall be submitted to the HIDOH Environmental Planning Office, TMDL Program.

The ecological monitoring shall include ecological assessment in accordance with the Coral Reef Assessment and Monitoring Program protocols used by the Department of Land and Natural Resources. The initial assessment shall use the full protocol. Subsequent biannual assessments can use the Rapid Assessment Techniques. Results shall be reported biannually to the Aquatic Resources Division, Department of Land and Natural Resources.

The monitoring and assessments shall be conducted by degreed scientists experienced with Clean Water Act programs, water quality monitoring, water quality assessment, water quality-based permitting, water quality modeling, watershed planning, and TMDL. Study design should be made available for both public review and peer review by the State Department of Health, Department of Aquatic Resources, and the University of Hawaii researchers. Results of monitoring shall be published and publicly available online.

20. The developer shall implement efficient soil-erosion and dust-control measures during and after development to the satisfaction of DOH and the County.

Transfer of Ownership

21. The developer shall give notice to the Department of Planning and the Council of any intent to sell, lease, assign, place in trust, or otherwise voluntarily alter the ownership interests in the Makena Resort Area, prior to any development.

Compliance with Conditions

22. The developer shall provide timely annual compliance reports to the Planning Director and the Council. The compliance reports shall include: (a) the status of the developer's compliance with each of these conditions; and (b) a reasonable estimate of the time needed for full compliance.

23. Failure to fulfill any condition may result in a reversion to former or more appropriate zoning or community plan designations or other remedies.

24. If any of the property subject to this Change in Zoning is consolidated with other property for purposes of an SMA permit application, these conditions shall apply to the entirety of the consolidated property.

Residential Workforce Housing

25. The developer shall comply with the County's Residential Workforce Housing Policy as provided in Chapter 2.96, Maui County Code.

Water

26. The developer shall comply with all applicable County water ordinances.

    The water rates for the residential workforce housing units shall be no higher than the general water consumer rates set by the County in its annual budget, for as long as the units are subject to Chapter 2.96, Maui County Code.

27. The developer shall provide a water conservation plan for the Makena Resort Area, approved by the Department

of Water Supply, prior to the issuance of any SMA permits. For each project, the developer shall construct a dual waterline system to accommodate the use of non-potable water for landscaping and irrigation purposes prior to the issuance of any building permits.

Energy

28. All energy systems for all residential, commercial, and hotel units shall be designed and constructed to meet all applicable Energy Star® requirements established by the Climate Protection Division of the United States Environmental Protection Agency in effect at the time of construction. For purposes of this condition, energy systems shall include all hot-water systems, roof and attic areas, outside walls, windows, air-cooling systems, and heating systems.

29. All residential, commercial, and hotel units shall comply with Chapter 16.16, Maui County Code.

30. All air-cooling systems and all heating systems for laundry facilities, swimming pools, and spa areas shall make maximum use of energy-efficient construction and technology.

Access for Parks and Recreation

31. The developer shall construct a minimum of 60 new parking stalls at Maluaka Beach, including at least 10 at the north end, within one year of the issuance to the developer of any SMA permit by the Maui Planning Commission relating to a parcel or a portion thereof that is a subject of this Change in Zoning. Unless necessary to protect public safety or to comply with State or Federal law, the required parking stalls need not be asphalt surfaced. Development costs and land shall not satisfy park dedication requirements.

32. The developer shall develop an expansion of the beach park at the south end of Maluaka Beach, such that the beach park shall comprise at least 1.5 acres of land area for public use and beach access. The developer shall submit the necessary applications required for the expansion within six months of the approval of this

Change in Zoning. The land area of the expansion of the existing park shall be applied as credit toward satisfying a portion of any applicable park dedication requirements.

33. To the extent practicable, the developer shall provide, in perpetuity, traversable lateral shoreline access in the area between the shoreward boundary and the mauka boundary of the Makena Resort Area. Costs associated with this condition shall not satisfy park dedication requirements.

34. Within one year of the approval of this Change in Zoning, the developer shall initiate and fund a plan for the development of the State Park at Makena for the State Department of Land and Natural Resources and the Department of Parks and Recreation, soliciting and taking into consideration the comments of various user groups, including Surfrider Foundation, Savemakena.org, Maui Tomorrow, the Kihei Community Association, and the Makena Homeowner's Association. The plan shall incorporate recreational, landscaping, parking, and facility concepts as a guide for future development of the park. Costs associated with this condition shall not satisfy park dedication requirements.

35. The developer shall renovate and beautify Makena Landing (TMK: 2-1-007:094), see attached map, in coordination with the Department of Parks and Recreation and the State Department of Land and Natural Resources. Costs associated with this condition shall not satisfy park dedication requirements.

36. The developer shall maintain Makena Landing (TMK: 2-1-007:094), North Maluaka (TMK: 2-1-007:068), and South Maluaka (TMK: 2-1-005:124), see attached map, and all future parklands within the Makena Resort Area.

Hawaiian Island Architecture

37. To exhibit respect for the Hawaiian culture and a Hawaiian sense of place, structures within the Makena Resort Area shall be based on or inspired by principles of Hawaiian island architecture in design and construction.

Native Forests and Species

38. The developer shall provide a baseline study survey of flora and fauna as part of each SMA permit application within the Makena Resort Area; the study shall be conducted by recognized independent experts on Hawaiian flora and fauna and list all endemic, indigenous, and endangered species, their distribution in the Makena Resort Area and adjacent shorelines. This study shall also include a preservation/mitigation plan and comments from the State Department of Land and Natural Resources, the U.S. Fish and Wildlife Service, and the U.S. Corps of Engineers, and the Maui representative of the Hawaii Wildlife Fund and The Nature Conservancy.

Transient Vacation Rentals/Time Shares

39. No transient vacation rentals or time shares shall be allowed within this Makena Resort rezoning application area; and further, no special use permit or conditional permit for such accommodations shall be accepted by the Department of Planning.

Hotel Limitation

40. A second hotel shall not be constructed within the Makena Resort Area.

LEED Certified Buildings

41. All buildings constructed within the Makena Resort Area shall be LEED (Leadership in Energy and Environmental Design) certified if they are 500 square feet or larger.

Dwelling Units

42. New dwelling units shall not exceed 800, excluding residential workforce housing.

Police

43. The developer, its successors and permitted assigns, shall contribute $1,000 per market-priced unit, collected at issuance of building permit, to the County, for the development and maintenance of a police station in South Maui.

Emergency Evacuation

44. The developer shall provide Driveway "D" from Makena Alanui Road to Makena Resort Sewage Treatment Plant and beyond as an emergency evacuation route for the area.

lu:misc:Makena conditions (12-10-08)

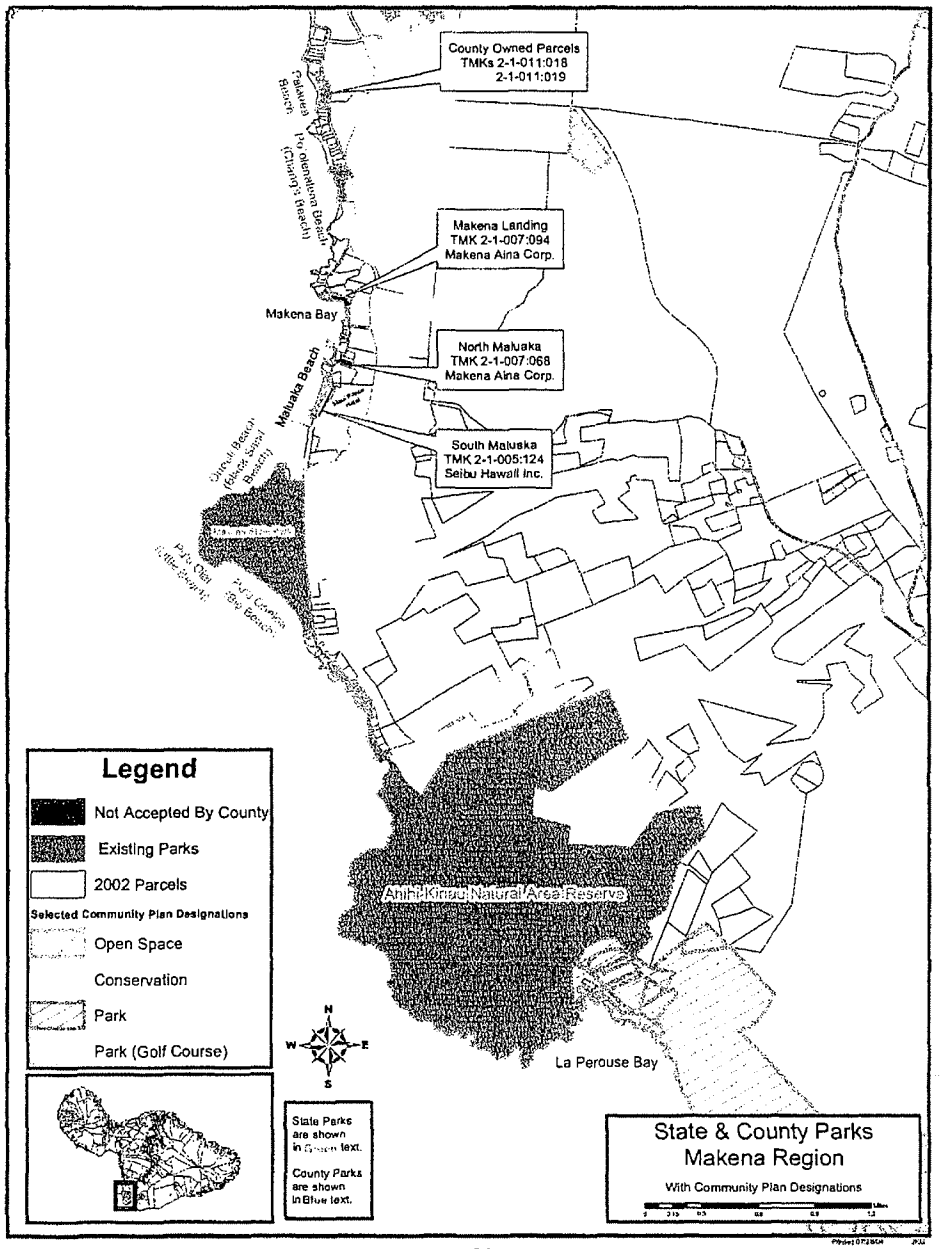


EXHIBIT "D"

LOT 2-B

CHANGE IN ZONING - MAKENA

Beginning at the northeast corner of this piece of land, same being the northwest corner of Lot 2-A, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 7557.74 feet North and 5232.55 feet East, and thence running by azimuths measured clockwise from True South:

1.	347°	40'	598.39	feet;
2.	36°	12'	27.28	feet;
3.	Thence on a curve to the left with a radius of 770.00 feet, the chord azimuth and distance being: 19° 14' 05" 449.36 feet;			
4.	148°	06'	427.44	feet;
5.	Thence on a curve to the left with a radius of 400.00 feet, the chord azimuth and distance being: 115° 28' 431.41 feet;			
6.	82°	50'	139.91	feet;
7.	172°	54'	447.59	feet;
8.	266°	13' 36"	847.68	feet to the point of beginning and containing an area of 12.414 Acres.

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared by:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

EXHIBIT "D"

LOT 3

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 6700.16 feet North and 2692.32 feet East and running by azimuths measured clockwise from True South:

1.	149°	59'		48.08	feet;
2.	184°	55'		49.28	feet;
3.	194°	07'	40"	32.24	feet;
4.	204°	39'		133.14	feet;
5.	204°	38'	56"	41.06	feet;
6.	253°	50'	56"	136.00	feet;
7.	211°	35'	56"	37.00	feet;
8.	271°	20'	56"	117.00	feet;
9.	217°	35'	56"	75.00	feet;
10.	205°	35'	56"	95.00	feet;
11.	192°	30'	56"	75.00	feet;
12.	216°	35'	56"	148.00	feet;
13.	269°	00'	56"	52.00	feet;
14.	205°	40'	56"	49.00	feet;

R. M. TOWILL CORPORATION
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15. Thence on a curve to the right with a radius of 420.00 feet, the chord azimuth and distance being:
337° 34' 36" 593.97 feet;

16. 22° 34' 36" 242.10 feet;

17. Thence on a curve to the left with a radius of 830.00 feet, the chord azimuth and distance being:
9° 16' 36" 381.88 feet;

18. 355° 58' 36" 572.95 feet;

19. Thence on a curve to the right with a radius of 30.00 feet, the chord azimuth and distance being:
40° 58' 36" 42.43 feet;

20. 85° 58' 36" 103.79 feet;

21. Thence on a curve to the right with a radius of 470.00 feet, the chord azimuth and distance being:
94° 38' 36" 141.65 feet;

22. 103° 18' 36" 91.40 feet;

23. Thence on a curve to the left with a radius of 530.00 feet, the chord azimuth and distance being:
96° 23' 36" 127.65 feet;

24. 89° 28' 36" 89.29 feet;

25. Thence on a curve to the right with a radius of 20.00 feet, the chord azimuth and distance being:
134° 28' 36" 28.28 feet;

26. 179° 28' 36" 110.34 feet;

27. 182° 58' 36" 381.81 feet;

28. 176° 42' 36" 76.58 feet;

29. 176° 42' 40" 43.77 feet;

30. 134° 18' 40" 150.22 feet;

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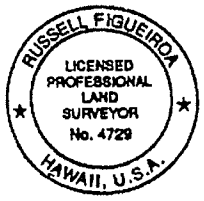
31.	120°	28'	40"	50.86	feet;
32.	267°	30'		83.24	feet;
33.	275°	23'		76.45	feet;
34.	309°	00'		48.00	feet;
35.	241°	56'		34.37	feet;
36.	241°	55'	56"	86.88	feet;
37.	151°	23'	56"	58.95	feet;
38.	175°	09'	56"	9.65	feet;
39.	175°	10'		26.75	feet;
40.	135°	57'		71.93	feet;
41.	106°	04'		101.15	feet;
42.	85°	04'		68.30	feet;
43.	161°	55'		24.33	feet;
44.	131°	26'		22.27	feet to the point of beginning and containing an area of 22.108 Acres.



420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared by:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

EXHIBIT "D"

LOT 8-B

CHANGE IN ZONING - MAKENA

Beginning at the northeast corner of this piece of land, same being the northwest corner of Lot 6, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 5935.17 feet North and 5255.58 feet East, and thence running by azimuths measured clockwise from True South:

1.	357°	20'		29.90	feet;
2.	Thence on a curve to the left with a radius of 170.000 feet, the chord azimuth and distance being:				
	349°	17'		47.61	feet;
3.	341°	14'		336.04	feet;
4.	Thence on a curve to the right with a radius of 800.00 feet, the chord azimuth and distance being:				
	33°	29'	12"	107.34	feet;
5.	37°	20'		464.61	feet;
6.	Thence on a curve to the left with a radius of 800.00 feet, the chord azimuth and distance being:				
	12°	01'		684.19	feet;
7.	346°	42'		308.18	feet;
8.	5°	35'		461.50	feet;
9.	19°	35'		45.94	feet;
10.	88°	25'		387.00	feet;
11.	181°	23'		101.39	feet;

12. 180° 00' 218.30 feet;

13. Thence on a curve to the left with a radius of 800.00 feet, the chord azimuth and distance being:
156° 11' 11" 646.02 feet;

14. 184° 16' 61.82 feet;

15. 214° 32' 200.78 feet;

16. 153° 18' 306.94 feet;

17. 183° 56' 605.61 feet;

18. 266° 17' 183.77 feet;

19. 244° 06' 739.18 feet;

20. 273° 13' 68.47 feet;

21. 280° 08' 61.96 feet to the point of beginning and containing an area of 33.552 Acres.

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

R. M. TOWILL CORPORATION

Description Prepared By:

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Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

EXHIBIT "D"

LOT 8-D

CHANGE IN ZONING - MAKENA

Beginning at the northwest corner of this piece of land, same being the south corner of Lot 20, the coordinate of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 1102.56 feet North and 4196.06 feet East, and thence running by azimuths measured clockwise from True South:

1. 273° 30' 182.85 feet;

2. Thence on a curve to the right with a radius of 4300.00 feet, the chord azimuth and distance being:
18° 20' 01" 1201.65 feet;

3. 153° 56' 62.13 feet;

4. 188° 41' 825.97 feet;

5. 199° 20' 296.21 feet to the point of beginning and containing an area of 4.220 Acres.

R. M. TOWILL CORPORATION

Description Prepared By:

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HAWAII, U.S.A.

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

EXHIBIT "D"

LOT 7

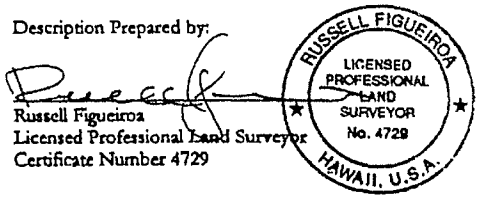
CHANGE IN ZONING - MAKENA

Beginning at the northeast corner of this piece of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 5784.82 feet North and 2758.52 feet East and running by azimuths measured clockwise from True South:

1.	359°	28'	36"	137.54	feet;
2.	94°	31'	26"	130.00	feet;
3.	193°	28'	36"	82.00	feet;
4.	114°	58'	36"	85.00	feet;
5.	204°	58'	36"	35.00	feet;
6.	281°	58'	36"	100.00	feet;
7.	269°	28'	36"	73.68	feet to the point of beginning and containing an area of 0.420 Acre.

R. M. TOWILL CORPORATION

Description Prepared by:



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March 6, 2000

Russell Figueiroa
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Certificate Number 4729

EXHIBIT "D"

LOT 9

CHANGE IN ZONING - MAKENA

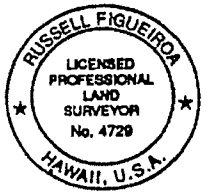
Beginning at the southeast corner of this piece of land, same being also the southwest corner of Lot 10, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4858.47 feet North and 2870.09 feet East and running by azimuths measured clockwise from True South:

1.	110°	00'		239.21	feet;
2.	198°	58'	40"	157.28	feet;
3.	Thence on a curve to the left with a radius of 228.00 feet, the chord azimuth and distance being: 197° 41' 07"			10.29	feet;
4.	102°	28'	06"	6.90	feet;
5.	198°	58'	36"	32.13	feet;
6.	176°	58'	36"	117.12	feet;
7.	196°	28'	36"	227.31	feet;
8.	167°	36'	56"	140.09	feet;
9.	179°	28'	36"	17.65	feet;
10.	Thence on a curve to the right with a radius of 20.00 feet, the chord azimuth and distance being: 224° 28' 36"			28.28	feet;
11.	269°	28'	36"	89.29	feet;

12. Thence on a curve to the right with a radius of 470.00 feet, the chord azimuth and distance being:
274° 08' 37.5" 76.48 feet;

13. 7° 33' 352.37 feet;

14. 0° 03' 427.79 feet to the point of beginning and containing an area of 2.918 Acres.



420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

EXHIBIT "D"

LOT 10
CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the northeast corner of Lot 11-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 4652.68 feet North and 3542.49 feet East and running by azimuths measured clockwise from True South:

1. 72° 47' 315.75 feet;

2. 112° 06' 367.35 feet;

3. 110° 00' 24.28 feet;

4. 200° 00' 178.00 feet;

5. 180° 03' 427.79 feet;

6. 187° 33' 352.37 feet;

7. Thence on a curve to the right with a radius of 470.00 feet, the chord azimuth and distance being:
281° 03' 37.5" 36.90 feet;

8. 283° 18' 36" 91.40 feet;

9. Thence on a curve to the left with a radius of 530.00 feet, the chord azimuth and distance being:
274° 38' 36" 159.73 feet;

10. 265° 58' 36" 105.89 feet;

11. Thence on a curve to the right with a radius of 30.00 feet, the chord azimuth and distance being:
308° 58' 35" 40.92 feet;

12. Thence still on a curve to the left with a radius of 830.00 feet, the chord azimuth and distance being:
343° 58' 35" 231.02 feet;

13. 335° 58' 36" 174.49 feet;

14. Thence on a curve to the right with a radius of 570.00 feet, the chord azimuth and distance being:
353° 01' 36" 334.26 feet;

15. 10° 04' 36" 228.38 feet to the point of beginning and containing an area of 13.526 Acres.

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

EXHIBIT "D"

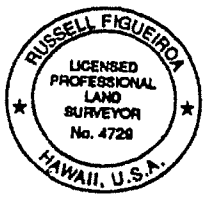
LOT 11-A

CHANGE IN ZONING - MAKENA

Beginning at the southeast corner of this piece of land, same being also the northeast corner of Lot 15-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 3978.85 feet North and 3422.75 feet East and running by azimuths measured clockwise from True South:

1. 94° 44' 640.58 feet;
2. 210° 40' 337.40 feet;
3. 180° 00' 99.77 feet;
4. 110° 00' 596.17 feet;
5. 236° 53' 50.01 feet;
6. 290° 00' 351.76 feet;
7. 200° 00' 119.98 feet;
8. 290° 00' 43.27 feet;
9. 20° 00' 119.98 feet;
10. 290° 00' 24.28 feet;
11. 200° 00' 199.98 feet;
12. 292° 06' 367.35 feet;
13. 252° 47' 315.75 feet;

14. 10° 04' 36" 684.39 feet to the point of beginning and containing an area of 9.062 Acres.



420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

EXHIBIT "D"

LOT 15-A

Beginning at the northeast corner of this piece of land, same being also the southeast corner of Lot 11-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 3978.85 feet North and 3422.75 feet East and running by azimuths measured clockwise from True South:

1. 10° 04' 36" 815.32 feet;
2. Thence on a curve to the right with a radius of 520.00 feet, the chord azimuth and distance being: 17° 40' 37.5" 137.55 feet;
3. 110° 26' 441.91 feet;
4. 90° 00' 339.85 feet;
5. 78° 14' 590.87 feet;
6. 27° 52' 44" 90.02 feet;
7. 25° 07' 153.25 feet;
8. 17° 07' 03" 32.00 feet;
9. Thence on a curve to the left with a radius of 45.00 feet, the chord azimuth and distance being: 153° 25' 19" 62.17 feet;
10. Still on a curve to the left with a radius of 46.00 feet, the chord azimuth and distance being: 64° 48' 33" 68.68 feet;
11. 90° 45' 4.59 feet;
12. 8° 15' 650.10 feet;

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420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

13. 8° 00' 360.00 feet;

14. 112° 00' 503.50 feet;

15. 196° 30' 708.56 feet;

16. 220° 00' 285.81 feet;

17. 227° 49' 278.45 feet;

18. 256° 00' 49.00 feet;

19. 317° 57' 13.00 feet;

20. 219° 40' 16.00 feet;

21. 125° 15' 9.00 feet;

22. 219° 15' 20.00 feet;

23. Thence on a curve to the right with a radius of 25.00 feet, the chord azimuth and distance being:
245° 13' 30" 21.90 feet;

24. 271° 12' 6.00 feet;

25. 281° 04' 28.00 feet;

26. 304° 42' 107.24 feet;

27. 209° 20' 124.40 feet;

28. 131° 36' 15" 139.84 feet;

29. 200° 43' 112.00 feet;

30. 217° 57' 130.00 feet;

31. 205° 57' 158.00 feet;

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

32. 196° 34' 160.00 feet;

33. 203° 26' 105.00 feet;

34. 182° 36' 123.00 feet;

35. 198° 59' 141.00 feet;

36. 180° 48' 52.16 feet;

37. 260° 37' 62.31 feet;

38. 350° 37' 189.03 feet;

39. Thence on a curve to the right with a radius of 272.00 feet, the chord azimuth and distance being:
354° 48' 30" 39.76 feet;

40. 359° 00' 15.07 feet;

41. Thence on a curve to the right with a radius of 20.00 feet, the chord azimuth and distance being:
22° 21' 15" 15.86 feet;

42. Thence still on a curve to the left with a radius of 50.00 feet, the chord azimuth and distance being:
3° 06' 10" 67.69 feet;

43. Thence still on a curve to the left with a radius of 50.00 feet, the chord azimuth and distance being:
265° 56' 47" 81.46 feet;

44. 278° 40' 13.16 feet;

45. 159° 26' 19.13 feet;

46. Thence on a curve to the left with a radius of 50.00 feet, the chord azimuth and distance being:
161° 58' 55" 49.53 feet;

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS

47. Thence still on a curve to the right with a radius of 20.00 feet, the chord azimuth and distance being:
155° 38' 45" 15.86 feet;

48. 179° 00' 3.05 feet;

49. 282° 45' 48.60 feet;

50. 207° 35' 10.00 feet;

51. 340° 05" 12.00 feet;

52. 287° 59' 125.00 feet;

53. 178° 50' 104.20 feet;

54. 92° 25' 94.80 feet;

55. 138° 59' 24.00 feet;

56. 274° 44' 1037.97 feet to the point of beginning and containing an area of 38.262 Acres.

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

EXHIBIT "D"

LOT 21-A

CHANGE IN ZONING - MAKENA

Beginning at the southwest corner of this piece of land, same being also the northwest corner of Lot 21-B, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 621.97 feet South and 2447.61 feet East and running by azimuths measured clockwise from True South:

1. 207° 00' 95.11 feet;

2. 192° 00' 535.00 feet;

3. 170° 00' 200.00 feet;

4. 262° 00 290.00 feet;

5. 225° 00' 545.00 feet;

6. 277° 00' 49.54 feet;

7. 357° 00' 130.83 feet;

8. 23° 00' 904.81 feet;

9. 355° 00' 188.10 feet;

10. 46° 00' 60.76 feet;

11. Thence on a curve to the left with a radius of 330.00 feet, the chord azimuth and distance being:
44° 06' 48" 299.41 feet;

12. 125° 18' 317.33 feet to the point of beginning and containing an containing an area of 11.808 Acres.

EXHIBIT "D"

LOT 22-B

CHANGE IN ZONING - MAKENA

Beginning at the northeast corner of this piece of land, same being also the southeast corner of Lot 22-A, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OLAI" being 906.70 feet South and 2849.74 feet East and running by azimuths measured clockwise from True South:

1. 356° 00' 173.67 feet;
2. 18° 00' 725.57 feet;
3. 132° 41' 129.27 feet;
4. 172° 12' 359.21 feet;
5. Thence on a curve to the left with a radius of 500.00 feet, the chord azimuth and distance being: 210° 19' 22" 308.29 feet;
6. 192° 22' 233.89 feet;
7. Thence on a curve to the left with a radius of 330.00 feet, the chord azimuth and distance being: 194° 45' 03" 27.46 feet;
8. 305° 18' 175.40 feet to the point of beginning and containing an area of 4.096 Acres.

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS
420 WAIAKAMILO ROAD, #411 • HONOLULU, HAWAII 96817-4941

RUSSELL FIGUEIROA
LICENSED PROFESSIONAL LAND SURVEYOR
No. 4729
HAWAII, U.S.A.

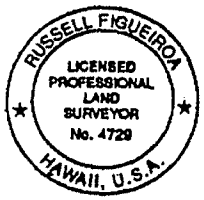
420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

R. M. TOWILL CORPORATION
CIVIL ENGINEERS • SURVEYORS



R. M. TOWILL CORPORATION

Description Prepared By:

Russell Figueiroa
Licensed Professional Land Surveyor
Certificate Number 4729

420 Waiakamilo Rd., #411
Honolulu, Hawaii 96817-4941
March 6, 2000

WE HEREBY CERTIFY that the foregoing BILL NO. 117 (2008)

1. Passed FINAL READING at the meeting of the Council of the County of Maui, State of Hawaii, held on the 19th day of December, 2008, by the following vote:

G. Riki HOKAMA Chair	Dennis A. MATEO Vice-Chair	Michelle ANDERSON	Gladys C. BAISA	Jo Anne JOHNSON	William J. MEDEIROS	Michael J. MOLINA	Joseph PONTANILLA	Michael P. VICTORINO
Aye	No	No	Excused	No	Aye	Aye	Aye	Aye

2. Was transmitted to the Mayor of the County of Maui, State of Hawaii, on the 22nd day of December, 2008.

DATED AT WAILUKU, MAUI, HAWAII, this 19th day of December, 2008.

RECEIVED
2008 DEC 22 AM 10:25
OFFICE OF THE COUNTY CLERK

G. RIKI HOKAMA, CHAIR
Council of the County of Maui

ROY T. HIRAGA, COUNTY CLERK
County of Maui

THE FOREGOING BILL IS HEREBY APPROVED THIS 7th DAY OF January, 2009.

CHARMAINE TAVARES, MAYOR
County of Maui

I HEREBY CERTIFY that upon approval of the foregoing BILL by the Mayor of the County of Maui, the said BILL was designated as ORDINANCE NO. 3613 of the County of Maui, State of Hawaii.

ROY T. HIRAGA, COUNTY CLERK
County of Maui

Passed First Reading on December 10, 2008.
Effective date of Ordinance January 7, 2009.

RECEIVED
2009 JAN -7 PM 2:05
OFFICE OF THE
COUNTY CLERK

I HEREBY CERTIFY that the foregoing is a true and correct copy of Ordinance No. 3613, the original of which is on file in the Office of the County Clerk, County of Maui, State of Hawaii.

Dated at Wailuku, Hawaii, on

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

BARBARA A. ANNIS
DEPUTY COMPTROLLER

(P)1199.9

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

JUL - 8 2009

RECEIVED
JUL 09 2009
Dowling Company, Inc.

Mr. Brian Ige
Construction Manager
Dowling Company, Inc.
2005 Main Street
Wailuku, Maui, Hawaii 96793

Dear Mr. Ige:

Subject: Proposed Installation of New Civil Defense Siren on Makena Land LLC Property
(Siren 157, Makena Resort BWS), Makena, Maui, Hawaii
Tax Map Key (2) 2-1-008:~~078~~ 108

This is to request your approval to install a new civil defense siren (Siren 157, Makena Resort ~~BWS) near to~~ at your sewage treatment plant and located on Makena Land, LLC property, further identified by the tax map key above. See Attachment 1. We provide the following information on this request:

1. We are implementing this project on behalf of the State Civil Defense. They are funding this siren replacement and are also responsible to repair and maintain the siren.

2. The new siren will provide the community and general public with emergency warning coverage which was not present before. The use of this siren is strictly for a public purpose.

3. The typical detail of the new siren/pole installation is shown on Attachment 2. The new siren will be solar powered so there will be no electrical connections to the pole.

4. I understand my staff has coordinated a construction right-of-entry and that we should be receiving a final document from you soon.

If there are no objections to this request, please sign below and return the original document to our office for our files.

EXHIBIT "B"

We look forward to your approval and future coordination of the siren design and construction. Thank you for your attention to this important matter. If you have any questions, please have your staff call Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

ERNEST Y.W. LAU
Public Works Administrator

BI:vca
Attachments
c: Mr. Vincent Shigekuni, PBR Hawaii & Associates w/attachments

The proposed siren site on Attachment 1 is acceptable (Siren 157, Makena Resort ~~BWS~~) and subject to the execution of a right-of-entry document and other conditions as noted below:

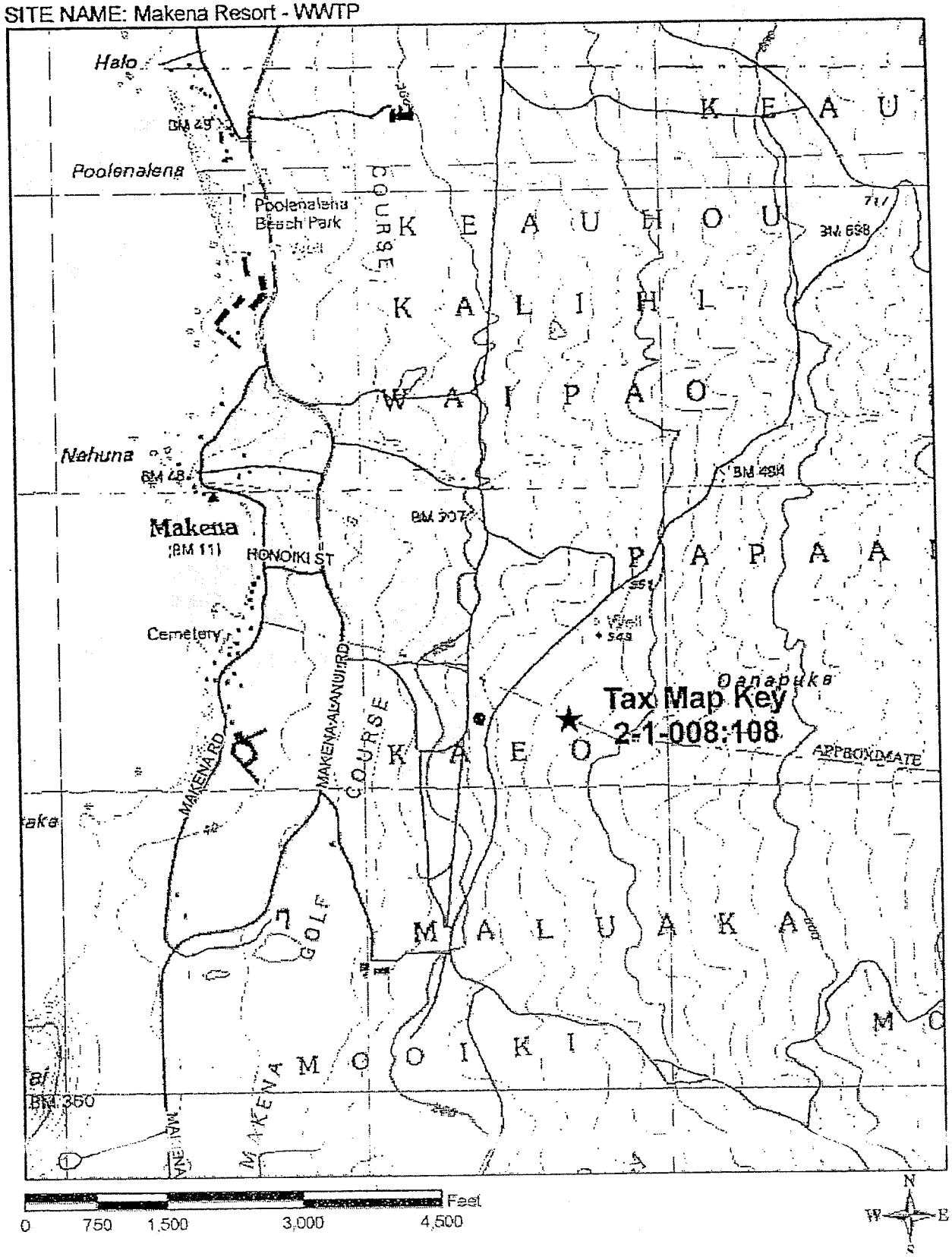
Date: _____

Makena Land, LLC
Its:

Attachment 1

LOCATION MAP

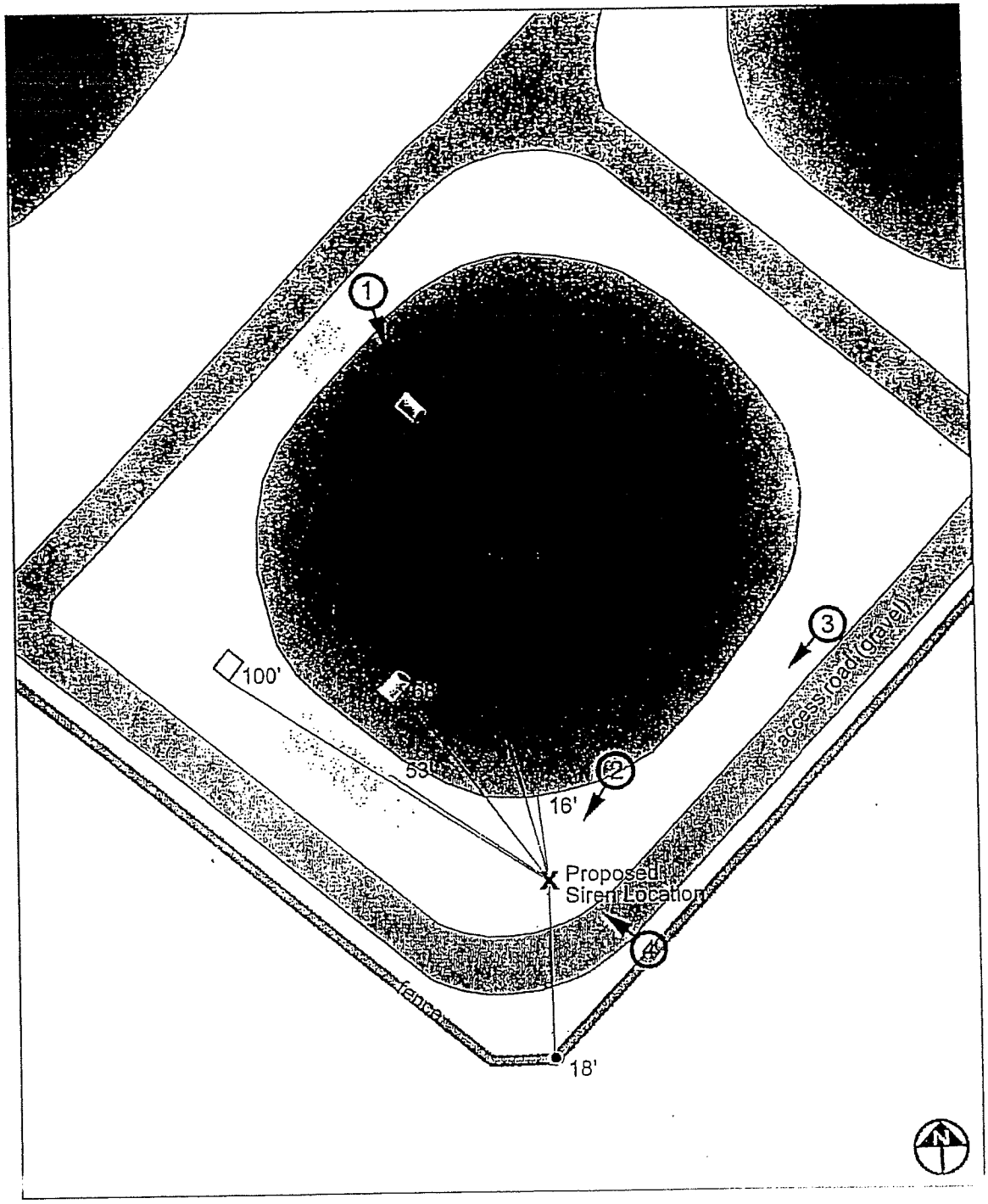
ISLAND: Maui
SITE NUMBER: 157
SITE NAME: Makena Resort - WWTP



SITE SKETCH

DATE: 6/24/2008
ISLAND: Maui
SITE NUMBER: 157
SITE NAME: Makena Resorts - WWTP

LEGEND
- Photo Direction
- Light
- Pipe
- Corner support post



SITE PHOTOGRAPHS

DATE: 6/19/2009
ISLAND: Maui
SITE NUMBER: 157
SITE NAME: Makena Resorts - WWTP

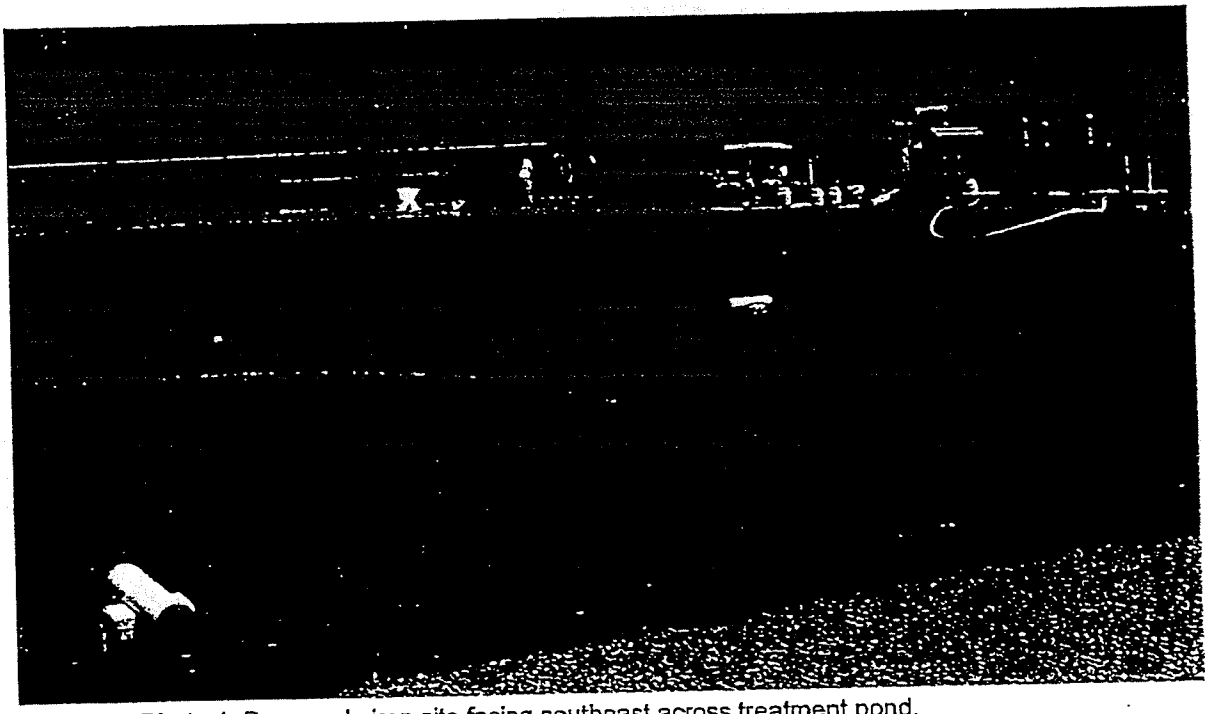


Photo 1: Proposed siren site facing southeast across treatment pond.

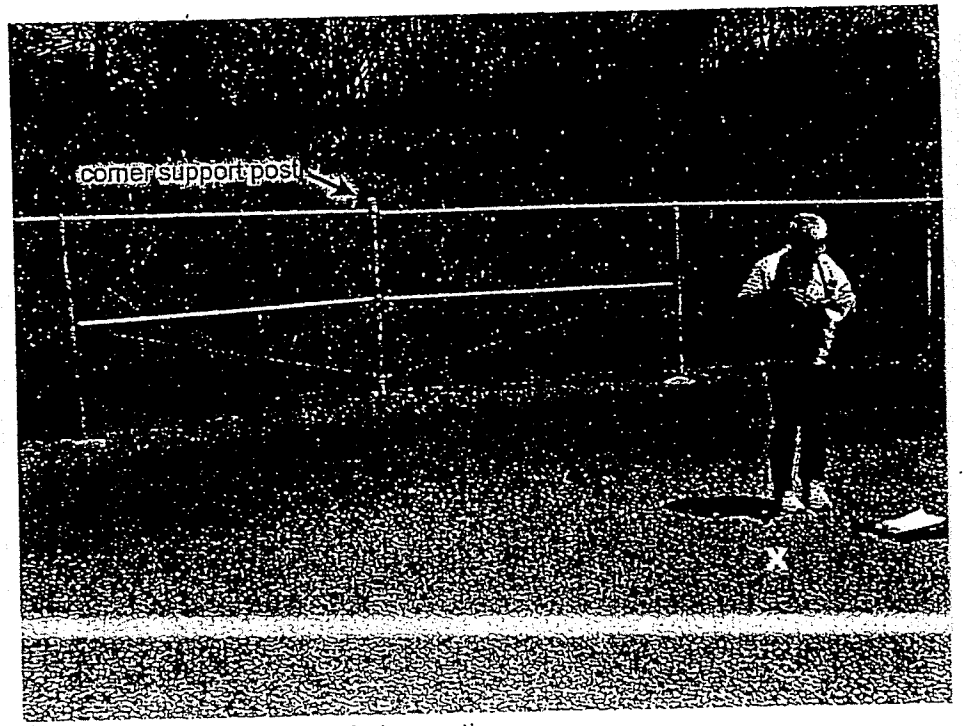


Photo 2: Proposed siren site facing south.

SITE PHOTOGRAPHS

DATE: 6/19/2009
ISLAND: Maui
SITE NUMBER: 157
SITE NAME: Makena Resorts - WWTP

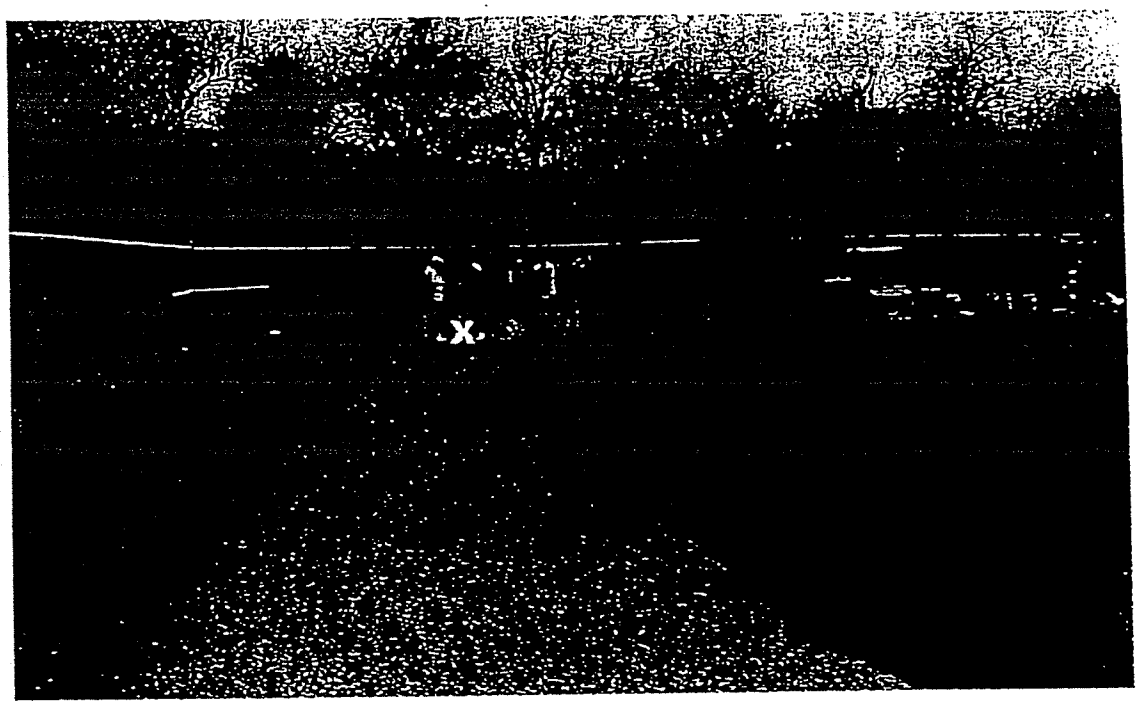
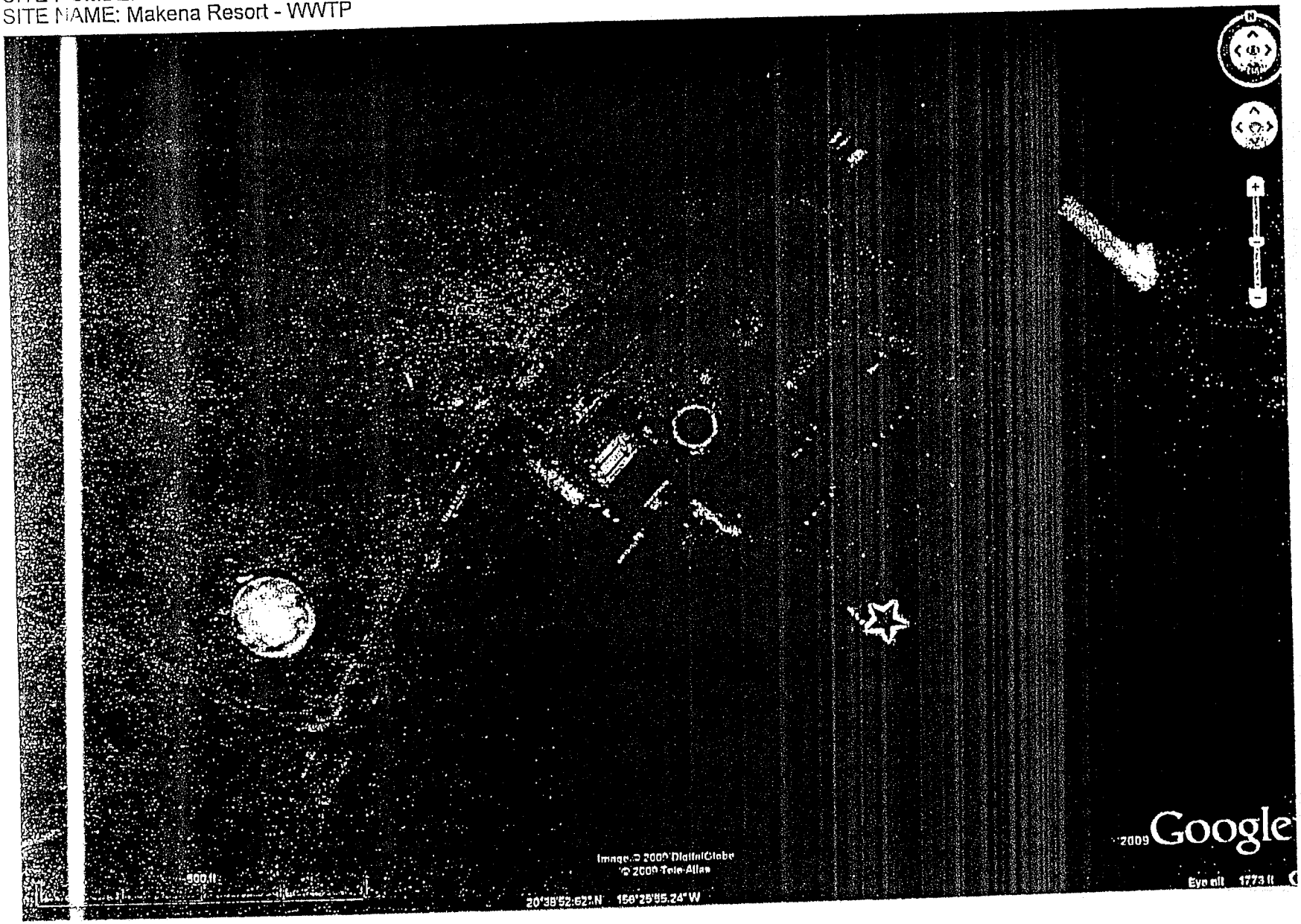


Photo 3: Proposed siren site facing southwest.

Photo 4: Proposed siren site facing northwest towards the WWTP entrance.

ISLAND: Maui
SITE NUMBER: 157
SITE NAME: Makena Resort - WWTP



Approximate location of proposed siren site.

DATE/TIME: 6/19/2009
ISLAND: [ ] KAUAI [ ] OAHU [x] MAUI [ ] MOLOKAI [ ] LANAI [ ] HAWAII
SITE NUMBER: 157
SITE NAME: Makena Resorts - WWTP

GPS COORDS:	WORK TYPE	PRIORITY ORDER for ALTERNATIVES (1 as the highest)	ACCESS
N 20° 38'49.9	[x] N - Add New		[ ] Public Road [ ] Guardrails
W 156° 25'51.669	[ ] E - Upgrade Existing		[x] Gates [ ] No Road
	[ ] A - Choose Alternative		[ ] Fences

LANDOWNER			PERMIT REQUIREMENTS
TMK:	221008108	[ ] Streets/ Right of Way	[x] None
Name:	Makena Land LLC,	[ ] Park	[ ] CDUA
Address:	5415 Makena Alanui Kihei, HI 96753	[ ] Public	[ ] SMA
Phone:	270-0511 870-1536	[x] Private	
Contact Person:	Brian Ige Construction Manager (Dowling)		

VEGETATION	SOIL	TERRAIN
[x] B - Bare	[ ] SA - Sand	[x] F - Flat
[ ] G - Grass	[ ] S - Silt	[ ] SL - Sloped
[ ] T - Trees	[ ] C - Clay	[ ] ST - Steep
[ ] S - Shrubs	[ ] CO - Coral	
[ ] Other	[x] R - Rock	
	[ ] Other	

VEG. TRIMMING	ANTENNA TYPE	POLE TYPE
[ ] Yes	[ ] O - Omni	[ ] H2
[ ] No	[x] Y - Yagi to Lanai	

SURROUNDING LAND USES

[ ] R - Residential	[x] I - Industrial
[ ] V - Vacant Land	[ ] S - School
[ ] AG - Agricultural	[ ] PK - Park
[ ] CO - Conservation	[ ] PS - Police Station
[x] C - Commercial	[ ] FS - Fire Station
[x] H - Hotel	[ ] HO - Hospital
[x] GC - Golf Course	
[ ] O - Other (specify)	

SIREN / SPEAKER TYPE / UNIT COUNT
[x] DSA 121 (4) units
1 DSA 121 at 90°, and 1 at 180°
2 DSA 121 stacked and pointed 270°

LANDMARKS / DISTANCE
16' from edge of treatment pond
18' from corner support post fence
53' from Infrastructure pump concrete pad
68' from pond pipe
100' from light
128' from pond pipe II

UTILITY Electrical Connection to/ Coodination with

[x] Solar Energy	[ ] Kauai Island Utility Corporation
[ ] HECO	[ ] Hawaiian Telcom
[ ] HELCO	[ ] Oceanic Time Warner Cable
[ ] MECO	[ ] Other (specify)

FIELD NOTES
Must obtain permission to access site, road has locked gate, as does the WWTP. The proposed site is located above (west of) the Makena Golf Course, just south of the Honoiki Street and Makena-Alanui Road intersection.

Surrounding land uses to the proposed site include: hotel/resort, golf course, industrial (water tank, sewage treatment plant), and vacant land. Utility poles run along the opposite side of the access road. Need to tone for underground utilities. Cabinet direction at 180°. Soil Type: Oanapuka extremely stony silt loam, 7 to 25 percent slopes (NRCS 2001). Onsite conditions may vary.

Norman Ogasawara says: "Also note we will drop the Poolenalena, Makena site and add this site in its place. As a side note SCD will probably need to leave the existing Makena #2 site there by leaving the total count of new and old combined sites that we will work on will remain about the same. SCD will also do some modifications to the existing siren to get it updated to present standards."

(7/10/2008)

SCD met with Brian Ige from Dowling Company, Inc. & he accompanied & recommended this site to SCD on 6/19/2009.

EXISTING SIREN
Pls. Indicate which equipment to be salvaged, where to be salvaged, and whom to be salvaged by.

All electronics, mechanical relays, siren heads, and boxes to be delivered to State Civil Defense 3949 Diamond Head Road Blg 90 Attn: Assistant Telecommunications Office

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

BARBARA A. ANNIS
DEPUTY COMPTROLLER

(P)1200.9

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810

JUL - 8 2009

RECEIVED
JUL 09 2009
Dowling Company, Inc.

Mr. Brian Ige
Construction Manager
Dowling Company, Inc.
2005 Main Street
Wailuku, Maui, Hawaii 96793

Dear Mr. Ige:

Subject: Proposed Installation of New Civil Defense Siren on Makena Land, LLC Property (Siren 158, Big Beach-Makena), Makena, Maui, Hawaii
Tax Map Key (2) 2-1-005:108

This is to request your approval to install a new civil defense siren (Siren 158, Big Beach-Makena) near Big Beach and located on Makena Land, LLC property, further identified by the tax map key above. See Attachment 1. We provide the following information on this request:

1. We are implementing this project on behalf of the State Civil Defense. They are funding this siren installation and are responsible to repair and maintain the siren.

2. The new siren will provide the community and general public with emergency warning coverage which was not present before. The use of this siren is strictly for a public purpose.

3. The typical detail of the new siren/pole installation is shown on Attachment 2. The new siren will be solar powered so there will be no electrical connections to the pole.

4. I understand my staff has coordinated a construction right-of-entry and that we should be receiving a final document from you soon.

If there are no objections to this request, please sign below and return the original document to our office for our files.

EXHIBIT "C"

We look forward to your approval and future coordination of the siren design and construction. Thank you for your attention to this important matter. If you have any questions, please have your staff call Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

ERNEST Y.W. LAU
Public Works Administrator

BI:vca
Attachments
c: Mr. Vincent Shigekuni, PBR Hawaii & Associates w/attachments

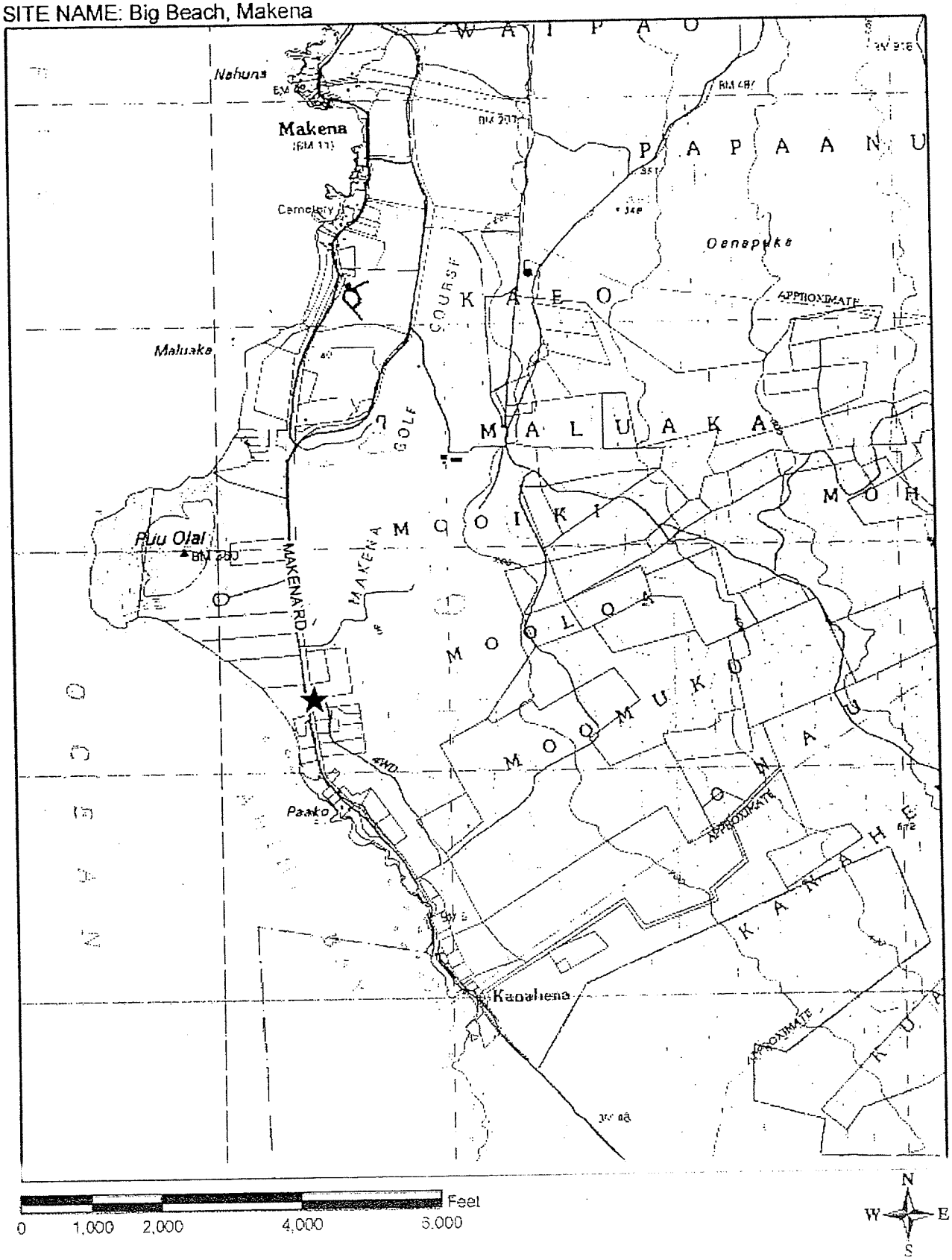
The proposed siren site on Attachment 1 is acceptable (Siren 158, Big Beach-Makena) and subject to the execution of a right-of-entry document and other conditions as noted below:

Makena Land, LLC
Its:

Date: _____

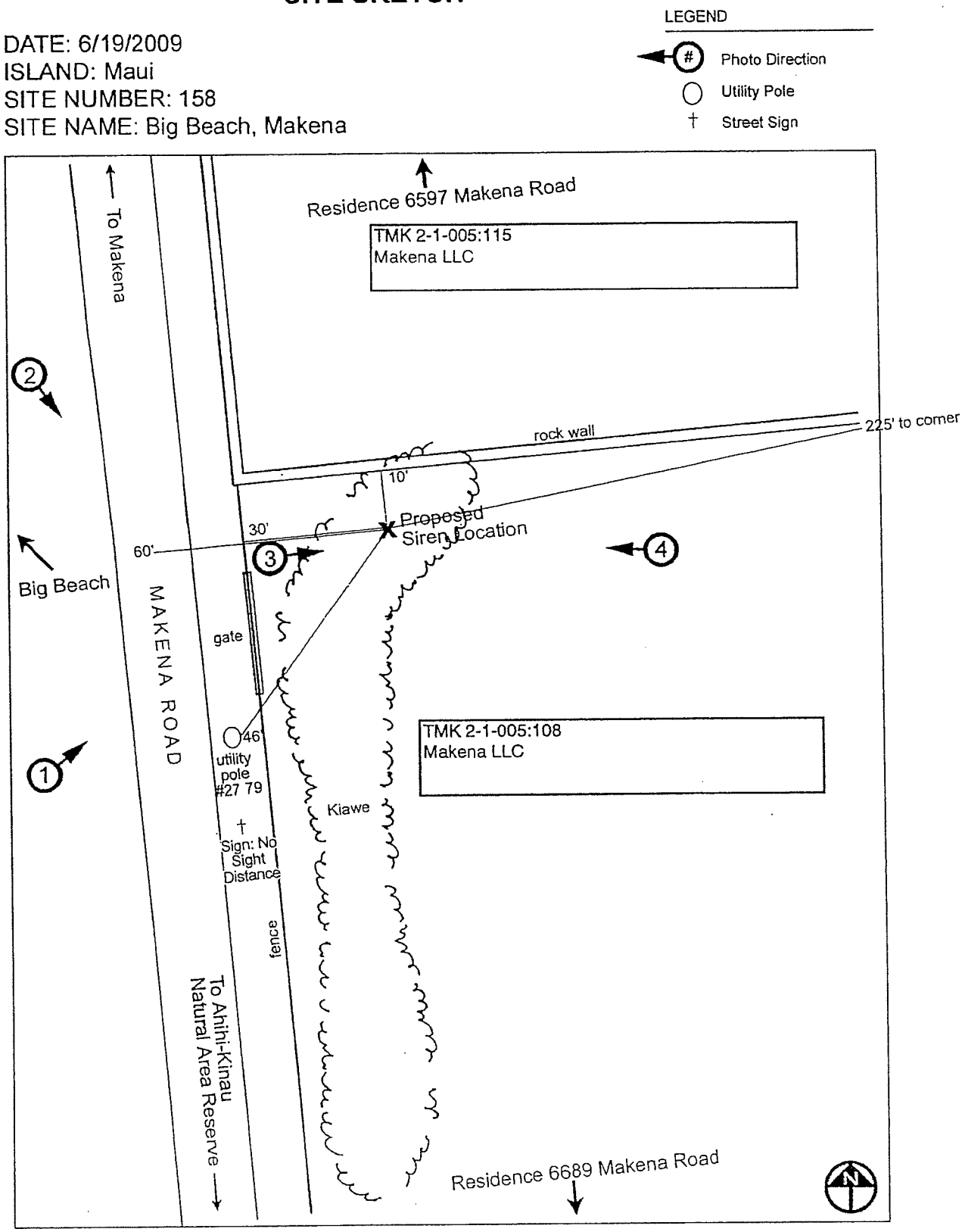
SITE LOCATION MAP

ISLAND: Maui
SITE NUMBER: 158
SITE NAME: Big Beach, Makena



SITE SKETCH

DATE: 6/19/2009
ISLAND: Maui
SITE NUMBER: 158
SITE NAME: Big Beach, Makena



SITE PHOTOGRAPHS

DATE: 6/19/2009
ISLAND: Maui
SITE NUMBER: 158
SITE NAME: Big Beach, Makena

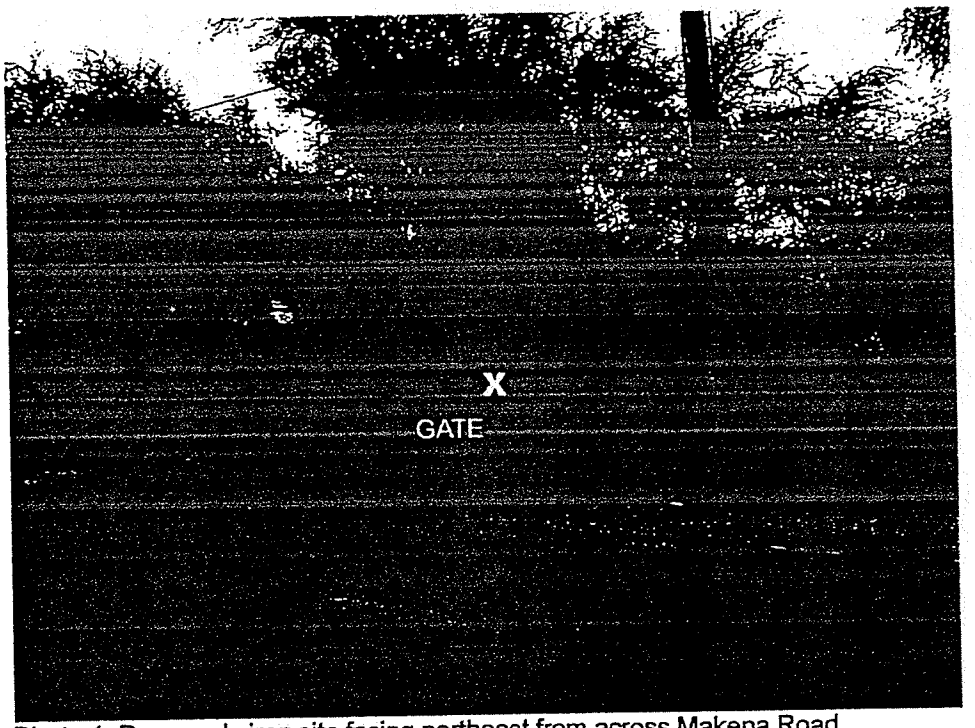


Photo 1: Proposed siren site facing northeast from across Makena Road.

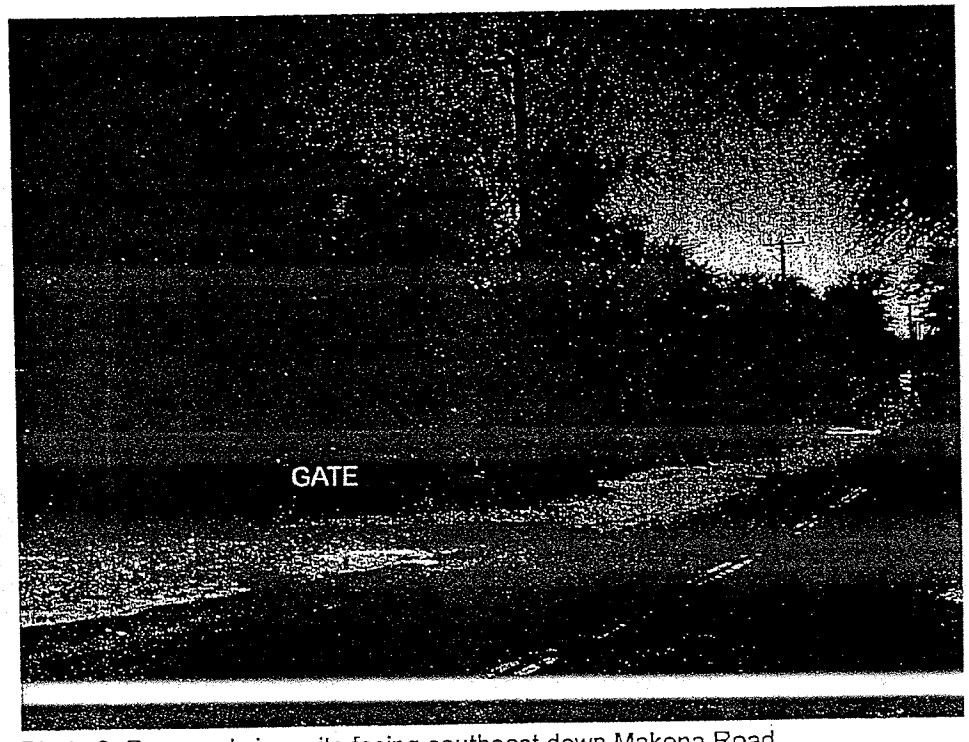


Photo 2: Proposed siren site facing southeast down Makena Road.

SITE PHOTOGRAPHS

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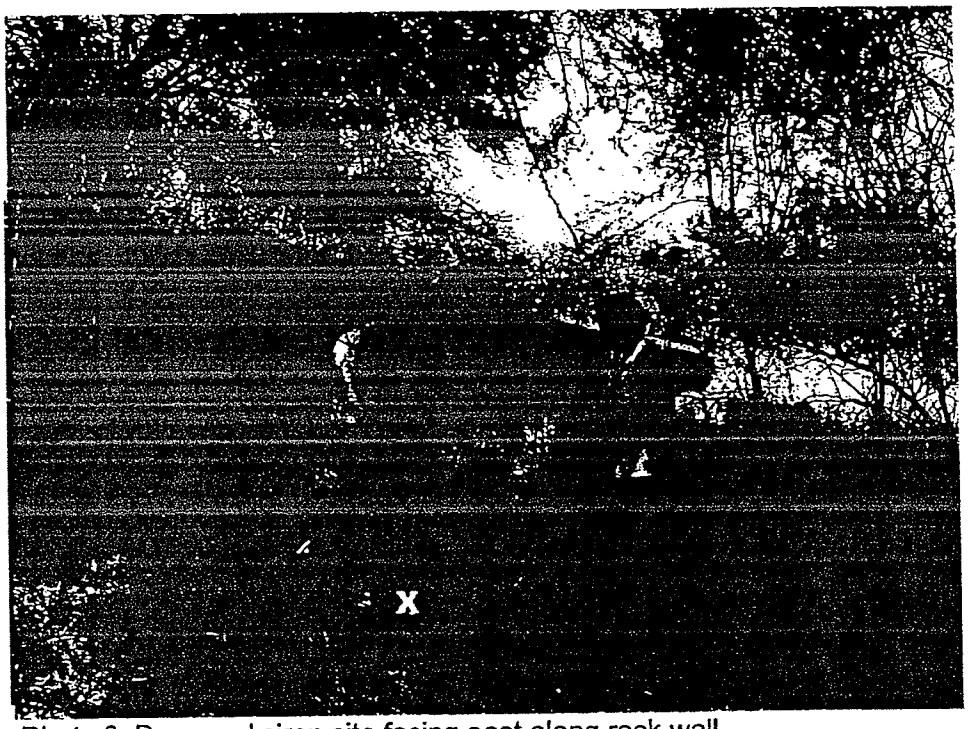
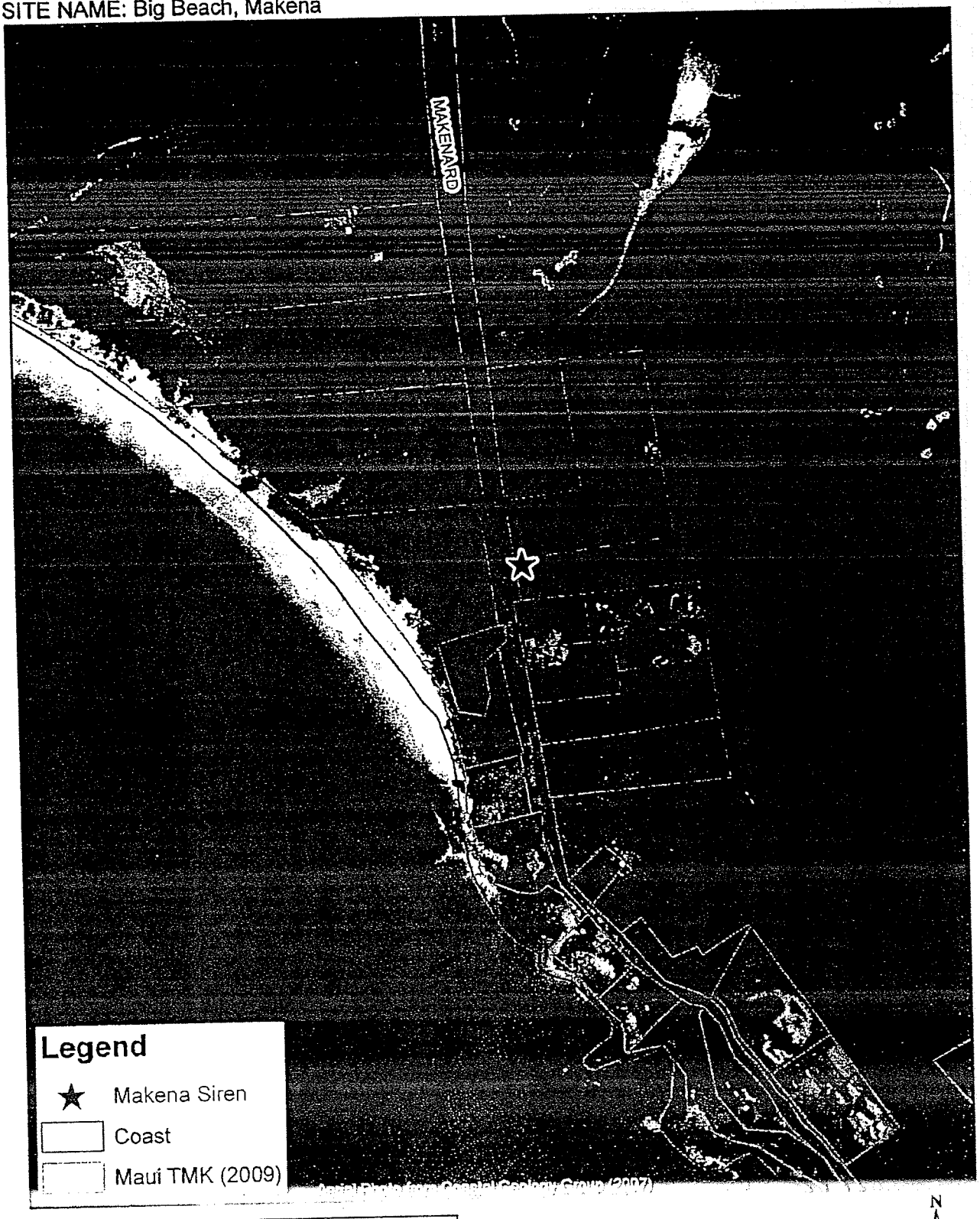


Photo 3: Proposed siren site facing east along rock wall.

Photo 4: Proposed siren site facing west toward Makena Road.

AERIAL PHOTO

ISLAND: Maui
SITE NUMBER: 158
SITE NAME: Big Beach, Makena



5/1

DATE/TIME: 6/19/2009
ISLAND: [ ] KAUAI [ ] OAHU [x] MAUI [ ] MOLOKAI [ ] LANAI [ ] HAWAII
SITE NUMBER: 158
SITE NAME: Big Beach, Makena

GPS COORDS.	WORK TYPE	PRIORITY ORDER for ALTERNATIVES	ACCESS	
N 20° 37 49.042	[x] N - Add New	*(1 as the highest)*	[x] Public Road	[x] Guardrails
W 156° 26 36.526	[ ] E - Upgrade Existing	1	[x] Gates	[ ] No Road
	[ ] A - Choose Alternative		[ ] Fences	

SITE USER			PERMIT REQUIREMENTS
TMK:	2-1-5:108	[x] Streets/ Right of Way	[ ] None
Name:	Makena LLC	[x] Park	[ ] CDUA
	Contact: Dowling Co. Inc	[ ] Public	[x] SMA
Phone:	870-1536	[ ] Private	close to CDUA
Contact Person:	Brian H Ige brian@dowlingco.co		

VEGETATION	SOIL	TERRAIN	SURROUNDING LAND USES	
[x] B - Bare	[ ] SA - Sand	[x] F - Flat	[x] R - Residential	[ ] I - Industrial
[ ] G - Grass	[x] S - Silt	[ ] SL - Sloped	[x] V - Vacant Land	[ ] S - School
[ ] T - Trees	[ ] C - Clay	[ ] ST - Steep	[ ] AG - Agricultural	[x] PK - Park
[x] S - Shrubs	[ ] CO - Coral	**POLE TYPE**	[ ] CO - Conservation	[ ] PS - Police Station
[ ] Other	[ ] R - Rock	[x] H2	[ ] C - Commercial	[ ] FS - Fire Station
	[ ] Other	[ ]	[ ] H - Hotel	[ ] HO - Hospital
			[ ] GC - Golf Course	
			[ ] O - Other	

VEG. TRIMMING	ANTENNA TYPE
[ ] Yes	[ ] O - Omni
[x] No	[x] Y - Yagi to Lanai

SIREN / SPEAKER TYPE / UNIT COUNT

[x] MOD 6024H (1) unit

LANDMARKS / DISTANCE

10' from rock wall
46' to utility pole
30' to fence/gate
60' to Makena Road centerline
225' to corner of property (east)

UTILITY Electrical Connection to/ Coordination with

[x] Solar Energy [ ] Kauai Island Utility Corporation
[ ] HECO [ ] Hawaiian Telcom
[ ] HELCO [ ] Oceanic Time Warner Cable
[ ] MECO [ ] Other (specify) _____

FIELD NOTES

The proposed site is located across Makena Road from Big Beach. There is an old gate that Makena LLC will have to allow SCD access to the proposed site. The lot is vacant and is located between property addresses 6597 and 6689. There is a utility pole near the gate which has the numbers 27 and 79. Surrounding land uses to the proposed site include: residential, vacant land, and Big Beach Park (beach access and parking lot). Overhead electrical lines run along the same side of Makena Road. Need to tone for underground utilities. The cabinet is to be positioned facing 260°. Soil Type: Makena loam stony complex up to 44 inches deep (NRCS 2000). Onsite conditions may vary. Landowner is the site user. Brian Ige, who is our liason with Makena LLC accompanied & recommended this site to SCD on 6/19/2009.

EXISTING SIREN

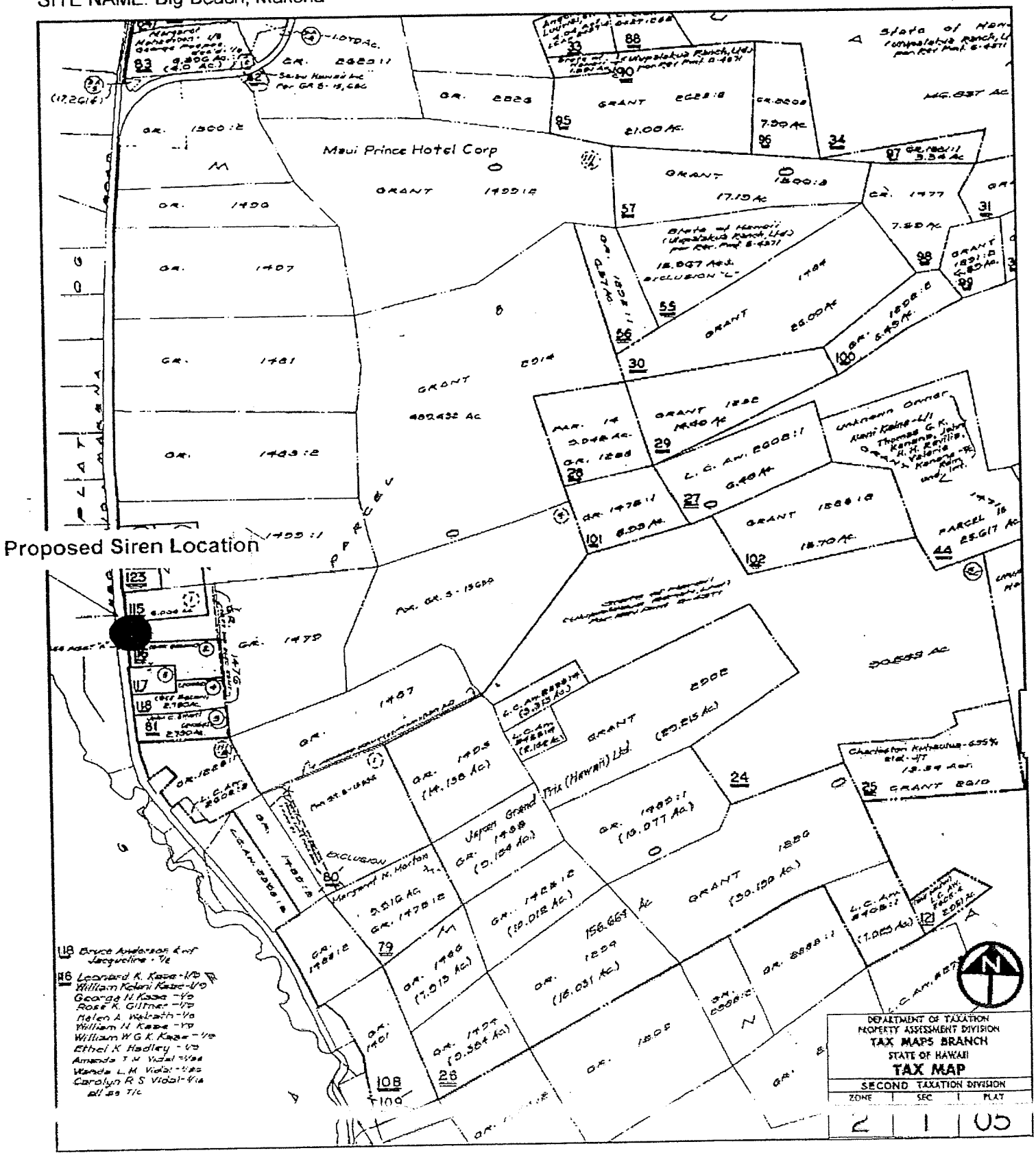
Pls. Indicate which equipment to be salvaged, where to be salvaged, and whom to be salvaged by.

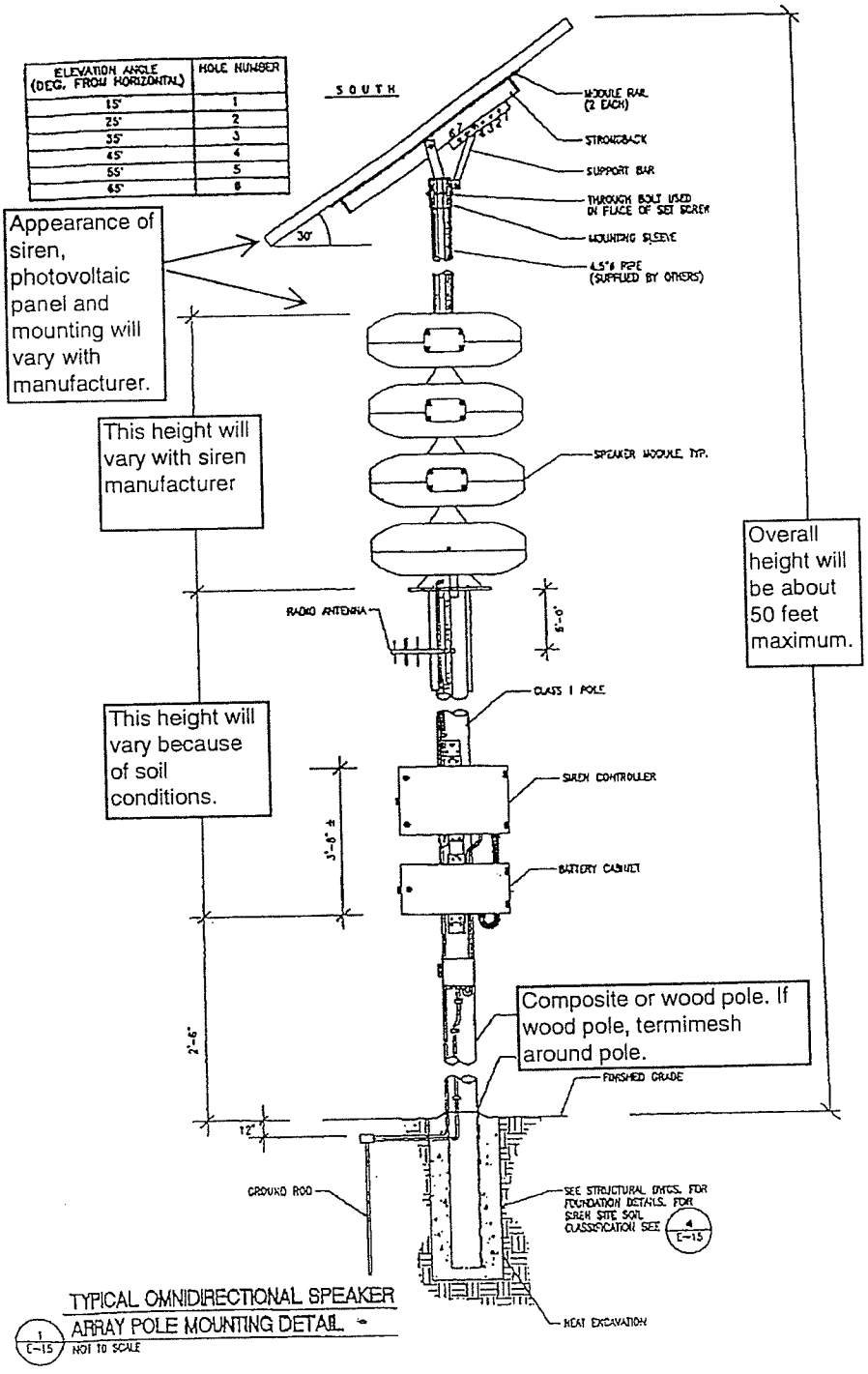
All electronics, mechanical relays, siren heads to be delivered to State Civil Defense 3949 Diamond Head Road Blg 90 Attn: Assistant Telecommunications Officer

6/7

TAX MAP KEY

ISLAND: Maui
SITE NUMBER: 158
SITE NAME: Big Beach, Makena





TYPICAL OMNIDIRECTIONAL SPEAKER ARRAY POLE MOUNTING DETAIL

1/E-15 NOT TO SCALE

HAWAII STATE CIVIL DEFENSE
DISASTER WARNING AND COMMUNICATION DEVICES, STATEWIDE

ATTACHMENT 2

MARINE WATER QUALITY MONITORING
MAKENA RESORT, MAKENA, MAUI
WATER CHEMISTRY
REPORT 1-2008

Prepared for

Makena Land LLC

2005 Main St.

Wailuku, Maui, Hawaii 96793

By

Marine Research Consultants, Inc.

1039 Waakaua Pl.

Honolulu, Hawaii 96822

Submitted

September 9, 2008

EXHIBIT "D"

I. PURPOSE

The Makena Resort fronts approximately 5.4 miles of coastline of southeastern Maui, extending from Papanui Stream (Nahuna Point) on the north and Pu`u Olai (Ahihi Bay) on the south. Within the Resort are two 18-hole golf courses (North and South Courses), as well as a hotel, sewage treatment plant and private residences. No part of the project involves direct alteration of the shoreline or nearshore marine environments.

Evaluations of other golf courses and other forms of resort development located near the ocean in the Hawaiian Islands reveal that there is detectable input to the coastal ocean of materials used for fertilization of turfgrass and landscaping (Dollar and Atkinson 1992). However, there are few, if any, effects that have been documented to be considered detrimental to the marine ecosystem. Thus, there is no *a priori* reason to suspect that the construction and responsible operation of the golf courses and other components of the Makena Resort will cause any harmful changes to the marine environment. Nevertheless, in the interest of assuring maintenance of environmental quality, and as a means of ensuring that proper procedures are set forth, a condition of the Land Use Commission District Boundary Amendment for the project was the implementation of an ongoing marine monitoring program off the Makena Resort Development. The primary goals of the program are twofold: 1) to assess the degree that materials used on land to enhance turf growth and landscaping, as well as other nutrient subsidies, leach to groundwater and subsequently reach the ocean, and 2) to determine the fate of these materials within the nearshore zone. In terms of determining fate, the question that is addressed is if the materials that originate from Resort activities disperse with little or no effect, or do they cause changes in water quality sufficient to alter marine biological community structure?

The rationale of the monitoring program is to conduct repetitive evaluations of water chemistry at the same locations at regular time intervals (twice per year). This strategy allows for determination of variations in effects from the Makena Resort in both space (at different locations along the shoreline) and time. These studies also fulfill condition No. 10, Declaration of Conditions pertaining to the Amendment of the District Boundary, as required by the Land Use Commission, dated April 17, 1998. The following report presents the results of the twenty-first increment in the monitoring program, and contains data from water chemistry sampling conducted on June 29, 2008.

II. ANALYTICAL METHODS

Three survey sites directly downslope from the Makena Resort have been selected as sampling locations. A fourth site, located offshore of an area with minimal land-based development, particularly golf course operations, was selected as a control. During the June 2007 survey, another sampling location was added near the southern boundary of Maluaka Bay. It is anticipated that this station will remain part of the sampling protocol permanently. Figure 1 is a map showing the shoreline and topographical features of the Makena area, and the location of the North and South Golf Courses. All survey sites are depicted as transects perpendicular to the shoreline extending from the shoreline out to what is considered open coastal ocean (i.e., beyond the effects of activities on land). Survey Site 1 is located near the northern boundary of the project

site off Nahuna Point; Survey Site 2 bisects Makena Bay near Makena Landing. Site 3 bisects the middle of the South course on the north side of Maluaka Point. Site 3A is on the southern corner of Maluaka Bay. Site 4, which is considered the Control site, is located near the northern boundary of the 'Ahihi-Kina`u natural area reserve north of the 1790 lava flow and approximately 1-2 miles south of the existing Makena Golf courses (Figure 1). The control site was located off a shoreline area with minimal land uses (i.e., residences near the shoreline and upslope ranchlands) rather than off the completely uninhabited 1790 lava flow. This location was selected as the most appropriate control site, as it is the farthest location from the Makena Resort with the same geophysical structural of the land area. The completely different geological structure of the lava flow off the natural reserve likely results in very different groundwater dynamics compared to the land area where the Makena Resort is located, hence making the lava flow an unsuitable control site.

In July of 2002, Site 3 was relocated from a location at the southern boundary of the project offshore of Oneloa Beach to the location directly off the Makena Golf Course, as described above. The relocation of Site 3 was deemed necessary as the original location consistently showed virtually no input of groundwater to the ocean. Such lack of groundwater discharge resulted in little potential for evaluating effects from the project. The new location of Site 3 is directly downslope from both the portion of the golf course nearest to the ocean, several newly constructed private residences, and a 3-acre recently restored wetland area. As a result, the new location represents an area that reflects the maximum influence on nearshore water quality from a variety of land uses and natural habitat.

All fieldwork for the present survey was conducted on June 29, 2008, Environmental conditions during sample collection consisted of mild winds (8-10 knots), sunny skies, and very little swell. No significant rainfall to the area occurred in the week preceding the survey.

Water samples were collected at stations along transects that extend from the highest wash of waves to between125-200 meters (m) offshore, depending on the site. Such a sampling scheme is designed to span the greatest range of salinity with respect to freshwater efflux at the shoreline. Sampling was more concentrated in the nearshore zone because this area is most likely to show the effects of land-based activities. With the exception of the two stations closest to the shoreline (0 and 2 m offshore), samples were collected at two depths; a surface sample was collected within approximately 10 centimeters (cm) of the sea surface, and a bottom sample was collected within one m of the sea floor.

Water samples from the shoreline to a distance of 10 m offshore were collected in polyethylene bottles by swimmers working from the shoreline. A digital refractometer was used to pinpoint the location of maximum groundwater flux to the ocean for each transect site. Water samples beyond 10 m from the shoreline were collected from a small boat using a 1.8-liter Niskin-type oceanographic sampling bottle. This bottle was lowered to the desired depth in an open position where spring-loaded endcaps were triggered to close by a messenger released from the surface. Upon recovery, each sample was transferred into a 1-liter polyethylene bottle until further processing. Water samples were also collected from eight golf course irrigation wells (No's 1, 2, 3, 4, 5, 6, 8, and 11) and one irrigation lake on the same day as the ocean sampling.

Subsamples for nutrient analyses from all water sources were immediately placed in 125-milliliter (ml) acid-washed triple rinsed, polyethylene bottles and stored on ice until returned to Honolulu. Water for other analyses was subsampled from 1-liter polyethylene bottles and kept chilled until analysis.

Water quality parameters evaluated included the 10 specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (Open Coastal waters) of the State of Hawaii Department of Health Water Quality Standards. These criteria include: total nitrogen (TN) which is defined as dissolved inorganic nitrogen plus dissolved organic nitrogen, nitrate + nitrite nitrogen (NO_3^- + NO_2^-), ammonium (NH_4^+), total phosphorus (TP) which is defined as dissolved inorganic phosphorus plus dissolved organic phosphorus, chlorophyll a (Chl a), turbidity, temperature, pH and salinity. In addition, orthophosphate phosphorus (PO_4^{3-}) and silica (Si) were reported because these constituents are sensitive indicators of biological activity and the degree of groundwater mixing, respectively.

Analyses for NO_3^- + NO_2^- (hereafter termed NO_3^-), NH_4^+ and PO_4^{3-}, were performed on filtered samples using a Technicon autoanalyzer according to standard methods for seawater analysis (Strickland and Parsons 1968, Grasshoff 1983). TN and TP were analyzed in a similar fashion on unfiltered samples following digestion. Dissolved organic nitrogen (TON) and dissolved organic phosphorus (TOP) were calculated as the difference between TN and inorganic N, and TP and inorganic P, respectively. Limits of detection for the dissolved nutrients are 0.01 μM (0.14 μg/L) for NO_3^- and NH_4^+, 0.01 μM (0.31 μg/L) for PO_4^{3-}, 0.1 μM (1.4 μg/L) for TN and 0.1 μM (3.1 μg/L) for TP.

Chl a was measured by filtering 300 ml of water through glass fiber filters; pigments on filters were extracted in 90% acetone in the dark at -5°C for 12-24 hours, and the fluorescence before and after acidification of the extract was measured with a Turner Designs fluorometer (level of detection 0.01 μg/L). Salinity was determined using an AGE Model 2100 laboratory salinometer with a precision of 0.003‰.

In situ field measurements included water temperature, pH, dissolved oxygen and salinity which were acquired using an RBR Model XR-420 CTD calibrated to factory specifications. The CTD has a readability of 0.001°C, 0.001pH units, 0.001% oxygen saturation, and 0.001 parts per thousand (‰) salinity.

Nutrient, turbidity, Chl a and salinity analyses were conducted by Marine Analytical Specialists located in Honolulu, Hawaii. This laboratory possesses acceptable ratings from EPA-compliant proficiency and quality control testing.

III. RESULTS and DISCUSSION

A. General Overview

Table 1 shows results of all marine water chemical analyses for samples collected off Makena on June 29, 2008 with nutrient concentrations reported in micromolar units (μM). Table 2 shows

similar results with nutrient concentrations presented in units of micrograms per liter (μg/L). Tables 3 and 4 show geometric means of ocean samples with nutrient concentrations shown in μM and μg/L, respectively. Table 5 shows water chemistry measurements (in units of μM and μg/L) for samples collected from irrigation wells and one irrigation lake located on the Makena Resort Golf Courses. Concentrations of twelve chemical constituents in surface and deep-water samples from the June 2008 sampling are plotted as functions of distance from the shoreline in Figures 2 and 3. Mean concentrations (±standard error) of twelve chemical constituents in surface and deep water samples as functions of distance from the shoreline at Sites 1-4 collected since 1995 are plotted in Figures 4-15. In addition, data from the most recent sampling in June 2008 are also plotted on Figures 4-15.

During the June 2008 sampling, nearshore concentrations of dissolved Si, NO_3^-, and TN on all five transects were elevated up to three orders of magnitude compared to samples collected farthest from shore (Figure 2, Tables 1 and 2). Values of salinity display a mirror image with lowest values nearest the shoreline, and progressively increasing values with distance from shore (Figure 3, Tables 1 and 2). The horizontal gradients of nutrients were steepest on Transect 3-A where NO_3^- at the shoreline (175 μM) decreased by more than three orders of magnitude between the shoreline and 150 m from the shoreline (0.4 μM). At transect Sites 1, 2, 3, and 4, peak values of NO_3^- at the shoreline were between 5 and 41 μM. In contrast, at the seaward ends of these transects, concentrations of NO_3^- in surface waters ranged from 0.19 to 1.6 μM. (Figure 2, Table 1). Similar steep horizontal gradients were evident in Si concentrations for these sites, with the steepest gradient occurring at Site 3-A. Salinity displayed a mirror image, with lowest salinity at the shoreline (21-33‰), and rapidly increasing values with increasing distance from shore to near oceanic values (34.6 - 34.7‰) at the ends of the transects (Figure 3, Table 1). At Site 3-A horizontal gradients extended the entire length of each transect, from the shoreline out to the station farthest offshore. On the other four transect sites, horizontal gradients dissipated within 100 m of the shoreline (Tables 1 and 2).

With the exception of Site 1, which displayed uniform concentrations across the entire transect, horizontal gradients in the surface concentrations of phosphate phosphorus (PO_4^{3-}) were also evident with the highest values in the samples collected near the shoreline, and progressively lower concentrations with increasing distance from shore. While there were distinct gradients in the concentrations of PO_4^{3-}, the magnitude of the range in values was far less than for Si, NO_3^- and TN (Figure 2, Tables 1 and 2) and the gradient extended out only to a distance of 50 m from the shoreline.

With no streams in the sampling area, the pattern of elevated Si, NO_3^-, PO_4^{3-} and TN with a corresponding reduced salinity indicates groundwater entering the ocean near the shoreline. Low salinity groundwater, which contains high concentrations of Si, NO_3^-, TN and PO_4^{3-} (see values for well waters in Table 5), percolates to the ocean near the shoreline, resulting in a distinct zone of mixing in the nearshore region. The zone of mixing is discernible by distinct decreasing gradients of nutrients and increasing gradients of salinity with distance from shoreline. During periods of low tide when sea conditions are calm, the zone of mixing between groundwater and ocean water is most pronounced. The June 2008 sampling was conducted during a period with a slightly rising tide (0.02 ft – 1.0 ft) and minimal winds and displayed a marked zone of mixing extending approximately 150 m from shore. Past monitoring surveys at Makena Resort conducted

during periods of high tide and strong winds (e.g. December 2005) show substantially smaller horizontal gradients than the present survey. Comparing the results of surveys conducted during very different sea conditions clearly indicates that tidal state, as well as wind and wave energy, greatly affect groundwater mixing in the nearshore zone.

Dissolved nutrient constituents that are not associated with groundwater input (NH_4^+, TP, TON, TOP) showed varying results with respect to distance from the shoreline (Figure 2). With the exception of Site 4, NH_4^+ concentrations in the surface waters did not show any distinct patterns with respect to distance from the shoreline and was relatively constant within any one transect. At Site 4, NH_4^+ decreased with increasing distance from the shoreline from 5.2 μM at the shoreline to 0.27 μM at the farthest offshore station (Table 1). Concentrations of TOP and TON were highest in the shoreline samples at Sites 3-A, 3 and Site 4 compared to the offshore samples while at Sites 1 and 2, concentrations of TOP and TON were nearly constant along the length of the transect. Measurements of TP in the two samples collected nearest the shoreline at Site 3A were an order of magnitude higher than measured at the shorelines of the other four sites (Tables 1 and 2).

With the exception of Transect Site 2, patterns in surface concentrations of turbidity did not show any distinct patterns (Table 1, Figure 3). At Site 2, turbidity was highest in the shoreline and decreased with increasing distance offshore, however turbidity measurements were of the same magnitude as the other four sites during June 2008. In previous surveys, turbidity has generally been highest on Transect 2 compared to the other sites. Transect 2 bisects Makena Bay, which is semi-enclosed embayment with a silt/sand bottom rather than the predominantly "hard" reef or sand bottoms that occur at the other transect sites. In addition, it has been observed that during flash floods originating in the ranch lands upslope of the Makena Resort, terrigenous sediment may flow to the ocean in Makena Bay. As a result of wave-induced resuspension of the naturally occurring silt/sand substratum, as well as terrigenous runoff which may be partially retained within the embayment, turbidity has often been elevated at Transect 2 relative to the other transect sites. It is important to note that in surveys conducted since July 2002, water clarity in Makena Bay has improved greatly compared to preceding surveys in 2001 which reflected conditions following substantial input of terrigenous materials from a flash-flood that occurred in October 1999.

Patterns in the concentrations of Chl *a* showed higher shoreline values compared to offshore values at Sites 1, 2 and 3. Beyond the shoreline, concentrations of Chl *a* were of the same magnitude along 4 of the 5 transects, with slightly higher concentrations of Chl *a* occurring along the transect at Site 2 (Figure 3).

Surface water temperature ranged between 25.1°C and 27.0°C during the June 2008 survey (Tables 1 and 2). Temperature measurements in the shoreline samples varied between transect sites. At Sites 1, 2, and 3 shoreline temperature was $\sim$ 0.5°C higher than that measured at Sites 14 and 3-A (Tables 1 and 2). At all sites, temperatures were lowest at the shoreline and steadily increased with distance offshore (Figure 3). The greatest variation in temperature within any one transect occurred at Site 3-A where temperature increased by 1.5°C between the shoreline and offshore waters.

In many areas of the Hawaiian Islands, input of low salinity groundwater to the nearshore ocean creates a distinct buoyant surface lens that can persist for some distance offshore. Buoyant surface

layers are generally found in areas where turbulent processes (primarily wave action) are insufficient to completely mix the water column in the nearshore zone. Figures 2 -15 and Tables 1 and 2 show concentrations of water chemistry constituents with respect to vertical stratification. During the June 2008 survey, vertical stratification was evident for Si, NO_3^-, TN and salinity along all transects with the most pronounced gradients.

With respect to the other constituents of water chemistry, variations between surface and deep samples were generally small and no apparent trend with distance offshore (Figures 2-15). Only temperature showed any vertical stratification with the deeper waters ~0.5°C lower than the surface water (Figure 3).

B. Temporal Comparison of Monitoring Results

Figures 4-15 show mean concentrations (±standard error) of water chemistry constituents from surface and deep samples at Transect Sites 1-4 from the twenty-one monitoring surveys conducted from 1995 to 2007. In addition, the results of the most recent survey in June 2008 are also shown on each plot. Because Site 3-A was not added to the sampling regime until June 2007, data from this site is not yet included in Figures 4–15.

With the exception of Site 3, surface concentrations of most constituents during the June 2008 survey were within the mean ranges of past surveys (Figure 4-9 and 13-15) (NH_4^+ is the only exception). At Site 3, the Si, NO_3^-, and TN within 50 m of the shoreline were substantially higher, and salinity lower, during the most recent survey compared to mean values (Figures 10 -12). Several other constituents (PO_4^{3-}, TON, TP, TOP, and NH_4^+) were also higher during the most recent survey compared to the surface mean values at Site 3 (Figures 10 and 11). These variations can be a result of sampling during a period of particularly low mixing of groundwater and ocean water in the nearshore zone, or may reflect an increase in nutrient subsidies to groundwater as a result of activities on land. Distinctions between the mean values and the most recent survey were also visible for NH_4^+ and temperature in samples collected beyond 10 m of the shoreline at all four sites (Figures 4, 7, 10, and13).

C. Conservative Mixing Analysis

A useful treatment of water chemistry data for interpreting the extent of material input from land is application of a hydrographic mixing model. In the simplest form, such a model consists of plotting the concentration of a dissolved chemical species as a function of salinity. Comparison of the curves produced by such plots with conservative mixing lines provides an indication of the origin and fate of the material in question (Officer 1979, Dollar and Atkinson 1992, Smith and Atkinson 1993).

Figure 16 shows plots of concentrations of four chemical constituents (Si, NO_3^-, PO_4^{3-}, and NH_4^+) as functions of salinity for samples collected in June 2008. Figures 17 and 18 show the same type of plot with data pooled by transect site for a composite of all past surveys at Sites 1-4. In addition, data from the two surveys at Site 3-A, as well as for the most recent survey are shown in Figures 17 and 18. Each graph also shows four conservative mixing lines that are constructed by

connecting the end member concentrations of open ocean water with irrigation well No. 4 located on the upper North Course of the Makena Resort (representative of groundwater upslope of the Makena Resort).

If the parameter in question displays purely conservative behavior (no input or removal from any process other than physical mixing), data points should fall on, or very near, the conservative mixing line. If, however, external material is added to the system through processes such as leaching of fertilizer nutrients to groundwater, data points will fall above the mixing line. If material is being removed from the system by processes such as uptake by biotic metabolic processes, data points will fall below the mixing line.

Dissolved Si represents a check on the model as this material is present in high concentration in groundwater, but is not a major component of fertilizer. In addition, Si is not utilized rapidly within the nearshore environment by biological processes. It can be seen in Figure 16 that when concentrations of Si are plotted as functions of salinity, all but two data points fall on the conservative mixing line created by connecting endpoint concentrations from water collected from the upslope irrigation well and the open ocean. Such good agreement indicates that marine waters at these four transect sites are a mixture of groundwater flowing beneath the project and ocean water. The deviation of the two low salinity data points from Transect Site 1 from the mixing line indicate input of another source of groundwater in this area. Over the course of monitoring, data points from Site 1 have consistently been below the Si mixing lines in a similar manner as noted in June 2008 (Figure 17). These results indicate that with the exception of Transect 1, groundwater endmembers from upslope Well No. 4 provides a valid representation of groundwater that enters the ocean following flow through the Makena development. Over the course of monitoring since 1995, the relationship between salinity and Si has remained nearly constant (Figure 17).

NO_3^- is the form of nitrogen most common in fertilizer mixes that are used for enhancing turf growth. When the concentrations of NO_3^- are plotted as functions of salinity, data from each transect prescribes a distinctly different pattern (Figure 16). Data points from Transect 2 lie on the upslope well water mixing line. The position of these data arrays indicates that the source of NO_3^- entering the ocean at Transect 2 contains little or no subsidies from activities on land. Conversely, all of the data points from Transects 1, 3, 3-A each prescribe a different mixing line that lies above the irrigation well mixing lines, indicating subsidies of NO_3^- to the ocean from sources on land. As none of the mixing lines are similar in slope, it is evident that there are different magnitudes of subsidies of NO_3^- at each sites. Such relationships indicate subsidies of NO_3^- at Transect sites 1, 3 and 3-A that are likely a result of leaching of golf course fertilizers to the groundwater lens. In addition to the golf courses, however, all of the residences near the shoreline at Site 1 include landscaping and lawns. Data points for NO_3^- from Site 4 (control transect) fall below the mixing line during the June 2008 survey indicating that there is no additional input of NO_3^- to groundwater at this site. Such a result validates that Site 4 is indeed a good "control" area.

Transect Site 1 has also been used as a monitoring station for a similar evaluation of the effects of the Wailea Golf Courses on water chemistry that commenced in 1989. The lowest concentrations of NO_3^- relative to salinity at Transect site 1 occurred during the initial two years of study, with

subsequent higher concentrations since 1992. Hence, there appears to have been an increase of NO_3^- in nearshore waters that was not occurring in 1989-1991. Completion of the Wailea Gold Course occurred in December 1993, while completion of the Makena North Course occurred in November 1993. As the southern region of the Wailea Course and the northern part of the Makena Course overlap in the makai-mauka direction landward of ocean Transect 1, the increased concentrations of NO_3^- may be a result of leaching of fertilizer materials from the combined golf courses to groundwater that enters the ocean in the sampling area.

Mixing analyses also indicate an ongoing input of NO_3^- at the shoreline of Stations 3 and 3A located off the existing Makena Golf Course as well as several new residences that have been constructed adjacent to the Golf Course (Figures 16 and 17). While such subsidies have been noted in past surveys, they were of a lesser magnitude in the June 2008 survey than in previous years (Figure 17). Hence, it does not appear that the subsidies of NO_3^- are progressively increasing. Future monitoring will clarify if the trend of NO_3^- input to the ocean is indeed decreasing.

While the data reveal a long-term subsidy to the concentration of NO_3^- in groundwater and the nearshore zone at several of the sampling sites, the concentrations of NO_3^- fall in clearly linear relationship as functions of salinity. The linearity of the data array indicates that there is no detectable uptake of this material by the marine environment. Such lack of uptake indicates that the nutrients are not being removed from the water column by metabolic reactions that could change the composition of the marine environment. Rather, the nutrient subsidies are diluted to background oceanic levels by physical processes of wind and wave mixing. As a result, the increased nutrients do not appear to have the potential to cause alteration in biological community composition or function.

Similar situations have also been observed in other locales in the Hawaiian islands where nutrient subsidies from golf course leaching result in excess NO_3^- in the nearshore zone. At Keauhou Bay on the Big Island, it was shown that owing to the distinct vertical stratification in the nearshore zone, the excess nutrients never come into contact with benthic communities, thereby limiting the potential for increased uptake by benthic algae. In addition, the residence time of the high nutrient water was short enough within the embayment to preclude phytoplankton blooms. As a result, while NO_3^- concentrations doubled as a result of golf course leaching for a period of at least several years, there was no detectable negative effect to the marine environment (Dollar and Atkinson 1992). Owing to the unrestricted nature of circulation and mixing off the Makena project (no confined embayments) it is reasonable to assume that the excess NO_3^- subsidies that are apparent in the present study will not result in alteration to biological communities.

Indeed, surveys of the nearshore marine habitats off of Makena reveal a healthy coral reef that does not exhibit any negative effects from nutrient loading (Marine Research Consultants 2006). In addition to the lack of negative impacts to coral communities, inspection of the entire shoreline fronting the Makena Resort revealed that there are no areas where excessive algal growth is presently occurring.

The other form of dissolved inorganic nitrogen, NH_4^+, generally does not show a linear pattern of distribution with respect to salinity for either the June 2008 survey (Figure 16) or the entire monitoring program (Figure 18). Some samples with near oceanic salinity also displayed the

highest concentrations of NH_4^+. The lack of a correlation between salinity and concentration of NH_4^+ suggests that this form of nitrogen is not present in the marine environment as a result of mixing from groundwater sources. Rather, NH_4^+ is generated by natural biotic activity in the ocean waters off Makena. During the June 2008 survey, the highest measurements for NH_4^+ occurred in low salinity water at Site 4, the control site.

PO_4^{3-} is also a major component of fertilizer, but is usually not found to leach to groundwater to the extent of NO_3^-, owing to a high absorptive affinity of phosphorus in soils. Data points representing PO_4^{3-} vs. salinity do not show consistent linearity with respect to the mixing lines. In fact, nearly all data points for control Site 4 lie above the mixing line. Thus, the elevated NO_3^-, which is likely a result of golf course and residential landscaping, is not reflected in similar subsidies of PO_4^{3-}.

D. Time Course Mixing Analyses

While it is possible to evaluate monitoring results from repetitive surveys conducted over time in terms of concentrations of water chemistry constituents (See Section C), a more informative and accurate method of evaluating changes over time is to utilize the results of scaling nutrient concentrations to salinity. As discussed above, the simple hydrographic mixing model consisting of plotting concentrations of nutrient constituents versus salinity eliminates the ambiguity associated with comparing only the concentrations of samples collected during multiple samplings at different stages of tide and weather conditions. Figures 19 and 20 show plots of Si and NO_3^-, respectively, as functions of salinity collected during each year of sampling (1995-2008). Also shown in Figures 19 and 20 are straight lines that represent the least squares linear regression fitted through concentrations of Si and NO_3^- as functions of salinity at each monitoring site for each year. Tables 6-8 show the numerical values of the Y-intercepts, slopes, and respective upper and lower 95% confidence limits of linear regressions fitted through the data points for Si, NO_3^-, and PO_4^{3-} as functions of salinity for each year of monitoring at Transect Sites 1-4. Site 3-A has only been sampled three times. Data from Site 3-A is included in this comparison, and is shown in a different color.

The magnitude of the contribution of nutrients originating from land based activities to groundwater will be reflected in both the steepness of the slope and the Y-intercept of the regression line fitted through the concentrations scaled to salinity (the Y-intercept can be interpreted as the concentration that would occur at a salinity of zero if the distribution of data points is linear). This relationship is valid because with increasing contributions from land, nutrient concentrations in any given parcel of water will increase with no corresponding change in salinity. Hence, if the contribution from land to groundwater nutrient composition is increasing over time, there would be progressive increases in the absolute value of the slopes, as well as the Y-intercepts of the regression lines fitted through each set of annual nutrient concentrations when plotted as functions of salinity. Conversely, if the contributions to groundwater from land are decreasing, there will be decreases in the absolute values of the slopes and Y-intercepts.

Plots of the values of the slopes (Figure 21) and Y-intercepts (Figure 22) of regression lines fitted though concentrations of Si, NO_3^- and PO_4^{3-} scaled to salinity during each survey year provide an

indication of the changes that have been occurring over time in the nearshore ocean off the Makena Resort. As stated above, Si provides the best case for evaluating the effectiveness of the method, as Si is present in high concentration in groundwater but is not a component of fertilizers. NO_3^- and PO_4^{-3} are the forms of nitrogen and phosphorus, respectively, found in high concentrations in groundwater relative to ocean water, and is the major constituents found in fertilizers.

Examination of Figures 21 and 22, as well as Tables 6-8 reveal that none of the slopes or Y-intercepts of Si, NO_3^- and PO_4^{3-} from 1995 to 2008 at any of the transect sites exhibit any indication of progressively increasing or decreasing values over the course of monitoring. The term "REGSLOPE" in Tables 6-8 denotes the values of the slopes and 95% confidence limits of linear regressions of the values of the yearly slopes and Y-intercepts as a function of time. For all sites, the upper and lower 95% confidence limits of the REGSLOPE coefficients are not significantly different than zero, indicating that there is no statistically significant increase or decrease in the salinity-scaled concentrations of Si, NO_3^- and PO_4^{3-} over the course of the monitoring program (Tables 6-8).

For all three nutrients, there is little variation in either slopes or Y-intercepts during any year at Site 1, located off the "5 Graves" area downslope from the juncture of the Wailea and Makena Resorts (Figures 21 and 22). Such lack of variation indicates relatively consistent concentrations of Si, NO_3^- and PO_4^{3-} in groundwater entering the ocean over the thirteen years of monitoring. Sites 2 (Makena Landing) and 4 ('Ahihi-Kina`u) also show relative constant trends with time with the exception of 2001 which is marked by large spikes in Si and PO_4^{3-}. Such a fluctuation is not present for NO_3^- in 2001. Sampling in 2001 was conducted during a period of rough winter sea conditions marked by vigorous mixing of the water column. As a result, there was very weak linear relationship between nutrient concentrations and salinity.

At Site 3, located directly downslope for the point of the Makena Golf Course closest to the ocean, there is a trend of decreasing NO_3^- between 2002 and 2004, an increasing trend from 2004 to 2007, followed by another downturn in 2008 (Figures 21 and 22). As a result of these reversing trends, there is no significant increase or decrease over the six-year period of monitoring. The reversing trend may reflect changes in land use, such as variation in fertilizer application or construction-related activities in 2002-2004 versus 2004-2007..

F. Compliance with DOH Standards

Tables 1 and 2 also show samples that exceed DOH water quality standards for open coastal waters under "wet" and "dry" conditions. These criteria are applied depending upon whether the area is likely to receive less than (dry) or greater than (wet) 3 million gallons of groundwater input per mile per day. As it is not possible to accurately estimate groundwater and surface water discharge, both wet and dry standards are considered. DOH standards include specific criteria for three situations; criteria that are not to be exceeded during either 10% or 2% of the time, and criteria that are not to be exceeded by the geometric mean of samples. With twenty-one samplings collected to date, comparison of the 10% or 2% of the time criteria for any sample is

not statistically meaningful. However, comparing sample concentrations to these criteria provide an indication of whether water quality is near the stated specific criteria.

Boxed values in Tables 1 and 2 show instances where measurements exceed the DOH standards under dry conditions, while boxed and shaded values show instances where measurements exceed DOH standards under wet conditions.

Results from the June 2008 survey indicated that nearly all measurements of NO_3^- and NH_4^+ along all five transect sites exceeded the 10% DOH criteria under wet or dry conditions (Tables 1 and 2). Only twenty-two of the sixty-two samples collected did not exceed the DOH criteria for NO_3^- and those instances were mostly from deep waters beyond 50 m of the shoreline. Four measurements of TP, twenty-nine measurements of TN, and eleven measurements of Chl *a* exceeded the 10% DOH criteria under dry conditions. No measurements of turbidity exceeded the 10% DOH criteria under "dry" conditions. Under "wet" criteria, two measurements of TP, and seventeen measurements of TN, were exceeded. No measurements of turbidity or Chl a exceeded the "wet" standards. It is of interest to note that at Transect Site 4, which is considered the control station beyond the influence of the Makena Resort, exceedance of DOH criteria for NO_3^- and NH_4^+ were similar to Sites 1-3 and 3-A, which were located directly offshore of the Resort.

Tables 3 and 4 show geometric means of samples collected at the same locations during the twenty-one increments of the monitoring program at Sites 1, 2 and 4. Geometric means of samples collected over 12 increments of sampling at Site 3 and 3 increments of sampling at Site 3-A are also shown. These tables also specify the samples that exceed the DOH geometric mean limits for open coastal waters under "dry" (boxed) and "wet" (boxed and shaded) conditions. For NO_3^-, NH_4^+, and TN numerous dry and wet standards were exceeded while only six samples of TP and fifteen samples of turbidity exceeded standards. All but four samples exceed the geometric mean standards for Chl *a*.

Site 4 is considered a control transect, in that it is not located offshore of a resort, golf course or dense residential development. It can be seen in Tables 3 and 4, however, that the number of samples that exceed geometric mean criteria at Site 4 are comparable to the other three sites, all of which are located downslope from the Makena Resort. Hence, Resort activities, including golf courses cannot be attributed as the sole (or even major) factor causing water quality to exceed geometric mean standards.

Several comments can be made regarding the present DOH water quality standards and how they apply to the monitoring program at the Makena Resort. As noted above, the category of water quality standards that are applicable for the Makena Monitoring program are "Open Coastal Waters." As the name implies, these standards apply to "open" waters that can be reasonably defined as "waters beyond the direct influence of land." In order to evaluate the effects of land uses on the nearshore ocean off Makena, the selected sampling regime collects water within a zone that extends from the shoreline to the open coastal ocean. As a result, sampling takes place within the region of ocean that is directly influenced by land. If the monitoring protocol were revised to include only those sampling locations beyond 50-100 m from shore (i.e., open coastal waters), the monitoring scheme would be completely valid with respect to meeting regulatory compliance since the DOH standards do not stipulate any monitoring procedures or sampling locations.

Initial steps have been taken by DOH to rectify this situation. During revision of the Department of Health water quality standards in 2004, a unique set of monitoring criteria was added for the West Coast of the Island of Hawaii (i.e., "Kona standards"). The rationale for these unique standards was the recognition that existing numerical "standards" represent offshore coastal waters that are beyond the natural confluence of land and the nearshore ocean. As a result, the West Hawaii standards recognize that groundwater entering the ocean at the shoreline contains substantially elevated nutrients relative to open coastal waters. As a result, the Kona criteria provide the potential to meet water quality standards with elevated nutrient concentrations resulting from natural sources of groundwater input. As the same processes of groundwater discharge to the coastal ocean have been documented in Maui, it is hopeful that similar new provisions of the water quality standards with soon be applicable to the South Maui area.

III. SUMMARY

- The twenty-first phase of water chemistry monitoring of the nearshore ocean off the Makena Resort was carried out on June 29, 2008. Sixty-two ocean water samples were collected on four transects spaced along the project ocean frontage and on one control transect. Site 1 was located at the northern boundary of the project, Site 2 was located near the central part of the Makena North Golf Course in the center of Makena Bay, Site 3-A (initiated during the June 2007 survey) was located near the southern boundary of Maluaka Bay, Site 3 was downslope from the part of Makena South Golf Course that comes closest to the shoreline, and Control Site 4 was located to the south of Makena Resort near the northern boundary of the 'Ahihi-Kina`u Natural Area Reserve. Sampling transects extended from the shoreline out to the open coastal ocean. Water samples were analyzed for chemical criteria specified by DOH water quality standards, as well as several additional criteria. In addition, water samples were collected from eight irrigation wells and an irrigation lake.

- Water chemistry constituents that occur in high concentration in groundwater (Si, NO_3^- and PO_4^{3-}) displayed distinct horizontal gradients with high concentrations nearest to shore and decreasing concentrations moving seaward. Groundwater input (based on salinity) was greatest at Site 3-A but was also evident at the other four sites. As Site 4 was not located in the vicinity of the Makena Resort, it is apparent that groundwater input is not solely a response to Resort land usage.

- Vertical stratification of the water column was also evident on all transects during June 2008, with the surface samples displaying higher nutrient and lower salinities than bottom samples. The strong vertical and horizontal patterns of distribution indicate that physical mixing processes generated by tide, wind, waves and currents were insufficient to completely mix the water column throughout the sampling area.

- Chl a was elevated near the shoreline at Sites 1, 2 and 3 but not at Sites 4 and 3-A. As nutrient input to the ocean was highest at Site 3-A, it is evident that there is not a direct linkage between nutrient input and the concentration of Chl a. Turbidity was elevated only at Site 2 in the shoreline samples compared to the other sampling sites. Site 2 is located at the point where sediment-laden storm water runoff entered the ocean following a flash flood in

October 1999. While the highly turbid conditions associated with the runoff event are no longer evident, normal processes of circulation (tidal exchange, wave mixing) and the silt/sand bottom have often resulted in slightly more turbid conditions in Makena Bay (Site 2) compared to the other sampling sites that occur in areas with predominantly hard reef substrata. AT sampling stations beyond 2 m from the shoreline, turbidity levels at Site 2 were no elevated relative to other transect sites.

- With the exception of anomalously elevated concentrations at Site 4, concentrations of NH_4^+ were similar throughout the length of transects. Other organic water chemistry constituents that do not occur in high concentrations in groundwater (TON, TOP) showed elevated levels near the shoreline at Sites 3, 3-A and 4, but not at Sites 1 and 2.

- Scaling nutrient concentrations to salinity indicates that there were measurable subsidies of NO_3^- to groundwater that enters the nearshore ocean at three Transect sites. Results of the June 2008 monitoring indicated that these subsidies were greatest in magnitude at Site 3, followed in order by Site 3A and Site 1. No subsidies of NO_3^- were apparent at Site 2 (Makena Landing) or Site 4 ('Ahihi-Kina`u). These subsidies, which are likely a result of land uses involving fertilizers, substantially increase the concentration of NO_3^- with respect to salinity in groundwater flowing to the ocean compared to natural groundwater. The area shoreward of Site 1 includes an overlap of the southern part of the Wailea Gold Course and the northern part of the Makena North Course, as well as residential development. Sites 3 and 3A are directly downslope from the Makena South Course in an area were the golf course extends to the shoreline. In addition, private residences are near completion upslope of Transect 3, and it is possible that a cesspool remains from a house that was recently torn down. Hence, the subsidies of NO_3^- noted at these sites may result from a combination of sources.

- Linear regression statistics of nutrient concentration plotted as functions of salinity are useful for evaluating changes to water quality over time. When the regression values of nutrient concentrations versus salinity are plotted as a function of time, there are no statistically significant increases or decreases over the thirteen years of monitoring at any of the survey sites. The lack of increases in these slopes and intercepts indicate that there has been no consistent change in nutrient input from land to groundwater that enters the ocean from 1995 to 2008 (2002 to 2008 at Site 2). At Site 3 off the Makena Resort South Golf Course, there has been a progressive decrease in NO_3^- input between 2002 and 2004, followed by an increase between 2004 and 2007, and another decrease in 2008. Further monitoring at this site will be of interest to note the future direction of the oscillating trends noted in the last six years.

- Comparing water chemistry parameters to DOH standards revealed that numerous measurements of NO_3^- and NH_4^+, several measurements of TN and Chl *a*, and a few measurements of TP exceeded the DOH "not to exceed more than 10% of the time" criteria for dry and wet conditions of open coastal waters. No measurements of turbidity exceeded the DOH standards during the June 2008 survey. It is apparent that the concentrations of NO_3^- in nearshore marine waters that contains a mixture of seawater and natural groundwater may exceed DOH criteria with no subsidies from human activities on land. Numerous values of

NO_3^-, NH_4^+, TP, TN, turbidity and nearly all measurements of Chl *a* exceeded specified limits for geometric means. Such exceedances occurred at all survey sites, including the control site that was far from any golf course influence. The consistent exceedance of water quality standards is in large part a consequence of the standards not accounting for the natural effects of groundwater discharge to the nearshore ocean and resultant zones of mixing.

- As in past surveys, there is a subsidy of dissolved inorganic nutrients (e.g., NO_3^- and sometimes to a lesser extent PO_4^{3-}) to groundwater that enters the nearshore ocean at sampling sites downslope from parts of the Makena Resort. Without question, such input is a consequence of various land use activities. However, none of these inputs have increased significantly over time, and there is an indication of the beginning of a declining trend in the most recent data. Monitoring of coral reef community structure that is part of the ongoing monitoring, as well as the noted lack of any nuisance algal aggregations in the nearshore area indicate that the nutrient subsidies are not detrimental to marine community structure.
- The next phase of the Makena Resort monitoring program is scheduled for the December of 2008.

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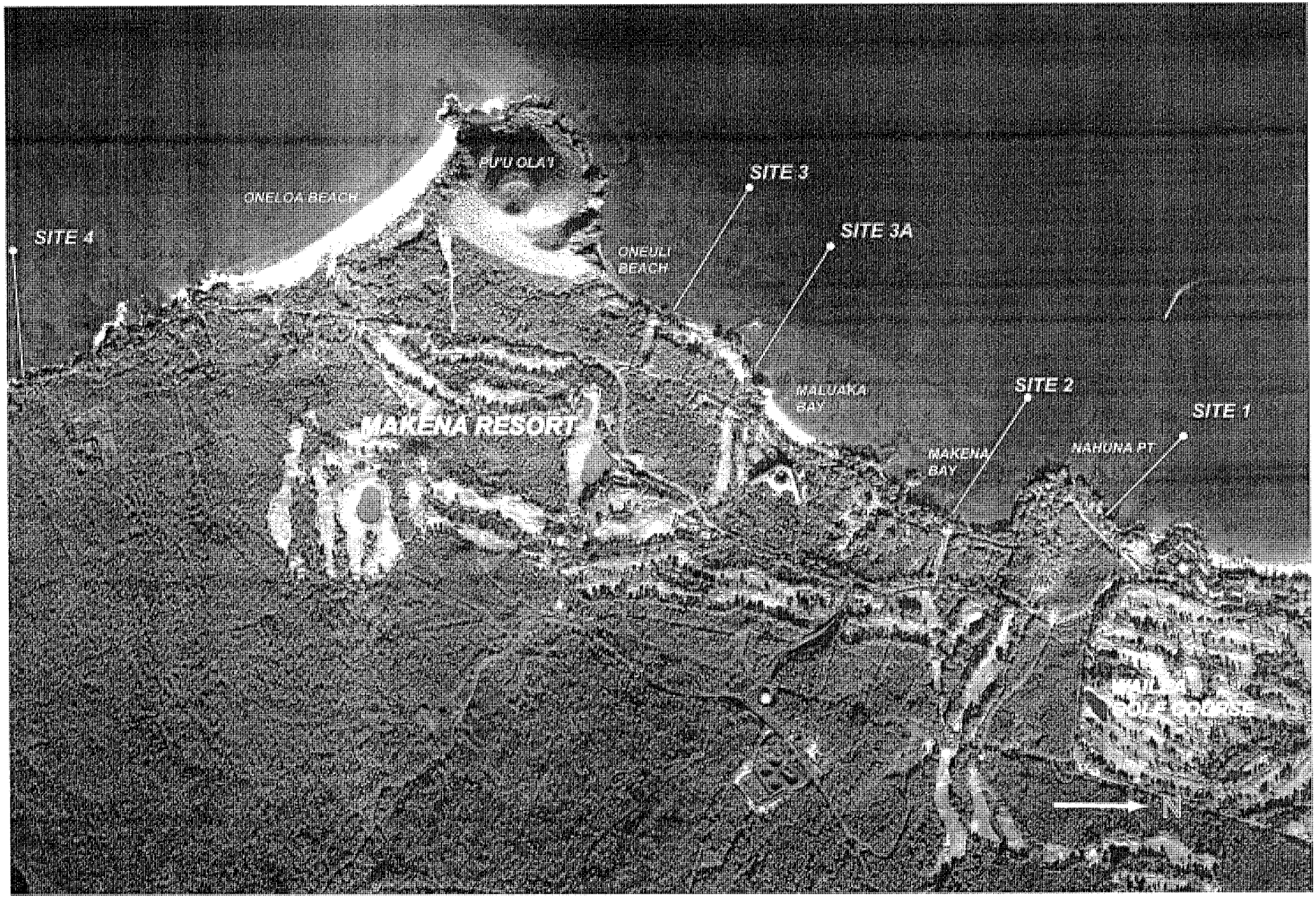

FIGURE 1. Aerial photograph of Makena Resort on southwest coastline of Maui. Also shown are locations of five water sampling transects that extend from the shoreline to 150-200 m from shore. The southern end of the Wailea golf course is visible at right.

TABLE 1. Water chemistry measurements from ocean water samples collected in the vicinity of the Makena Resort on June 29, 2008. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep, BDL=below detection limit. Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH 10% "dry" standards; boxed and shaded values exceed DOH 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	DEPTH (m)	PO_4^{3-} (µM)	NO_3^- (µM)	NH_4^+ (µM)	Si (µM)	TOP (µM)	TON (µM)	TP (µM)	TN (µM)	TURB (NTU)	SALINITY (ppt)	CHL a (µg/L)	TEMP (deg.C)	pH (std.units)	O2 % Sat
MAKENA 1	0 S	0.1	0.05	39.24	0.96	61.04	0.36	8.65	0.41	48.85	0.14	29.887	0.55	25.8	8.11	104.1
	2 S	0.1	0.05	31.34	0.23	57.61	0.35	9.02	0.40	40.59	0.13	30.874	0.58	25.8	8.14	108.7
	5 S	0.1	0.04	9.23	0.07	21.73	0.35	7.98	0.39	17.28	0.11	33.445	0.28	25.7	8.13	103.4
	5 D	1.0	0.04	5.66	0.92	16.62	0.31	6.90	0.35	13.48	0.06	33.816	0.18	25.8	8.12	100.4
	10 S	0.1	0.05	8.82	1.57	21.41	0.33	9.71	0.38	20.10	0.09	33.506	0.24	25.8	8.09	107.9
	10 D	1.7	0.06	2.56	1.07	7.78	0.38	8.63	0.44	12.26	0.11	34.410	0.24	25.8	8.08	109.3
	50 S	0.1	0.04	2.55	1.23	8.42	0.34	8.81	0.38	12.59	0.07	34.386	0.19	27.0	8.13	107.0
	50 D	4.4	0.05	0.11	1.20	1.66	0.38	9.70	0.43	11.01	0.12	34.849	0.25	26.1	8.10	98.4
	100 S	0.1	0.03	1.33	0.85	3.80	0.38	9.28	0.41	11.46	0.09	34.674	0.20	27.0	8.11	97.9
	100 D	6.2	0.04	0.03	1.19	1.46	0.38	9.83	0.42	11.05	0.08	34.848	0.13	25.9	8.10	95.2
	150 S	0.1	0.06	1.29	0.80	3.86	0.39	10.59	0.45	12.68	0.13	34.660	0.17	26.9	8.10	97.2
	150 D	11.7	0.07	0.05	0.97	1.44	0.41	10.38	0.48	11.40	0.08	34.827	0.16	25.9	8.11	95.3
MAKENA 2	0 S	0.1	0.14	5.17	1.45	18.97	0.39	8.53	0.53	15.15	0.35	33.428	0.76	25.7	8.08	93.4
	2 S	0.1	0.17	3.41	1.29	14.78	0.38	11.38	0.55	16.08	0.19	33.844	0.88	25.7	8.08	94.5
	5 S	0.1	0.12	3.12	1.47	13.26	0.41	8.81	0.53	13.40	0.15	33.951	0.39	25.7	8.10	93.6
	5 D	1.2	0.12	2.42	1.58	10.64	0.37	8.89	0.49	12.89	0.13	34.154	0.51	25.8	8.09	93.7
	10 S	0.1	0.05	1.84	0.95	9.42	0.39	9.78	0.44	12.57	0.12	34.244	0.35	25.8	8.09	94.1
	10 D	1.5	0.11	1.75	0.84	9.15	0.38	11.00	0.49	13.59	0.14	34.257	0.70	25.8	8.09	94.0
	50 S	0.1	0.11	0.63	0.94	6.29	0.38	11.68	0.49	13.25	0.07	34.448	0.53	26.7	8.14	98.4
	50 D	2.8	0.11	0.16	1.04	2.93	0.38	9.22	0.49	10.42	0.09	34.770	0.56	26.2	8.11	99.4
	100 S	0.1	0.14	0.72	0.30	6.46	0.39	11.24	0.53	12.26	0.10	34.476	0.26	26.8	8.11	99.2
	100 D	4.7	0.18	0.02	3.13	1.35	0.39	8.60	0.57	11.75	0.09	34.829	0.27	26.2	8.11	97.3
	150 S	0.1	0.04	0.01	0.40	2.60	0.38	8.59	0.42	9.00	0.11	34.758	0.16	26.8	8.10	94.8
	150 D	11.4	BDL	0.01	0.51	1.12	0.39	10.31	0.39	10.83	0.05	34.854	0.18	25.9	8.11	95.1
	200 S	0.1	0.01	0.19	0.42	3.46	0.39	8.54	0.40	9.15	0.09	34.723	0.27	26.7	8.11	96.5
	200 D	16.0	0.05	0.01	0.43	1.68	0.40	9.79	0.45	10.23	0.10	34.839	0.48	25.9	8.11	96.6
MAKENA 3-A	0 S	0.1	1.44	175.92	1.60	319.12	0.92	29.68	2.36	207.20	0.18	20.748	0.28	25.1	7.76	87.0
	2 S	0.1	2.04	155.68	2.60	281.64	0.64	41.48	2.68	199.76	0.15	23.052	0.29	25.2	7.73	87.0
	5 S	0.1	0.16	61.80	0.04	115.36	0.72	67.24	0.88	129.08	0.29	30.190	0.26	25.2	7.88	87.7
	5 D	1.0	0.12	34.20	0.92	69.20	0.60	27.52	0.72	62.64	0.18	32.134	0.25	25.2	7.94	88.3
	10 S	0.1	0.08	17.04	1.16	38.36	0.64	19.44	0.72	37.64	0.10	33.445	0.22	25.2	7.98	87.4
	10 D	1.8	0.01	0.86	0.50	3.61	0.38	7.52	0.39	8.88	0.21	34.756	0.17	25.2	8.05	90.1
	50 S	0.1	BDL	1.45	0.51	6.02	0.38	10.03	0.38	11.99	0.13	34.719	0.17	26.6	8.11	98.3
	50 D	4.3	0.01	0.26	1.64	2.09	0.36	10.98	0.37	12.88	0.12	34.807	0.15	26.3	8.10	97.9
	100 S	0.0	0.02	1.92	0.01	8.14	0.39	8.69	0.41	10.62	0.08	34.556	0.16	26.8	8.08	95.1
	100 D	5.0	0.23	0.04	1.67	1.58	0.41	10.84	0.64	12.55	0.06	34.843	0.10	26.1	8.11	95.5
	150 S	0.1	0.03	0.40	0.15	4.12	0.37	10.91	0.40	11.46	0.12	34.681	0.15	26.6	8.09	94.8
	150 D	11.5	0.02	BDL	0.79	1.17	0.36	8.12	0.38	8.91	0.10	34.893	0.14	25.9	8.11	94.7
MAKENA 3	0 S	0.1	0.32	41.48	1.64	53.80	0.72	20.48	1.04	63.60	0.15	33.289	0.67	25.8	7.98	92.1
	2 S	0.1	0.12	40.92	2.60	50.16	0.68	23.56	0.80	67.08	0.12	33.336	0.59	25.9	7.97	90.9
	5 S	0.1	0.32	45.60	1.40	53.20	0.88	33.52	1.20	80.52	0.15	33.219	0.52	25.9	7.97	90.8
	5 D	1.0	0.24	37.52	1.44	42.92	0.60	16.32	0.84	55.28	0.12	33.588	0.44	25.9	7.97	91.2
	10 S	0.1	0.08	23.92	1.84	30.56	0.68	26.68	0.76	52.44	0.23	33.977	0.26	25.9	7.97	90.8
	10 D	1.9	0.08	7.00	1.76	16.80	0.76	28.32	0.84	37.08	0.07	34.974	0.28	24.8	7.98	92.1
	50 S	0.1	0.02	1.20	0.43	5.23	0.36	12.09	0.38	13.72	0.09	34.693	0.22	26.6	8.08	97.1
	50 D	2.3	0.17	0.05	2.25	1.83	0.44	12.49	0.61	14.79	0.08	34.836	0.22	26.1	8.10	96.4
	100 S	0.1	0.04	0.99	1.21	4.45	0.38	10.12	0.42	12.32	0.08	34.751	0.18	26.6	8.08	94.7
	100 D	6.3	0.01	BDL	0.52	1.28	0.38	9.38	0.39	9.90	0.08	34.844	0.15	26.0	8.10	95.1
	150 S	0.1	0.05	1.61	1.26	6.12	0.42	8.13	0.47	11.00	0.12	34.622	0.15	26.2	8.08	95.8
	150 D	9.2	0.08	0.03	0.77	1.52	0.42	9.13	0.50	9.93	0.08	34.862	0.19	25.9	8.11	96.3
MAKENA 4	0 S	0.1	0.36	6.04	5.16	62.92	0.56	19.60	0.92	30.80	0.12	31.944	0.27	25.1	7.94	88.3
	2 S	0.1	0.24	3.48	5.28	44.32	0.60	22.12	0.84	30.88	0.13	32.833	0.22	25.6	7.96	90.6
	5 S	0.1	0.12	2.40	3.20	34.60	0.56	14.92	0.68	20.52	0.18	33.378	0.20	25.6	8.00	90.9
	5 D	1.0	0.01	1.86	1.02	19.93	0.38	7.68	0.39	10.56	0.08	33.917	0.17	25.6	8.05	90.4
	10 S	0.1	0.01	1.87	0.89	15.67	0.34	10.44	0.35	13.20	0.12	34.181	0.19	25.6	8.05	91.3
	10 D	2.0	0.14	2.07	1.00	17.42	0.37	7.36	0.51	10.43	0.10	34.109	0.19	25.7	8.05	90.6
	50 S	0.1	0.18	0.79	0.49	6.24	0.35	6.86	0.53	8.14	0.09	34.632	0.12	26.2	8.09	94.5
	50 D	4.4	0.03	0.05	0.31	1.93	0.35	6.83	0.38	7.19	0.13	34.811	0.12	25.9	8.09	92.8
	100 S	0.1	0.21	0.69	0.42	5.54	0.33	6.48	0.54	7.59	0.15	34.670	0.12	26.3	8.09	95.9
	100 D	6.4	0.04	0.01	0.29	2.07	0.35	7.64	0.39	7.94	0.10	34.817	0.09	25.9	8.10	95.1
	150 S	0.1	0.02	0.26	0.27	3.50	0.36	9.42	0.38	9.95	0.13	34.777	0.13	26.2	8.08	95.2
	150 D	7.7	BDL	BDL	0.21	1.70	0.37	8.92	0.37	9.13	0.18	34.841	0.22	25.9	8.11	96.0
DOH WQS	DRY	10%	0.71	0.36					0.96	12.86	0.50	*	0.50	**	***	****
		2%	1.43	0.64					1.45	17.86	1.00		1.00			
	WET	10%	1.00	0.61					1.29	17.85	1.25	*	0.90	**	***	****
		2%	1.78	1.07					1.93	25.00	2.00		1.75			

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.
** Temperature shall not vary by more than one degree C. from ambient conditions.
***pH shall not deviate more than 0.5 units from a value of 8.1.
****Dissolved Oxygen not to be below 75% saturation.

TABLE 2. Water chemistry measurements from ocean water samples (in µg/L) collected in the vicinity of the Makena Resort on June 29, 2008. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep; BDL=below detection limit. Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH 10% "dry" standards; boxed and shaded values exceed DOH 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	DEPTH (m)	PO_4^{3-} (µg/L)	NO_3^- (µg/L)	NH_4^+ (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	TURB (NTU)	SALINITY (ppt)	CHL a (µg/L)	TEMP (deg.C)	pH (std.units)	O2 % Sat
MAKENA 1	0 S	0.1	1.55	549.36	13.45	1715.2	11.16	121.10	12.71	683.90	0.14	29.887	0.55	25.8	8.11	104.1
	2 S	0.1	1.55	438.76	3.22	1618.8	10.85	126.28	12.40	568.26	0.13	30.874	0.58	25.8	8.14	108.7
	5 S	0.1	1.24	129.22	0.98	610.6	10.85	111.72	12.09	241.92	0.11	33.445	0.28	25.7	8.13	103.4
	5 D	1.0	1.24	79.24	12.89	467.0	9.61	96.60	10.85	188.72	0.06	33.816	0.18	25.8	8.12	100.4
	10 S	0.1	1.55	123.48	21.99	601.6	10.23	135.94	11.78	281.40	0.09	33.506	0.24	25.8	8.09	107.9
	10 D	1.7	1.86	35.84	14.99	218.6	11.78	120.82	13.64	171.64	0.11	34.410	0.24	25.8	8.08	109.3
	50 S	0.1	1.24	35.70	17.23	236.6	10.54	123.34	11.78	176.26	0.07	34.386	0.19	27.0	8.13	107.0
	50 D	4.4	1.55	1.54	16.81	46.6	11.78	135.80	13.33	154.14	0.12	34.849	0.25	26.1	8.10	98.4
	100 S	0.1	0.93	18.62	11.91	106.8	11.78	129.92	12.71	160.44	0.09	34.674	0.20	27.0	8.11	97.9
	100 D	6.2	1.24	0.42	16.67	41.0	11.78	137.62	13.02	154.70	0.08	34.848	0.13	25.9	8.10	95.2
	150 S	0.1	1.86	18.06	11.20	108.5	12.09	148.26	13.95	177.52	0.13	34.660	0.17	26.9	8.10	97.2
	150 D	11.7	2.17	0.70	13.59	40.5	12.71	145.32	14.88	159.60	0.08	34.827	0.16	25.9	8.11	95.3
MAKENA 2	0 S	0.1	4.34	72.38	20.31	533.1	12.09	119.42	16.43	212.10	0.35	33.428	0.76	25.7	8.08	93.4
	2 S	0.1	5.27	47.74	18.07	415.3	11.78	159.32	17.05	225.12	0.19	33.844	0.88	25.7	8.08	94.5
	5 S	0.1	3.72	43.68	20.59	372.6	12.71	123.34	16.43	187.60	0.15	33.951	0.39	25.7	8.10	93.6
	5 D	1.2	3.72	33.88	22.13	299.0	11.47	124.46	15.19	180.46	0.13	34.154	0.51	25.8	8.09	93.7
	10 S	0.1	1.55	25.76	13.31	264.7	12.09	136.92	13.64	175.98	0.12	34.244	0.35	25.8	8.09	94.1
	10 D	1.5	3.41	24.50	11.77	257.1	11.78	154.00	15.19	190.26	0.14	34.257	0.70	25.8	8.09	94.0
	50 S	0.1	3.41	8.82	13.17	176.7	11.78	163.52	15.19	185.50	0.07	34.448	0.53	26.7	8.14	98.4
	50 D	2.8	3.41	2.24	14.57	82.3	11.78	129.08	15.19	145.88	0.09	34.770	0.56	26.2	8.11	99.4
	100 S	0.1	4.34	10.08	4.20	181.5	12.09	157.36	16.43	171.64	0.10	34.476	0.26	26.8	8.11	99.2
	100 D	4.7	5.58	0.28	43.84	37.9	12.09	120.40	17.67	164.50	0.09	34.829	0.27	26.2	8.11	97.3
	150 S	0.1	1.24	0.14	5.60	73.1	11.78	120.26	13.02	126.00	0.11	34.758	0.16	26.8	8.10	94.8
	150 D	11.4	BDL	0.14	7.14	31.5	12.09	144.34	12.09	151.62	0.05	34.854	0.18	25.9	8.11	95.1
	200 S	0.1	0.31	2.66	5.88	97.2	12.09	119.56	12.40	128.10	0.09	34.723	0.27	26.7	8.11	96.5
	200 D	16.0	1.55	0.14	6.02	47.2	12.40	137.06	13.95	143.22	0.10	34.839	0.48	25.9	8.11	96.6
MAKENA 3-A	0 S	0.1	44.64	2462.88	22.41	8967.3	28.52	415.52	73.16	2900.80	0.18	20.748	0.28	25.1	7.76	87.0
	2 S	0.1	63.24	2179.52	36.42	7914.1	19.84	580.72	83.08	2796.64	0.15	23.052	0.29	25.2	7.73	87.0
	5 S	0.1	4.96	865.20	0.56	3241.6	22.32	941.36	27.28	1807.12	0.29	30.190	0.26	25.2	7.88	87.7
	5 D	1.0	3.72	478.80	12.89	1944.5	18.60	385.28	22.32	876.96	0.18	32.134	0.25	25.2	7.94	88.3
	10 S	0.1	2.48	238.56	16.25	1077.9	19.84	272.16	22.32	526.96	0.10	33.445	0.22	25.2	7.98	87.4
	10 D	1.8	0.31	12.05	7.00	101.4	11.77	105.33	12.08	124.37	0.21	34.756	0.17	25.2	8.05	90.1
	50 S	0.1	BDL	20.30	7.14	169.2	11.78	140.42	11.78	167.86	0.13	34.719	0.17	26.6	8.11	98.3
	50 D	4.3	0.31	3.64	22.97	58.7	11.16	153.72	11.47	180.32	0.12	34.807	0.15	26.3	8.10	97.9
	100 S	0.0	0.62	26.88	0.14	228.7	12.09	121.66	12.71	148.68	0.08	34.556	0.16	26.8	8.08	95.1
	100 D	5.0	7.13	0.56	23.39	44.4	12.71	151.76	19.84	175.70	0.06	34.843	0.10	26.1	8.11	95.5
	150 S	0.1	0.93	5.60	2.10	115.8	11.47	152.74	12.40	160.44	0.12	34.681	0.15	26.6	8.09	94.8
	150 D	11.5	0.62	BDL	11.06	32.9	11.16	113.68	11.78	124.74	0.10	34.893	0.14	25.9	8.11	94.7
MAKENA 3	0 S	0.1	9.92	580.72	22.97	1511.8	22.32	286.72	32.24	890.40	0.15	33.289	0.67	25.8	7.98	92.1
	2 S	0.1	3.72	572.88	36.42	1409.5	21.08	329.84	24.80	939.12	0.12	33.336	0.59	25.9	7.97	90.9
	5 S	0.1	9.92	638.40	19.61	1494.9	27.28	469.28	37.20	1127.28	0.15	33.219	0.52	25.9	7.97	90.8
	5 D	1.0	7.44	525.28	20.17	1206.1	18.60	228.48	26.04	773.92	0.12	33.588	0.44	25.9	7.97	91.2
	10 S	0.1	2.48	334.88	25.77	858.7	21.08	373.52	23.56	734.16	0.23	33.977	0.26	25.9	7.97	90.8
	10 D	1.9	2.48	98.00	24.65	472.1	23.56	396.48	26.04	519.12	0.07	34.974	0.28	24.8	7.98	92.1
	50 S	0.1	0.62	16.80	6.02	147.0	11.16	169.26	11.78	192.08	0.09	34.693	0.22	26.6	8.08	97.1
	50 D	2.3	5.27	0.70	31.51	51.4	13.64	174.86	18.91	207.06	0.08	34.836	0.22	26.1	8.10	96.4
	100 S	0.1	1.24	13.86	16.95	125.0	11.78	141.68	13.02	172.48	0.08	34.751	0.18	26.6	8.08	94.7
	100 D	6.3	0.31	BDL	7.28	36.0	11.78	131.32	12.09	138.60	0.08	34.844	0.15	26.0	8.10	95.1
	150 S	0.1	1.55	22.54	17.65	172.0	13.02	113.82	14.57	154.00	0.12	34.622	0.15	26.2	8.08	95.8
	150 D	9.2	2.48	0.42	10.78	42.7	13.02	127.82	15.50	139.02	0.08	34.862	0.19	25.9	8.11	96.3
MAKENA 4	0 S	0.1	11.16	84.56	72.24	1768.1	17.36	274.40	28.52	431.20	0.12	31.944	0.27	25.1	7.94	88.3
	2 S	0.1	7.44	48.72	73.92	1245.4	18.60	309.68	26.04	432.32	0.13	32.833	0.22	25.6	7.96	90.6
	5 S	0.1	3.72	33.60	44.80	972.3	17.36	208.88	21.08	287.28	0.18	33.378	0.20	25.6	8.00	90.9
	5 D	1.0	0.31	26.04	14.28	560.0	11.78	107.52	12.09	147.84	0.08	33.917	0.17	25.6	8.05	90.4
	10 S	0.1	0.31	26.18	12.46	440.3	10.54	146.16	10.85	184.80	0.12	34.181	0.19	25.6	8.05	91.3
	10 D	2.0	4.34	28.98	14.00	489.5	11.47	103.04	15.81	146.02	0.10	34.109	0.19	25.7	8.05	90.6
	50 S	0.1	5.58	11.06	6.86	175.3	10.85	96.04	16.43	113.96	0.09	34.632	0.12	26.2	8.09	94.5
	50 D	4.4	0.93	0.70	4.34	54.2	10.85	95.62	11.78	100.66	0.13	34.811	0.12	25.9	8.09	92.8
	100 S	0.1	6.51	9.66	5.88	155.7	10.23	90.72	16.74	106.26	0.15	34.670	0.12	26.3	8.09	95.9
	100 D	6.4	1.24	0.14	4.06	58.2	10.85	106.96	12.09	111.16	0.10	34.817	0.09	25.9	8.10	95.1
	150 S	0.1	0.62	3.64	3.78	98.4	11.16	131.88	11.78	139.30	0.13	34.777	0.13	26.2	8.08	95.2
	150 D	7.7	BDL	BDL	2.94	47.8	11.47	124.88	11.47	127.82	0.18	34.841	0.22	25.9	8.11	96.0
DOH WQS		DRY	10%	10.00	5.00				30.00	180.00	0.50	*	0.50	**	***	****
			2%	20.00	9.00				45.00	250.00	1.00		1.00			
		WET	10%	14.00	8.50				40.00	250.00	1.25	*	0.90	**	***	****
			2%	25.00	15.00				60.00	350.00	2.00		1.75			

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by more than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

****Dissolved Oxygen not to be below 75% saturation.

TABLE 3. Geometric mean data from water chemistry measurements (in μM) off the Makena Resort collected since August 1995 from Sites 1, 2, and 4 (N=21); since June 2002 from Site 3 (N=12) and since June 2007 from Site 3-A (N=3). For geometric mean calculations, detection limits were used in cases where sample was below detection limit. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep. Also shown are State of Hawaii, Department of Health (DOH) geometric mean water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH GM 10% "dry" standards; boxed and shaded values exceed DOH GM 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	PO_4^{3-} (μM)	NO_3^- (μM)	NH_4^+ (μM)	Si (μM)	TOP (μM)	TON (μM)	TP (μM)	TN (μM)	TURB (NTU)	SALINITY (ppt)	CHL a (μg/L)	TEMP (deg.C)	pH
MAKENA 1	0 S	0.19	34.08	0.30	56.69	0.23	7.04	0.48	48.17	0.32	29.220	0.99	25.6	8.13
	2 S	0.13	23.91	0.16	41.91	0.25	7.63	0.41	35.29	0.28	31.290	0.93	25.6	8.16
	5 S	0.11	10.64	0.15	22.43	0.26	8.07	0.39	22.57	0.23	32.650	0.65	25.6	8.16
	5 D	0.11	8.16	0.24	18.43	0.27	7.54	0.39	19.18	0.18	33.290	0.57	25.7	8.16
	10 S	0.09	3.61	0.18	9.69	0.26	7.52	0.36	12.72	0.17	34.180	0.42	25.7	8.16
	10 D	0.10	2.19	0.19	6.57	0.28	7.63	0.39	10.90	0.17	34.430	0.42	25.6	8.15
	50 S	0.09	2.68	0.20	7.35	0.26	7.41	0.37	11.54	0.15	34.360	0.33	25.7	8.14
	50 D	0.08	0.33	0.14	2.55	0.28	7.48	0.37	8.17	0.11	34.760	0.29	25.6	8.14
	100 S	0.08	1.04	0.16	4.75	0.27	6.79	0.37	9.83	0.12	34.510	0.28	25.7	8.14
	100 D	0.08	0.10	0.10	2.06	0.27	7.38	0.36	7.75	0.09	34.820	0.24	25.6	8.15
	150 S	0.09	0.34	0.16	3.07	0.26	7.39	0.37	8.76	0.12	34.700	0.22	25.8	8.14
	150 D	0.08	0.07	0.11	1.82	0.27	7.20	0.36	7.50	0.10	34.820	0.19	25.6	8.16
MAKENA 2	0 S	0.19	3.81	0.40	20.97	0.32	8.66	0.56	13.98	0.93	33.700	0.89	25.7	8.13
	2 S	0.19	3.73	0.29	19.28	0.32	8.14	0.54	13.28	0.67	33.550	0.89	25.8	8.13
	5 S	0.17	3.16	0.31	15.40	0.29	7.41	0.48	11.74	0.45	33.970	0.72	25.7	8.14
	5 D	0.17	2.89	0.37	14.57	0.31	7.58	0.51	11.94	0.44	34.030	0.90	25.7	8.14
	10 S	0.13	1.74	0.22	9.85	0.30	5.54	0.45	9.56	0.32	34.330	0.50	25.7	8.15
	10 D	0.12	1.06	0.26	8.01	0.31	7.34	0.45	9.39	0.26	34.460	0.57	25.7	8.15
	50 S	0.11	1.16	0.29	7.42	0.32	7.79	0.46	9.82	0.24	34.430	0.39	25.6	8.14
	50 D	0.10	0.27	0.23	3.26	0.31	7.82	0.44	8.55	0.18	34.760	0.44	25.6	8.14
	100 S	0.09	0.51	0.21	4.31	0.30	7.59	0.40	8.63	0.17	34.600	0.31	25.7	8.13
	100 D	0.08	0.17	0.23	2.33	0.29	7.30	0.39	7.91	0.12	34.790	0.31	25.7	8.15
	150 S	0.09	0.25	0.25	3.10	0.29	7.55	0.39	8.25	0.13	34.740	0.25	25.7	8.14
	150 D	0.07	0.11	0.16	2.00	0.30	7.73	0.39	8.15	0.10	34.810	0.24	25.7	8.16
	200 S	0.07	0.15	0.17	2.34	0.29	7.41	0.37	8.02	0.11	34.810	0.28	25.9	8.15
	200 D	0.08	0.05	0.22	1.69	0.29	7.97	0.38	8.34	0.10	34.840	0.27	25.7	8.17
MAKENA 3-A	0 S	1.19	222.35	0.88	350.56	0.33	18.96	1.57	245.70	0.15	15.800	0.30	25.1	7.77
	2 S	0.58	151.13	1.16	238.58	0.37	7.88	1.21	167.51	0.16	21.640	0.50	25.5	7.78
	5 S	0.31	95.33	0.33	152.94	0.40	16.18	0.86	131.67	0.20	27.270	0.53	25.5	7.88
	5 D	0.17	34.82	0.66	65.16	0.32	11.70	0.56	49.56	0.15	31.690	0.47	25.5	7.98
	10 S	0.08	8.96	0.52	22.82	0.31	11.64	0.44	23.86	0.09	33.810	0.24	25.7	8.04
	10 D	0.04	1.16	0.45	4.61	0.28	7.96	0.36	10.93	0.10	34.700	0.29	25.4	8.07
	50 S	0.05	3.15	0.59	9.35	0.28	9.77	0.37	14.83	0.10	34.520	0.15	26.3	8.10
	50 D	0.03	0.10	0.65	4.12	0.29	10.28	0.34	11.22	0.09	34.660	0.15	25.7	8.10
	100 S	0.07	2.04	0.13	7.30	0.28	8.52	0.38	11.57	0.08	34.650	0.17	26.2	8.08
	100 D	0.15	0.02	0.69	2.56	0.29	9.24	0.45	10.09	0.06	34.880	0.13	25.6	8.11
	150 S	0.03	0.51	0.25	4.65	0.31	9.75	0.35	12.95	0.09	34.670	0.16	26.0	8.09
	150 D	0.03	0.02	0.49	1.45	0.30	8.76	0.34	9.32	0.08	34.900	0.20	25.6	8.10
MAKENA 3	0 S	0.12	6.43	0.42	16.29	0.28	6.09	0.48	22.30	0.25	33.680	0.60	25.7	8.13
	2 S	0.16	12.24	0.32	23.77	0.27	6.84	0.50	28.33	0.27	33.650	0.64	25.8	8.12
	5 S	0.12	8.80	0.28	16.85	0.27	8.34	0.46	22.56	0.20	34.020	0.38	25.8	8.12
	5 D	0.13	4.98	0.30	11.79	0.28	7.15	0.45	17.27	0.19	34.290	0.45	25.8	8.12
	10 S	0.08	3.81	0.31	9.02	0.29	7.88	0.40	15.15	0.16	34.410	0.28	25.7	8.12
	10 D	0.09	2.00	0.24	6.30	0.30	8.01	0.41	12.54	0.14	34.630	0.29	25.6	8.13
	50 S	0.07	1.47	0.21	5.32	0.28	7.90	0.37	10.91	0.13	34.630	0.23	25.7	8.12
	50 D	0.07	0.32	0.20	2.74	0.29	8.12	0.38	9.04	0.09	34.790	0.23	25.6	8.14
	100 S	0.07	0.44	0.27	3.00	0.29	7.63	0.37	8.71	0.10	34.750	0.18	25.7	8.13
	100 D	0.06	0.09	0.25	1.84	0.29	7.10	0.36	7.65	0.08	34.800	0.19	25.7	8.14
	150 S	0.06	0.22	0.20	2.33	0.29	6.92	0.36	7.75	0.10	34.760	0.15	25.7	8.15
	150 D	0.06	0.07	0.13	1.75	0.28	6.93	0.36	7.31	0.09	34.830	0.17	25.7	8.17
MAKENA 4	0 S	0.19	34.08	0.30	56.69	0.23	7.04	0.48	48.17	0.32	29.220	0.99	25.6	8.13
	2 S	0.13	23.91	0.16	41.91	0.25	7.63	0.41	35.29	0.28	31.290	0.93	25.6	8.16
	5 S	0.11	10.64	0.15	22.43	0.26	8.07	0.39	22.57	0.23	32.650	0.65	25.6	8.16
	5 D	0.11	8.16	0.24	18.43	0.27	7.54	0.39	19.18	0.18	33.290	0.57	25.7	8.16
	10 S	0.09	3.61	0.18	9.69	0.26	7.52	0.36	12.72	0.17	34.180	0.42	25.7	8.16
	10 D	0.10	2.19	0.19	6.57	0.28	7.63	0.39	10.90	0.17	34.430	0.42	25.6	8.15
	50 S	0.09	2.68	0.20	7.35	0.26	7.41	0.37	11.54	0.15	34.360	0.33	25.7	8.14
	50 D	0.08	0.33	0.14	2.55	0.28	7.48	0.37	8.17	0.11	34.760	0.29	25.6	8.14
	100 S	0.08	1.04	0.16	4.75	0.27	6.79	0.37	9.83	0.12	34.510	0.28	25.7	8.14
	100 D	0.08	0.10	0.10	2.06	0.27	7.38	0.36	7.75	0.09	34.820	0.24	25.6	8.15
	150 S	0.09	0.34	0.16	3.07	0.26	7.39	0.37	8.76	0.12	34.700	0.22	25.8	8.14
	150 D	0.08	0.07	0.11	1.82	0.27	7.20	0.36	7.50	0.10	34.820	0.19	25.6	8.16
DOH WQS GEOMETRIC MEAN	DRY	0.25	0.14					0.52	7.86	0.20	*	0.15	**	***
	WET	0.36	0.25					0.64	10.71	0.50		0.30		

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by more than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

TABLE 4. Geometric mean data (in µg/L) from water chemistry measurements (in µM) off the Makena Resort collected since August 1995 for Sites 1, 2, and 4 (N=21); since June 2002 from Site 3 (N=12) and since June 2007 from Site 3-A (N=3). For geometric mean calculations, detection limits were used in cases where sample was below detection limit. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep. Also shown are State of Hawaii, Department of Health (DOH) geometric mean water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH GM 10% "dry" standards; boxed and shaded values exceed DOH GM 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	PO_4^{3-} (µg/L)	NO_3^- (µg/L)	NH_4^+ (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	TURB (NTU)	SALINITY (ppt)	CHL o (µg/L)	TEMP (deg.C)	pH
MAKENA 1	0 S	5.80	477.30	4.20	1592.4	7.10	98.60	14.80	674.60	0.32	29.220	0.99	25.6	8.13
	2 S	4.00	334.80	2.20	1177.3	7.70	106.80	12.60	494.20	0.28	31.290	0.93	25.6	8.16
	5 S	3.40	149.00	2.10	630.1	8.00	113.00	12.00	316.10	0.23	32.650	0.65	25.6	8.16
	5 D	3.40	114.20	3.30	517.7	8.30	105.60	12.00	268.60	0.18	33.290	0.57	25.7	8.16
	10 S	2.70	50.50	2.50	272.2	8.00	105.30	11.10	178.10	0.17	34.180	0.42	25.7	8.16
	10 D	3.00	30.60	2.60	184.6	8.60	106.80	12.00	152.60	0.17	34.430	0.42	25.6	8.15
	50 S	2.70	37.50	2.80	206.5	8.00	103.70	11.40	161.60	0.15	34.360	0.33	25.7	8.14
	50 D	2.40	4.60	1.90	71.6	8.60	104.70	11.40	114.40	0.11	34.760	0.29	25.6	8.14
	100 S	2.40	14.50	2.20	133.4	8.30	95.10	11.40	137.60	0.12	34.510	0.28	25.7	8.14
	100 D	2.40	1.40	1.40	57.9	8.30	103.30	11.10	108.50	0.09	34.820	0.24	25.6	8.15
	150 S	2.70	4.70	2.20	86.2	8.00	103.50	11.40	122.60	0.12	34.700	0.22	25.8	8.14
	150 D	2.40	0.90	1.50	51.1	8.30	100.80	11.10	105.00	0.10	34.820	0.19	25.6	8.16
MAKENA 2	0 S	5.80	53.30	5.60	589.0	9.90	121.20	17.30	195.80	0.93	33.700	0.89	25.7	8.13
	2 S	5.80	52.20	4.00	541.6	9.90	114.00	16.70	185.90	0.67	33.550	0.89	25.8	8.13
	5 S	5.20	44.20	4.30	432.6	8.90	103.70	14.80	164.40	0.45	33.970	0.72	25.7	8.14
	5 D	5.20	40.40	5.10	409.3	9.60	106.10	15.70	167.20	0.44	34.030	0.90	25.7	8.14
	10 S	4.00	24.30	3.00	276.7	9.20	77.50	13.90	133.80	0.32	34.330	0.50	25.7	8.15
	10 D	3.70	14.80	3.60	225.0	9.60	102.80	13.90	131.50	0.26	34.460	0.57	25.7	8.15
	50 S	3.40	16.20	4.00	208.4	9.90	109.10	14.20	137.50	0.24	34.430	0.39	25.6	8.14
	50 D	3.00	3.70	3.20	91.6	9.60	109.50	13.60	119.70	0.18	34.760	0.44	25.6	8.14
	100 S	2.70	7.10	2.90	121.1	9.20	106.30	12.30	120.80	0.17	34.600	0.31	25.7	8.13
	100 D	2.40	2.30	3.20	65.4	8.90	102.20	12.00	110.70	0.12	34.790	0.31	25.7	8.15
	150 S	2.70	3.50	3.50	87.1	8.90	105.70	12.00	115.50	0.13	34.740	0.25	25.7	8.14
	150 D	2.10	1.50	2.20	56.2	9.20	108.20	12.00	114.10	0.10	34.810	0.24	25.7	8.16
	200 S	2.10	2.10	2.30	65.7	8.90	103.70	11.40	112.30	0.11	34.810	0.28	25.9	8.15
	200 D	2.40	0.70	3.00	47.5	8.90	111.60	11.70	116.80	0.10	34.840	0.27	25.7	8.17
MAKENA 3-A	0 S	36.80	3114.20	12.30	9847.2	10.20	265.50	48.60	3441.20	0.15	15.800	0.30	25.1	7.77
	2 S	17.90	2116.70	16.20	6701.7	11.40	110.30	37.40	2346.10	0.16	21.640	0.50	25.5	7.78
	5 S	9.60	1335.10	4.60	4296.1	12.30	226.60	26.60	1844.10	0.20	27.270	0.53	25.5	7.88
	5 D	5.20	487.60	9.20	1830.3	9.90	163.80	17.30	694.10	0.15	31.690	0.47	25.5	7.98
	10 S	2.40	125.40	7.20	641.0	9.60	163.00	13.60	334.10	0.09	33.810	0.24	25.7	8.04
	10 D	1.20	16.20	6.30	129.5	8.60	111.40	11.10	153.00	0.10	34.700	0.29	25.4	8.07
	50 S	1.50	44.10	8.20	262.6	8.60	136.80	11.40	207.70	0.10	34.520	0.15	26.3	8.1
	50 D	0.90	1.40	9.10	115.7	8.90	143.90	10.50	157.10	0.09	34.660	0.15	25.7	8.1
	100 S	2.10	28.50	1.80	205.1	8.60	119.30	11.70	162.00	0.08	34.650	0.17	26.2	8.08
	100 D	4.60	0.20	9.60	71.9	8.90	129.40	13.90	141.30	0.06	34.880	0.13	25.6	8.11
	150 S	0.90	7.10	3.50	130.6	9.60	136.50	10.80	181.30	0.09	34.670	0.16	26.0	8.09
	150 D	0.90	0.20	6.80	40.7	9.20	122.60	10.50	130.50	0.08	34.900	0.20	25.6	8.1
MAKENA 3	0 S	3.70	90.00	5.80	457.6	8.60	85.20	14.80	312.30	0.25	33.680	0.60	25.7	8.13
	2 S	4.90	171.40	4.40	667.7	8.30	95.80	15.40	396.70	0.27	33.650	0.64	25.8	8.12
	5 S	3.70	123.20	3.90	473.3	8.30	116.80	14.20	315.90	0.20	34.020	0.38	25.8	8.12
	5 D	4.00	69.70	4.20	331.2	8.60	100.10	13.90	241.80	0.19	34.290	0.45	25.8	8.12
	10 S	2.40	53.30	4.30	253.4	8.90	110.30	12.30	212.10	0.16	34.410	0.28	25.7	8.12
	10 D	2.70	28.00	3.30	177.0	9.20	112.10	12.60	175.60	0.14	34.630	0.29	25.6	8.13
	50 S	2.10	20.50	2.90	149.4	8.60	110.60	11.40	152.80	0.13	34.630	0.23	25.7	8.12
	50 D	2.10	4.40	2.80	77.0	8.90	113.70	11.70	126.60	0.09	34.790	0.23	25.6	8.14
	100 S	2.10	6.10	3.70	84.3	8.90	106.80	11.40	121.90	0.10	34.750	0.18	25.7	8.13
	100 D	1.80	1.20	3.50	51.7	8.90	99.40	11.10	107.10	0.08	34.800	0.19	25.7	8.14
	150 S	1.80	3.00	2.80	65.4	8.90	96.90	11.10	108.50	0.10	34.760	0.15	25.7	8.15
	150 D	1.80	0.90	1.80	49.2	8.60	97.00	11.10	102.30	0.09	34.830	0.17	25.7	8.17
MAKENA 4	0 S	5.80	477.30	4.20	1592.4	7.10	98.60	14.80	674.60	0.32	29.220	0.99	25.6	8.13
	2 S	4.00	334.80	2.20	1177.3	7.70	106.80	12.60	494.20	0.28	31.290	0.93	25.6	8.16
	5 S	3.40	149.00	2.10	630.1	8.00	113.00	12.00	316.10	0.23	32.650	0.65	25.6	8.16
	5 D	3.40	114.20	3.30	517.7	8.30	105.60	12.00	268.60	0.18	33.290	0.57	25.7	8.16
	10 S	2.70	50.50	2.50	272.2	8.00	105.30	11.10	178.10	0.17	34.180	0.42	25.7	8.16
	10 D	3.00	30.60	2.60	184.6	8.60	106.80	12.00	152.60	0.17	34.430	0.42	25.6	8.15
	50 S	2.70	37.50	2.80	206.5	8.00	103.70	11.40	161.60	0.15	34.360	0.33	25.7	8.14
	50 D	2.40	4.60	1.90	71.6	8.60	104.70	11.40	114.40	0.11	34.760	0.29	25.6	8.14
	100 S	2.40	14.50	2.20	133.4	8.30	95.10	11.40	137.60	0.12	34.510	0.28	25.7	8.14
	100 D	2.40	1.40	1.40	57.9	8.30	103.30	11.10	108.50	0.09	34.820	0.24	25.6	8.15
	150 S	2.70	4.70	2.20	86.2	8.00	103.50	11.40	122.60	0.12	34.700	0.22	25.8	8.14
	150 D	2.40	0.90	1.50	51.1	8.30	100.80	11.10	105.00	0.10	34.820	0.19	25.6	8.16
DOH WQS	DRY	3.50	2.00					16.00	110.00	0.20	*	0.15	**	***
GEOMETRIC MEAN	WET	5.00	3.50					20.00	150.00	0.50		0.30		

* Solinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by more than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

TABLE 5. Water chemistry measurements in μM and μg/L (shaded) from irrigation wells and two irrigation lakes collected in the vicinity of the Makena Resort on June 29, 2008. For sampling site locations, see Figure 1.

WELL	PO_4^{3-} (μM)	PO_4^{3-} (μg/L)	NO_3^- (μM)	NO_3^- (μg/L)	NH_4^+ (μM)	NH_4^+ (μg/L)	Si (μM)	Si (μg/L)	TOP (μM)	TOP (μg/L)	TON (μM)	TON (μg/L)	TP (μM)	TP (μg/L)	TN (μM)	TN (μg/L)	SALINITY (ppt)
1	1.20	37.20	139.6	1953.7	1.15	16.10	565.1	15879.3	1.00	31.00	13.70	191.80	2.20	68.20	154.4	2161.6	1.346
2	2.30	71.30	148.4	2076.9	0.95	13.30	737.7	20728.0	0.80	24.80	8.85	123.90	3.10	96.10	158.2	2214.1	1.790
3	2.20	68.20	140.2	1962.1	1.00	14.00	729.0	20484.9	0.60	18.60	25.00	350.00	2.80	86.80	166.2	2326.1	2.035
4	2.20	68.20	140.3	1963.5	1.05	14.70	691.8	19438.2	0.60	18.60	2.95	41.30	2.80	86.80	144.3	2019.5	1.736
5	1.35	41.85	203.9	2853.9	1.25	17.50	593.9	16687.2	1.30	40.30	20.45	286.30	2.65	82.15	225.6	3157.7	1.570
6	1.45	44.95	195.0	2729.3	1.60	22.40	572.5	16085.8	0.25	7.75	15.90	222.60	1.70	52.70	212.5	2974.3	1.615
8	1.80	55.80	122.3	1711.5	1.85	25.90	643.8	18090.8	0.35	10.85	20.65	289.10	2.15	66.65	144.8	2026.5	1.733
11	2.10	65.10	118.1	1653.4	0.90	12.60	644.5	18109.0	0.05	1.55	34.60	484.40	2.15	66.65	153.6	2150.4	2.244
IL10	0.85	26.35	62.0	868.0	17.65	247.10	605.5	17014.6	2.05	63.55	81.45	1140.30	2.90	89.90	161.1	2255.4	2.141

TABLE 6. Linear regression statistics (y-intercept and slope) of cancentrotions of silica as functions of salinity from four ocean transect sites off of the Makena Resort collected during monitoring surveys from 1995 to June 2008 (Transect Site 3 has been monitored since 2002; Trasect Site 3A since 2007). Also shown are standard errors and upper and lower 95% confidence limits around the y-intercepts and slopes."REGSLOPE" indicates regression statistics for slope of yearly coefficients as a function of time. For location of transect sites, see Figure 1.

SILICA -Y-INTERCEPT

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	522.34	12.18	491.03	553.66
1996	629.56	11.05	605.49	653.64
1997	504.17	2.83	496.89	511.46
1998	484.14	2.44	477.86	490.41
1999	479.11	9.89	457.55	500.66
2000	528.68	5.87	513.58	543.77
2001	625.85	10.91	597.82	653.88
2002	502.98	8.68	480.66	525.30
2003	625.85	10.91	597.82	653.88
2004	546.00	8.33	527.84	564.16
2005	466.59	11.09	442.42	490.75
2006	487.68	24.60	434.08	541.28
2007	491.19	34.99	414.95	567.42
2008	441.78	21.87	385.57	497.98
REGSLOPE	-5.14	3.98	-13.81	3.54
SITE 2				
1995	468.41	85.54	248.51	688.30
1996	549.09	177.83	164.91	933.28
1997	567.57	9.71	543.80	591.33
1998	563.20	37.23	472.10	654.30
1999	466.74	95.75	261.37	672.11
2000	770.15	27.32	703.31	837.00
2001	1254.31	74.17	1072.82	1435.81
2002	577.53	29.40	505.60	649.46
2003	505.05	20.10	461.94	548.15
2004	565.31	93.71	364.33	766.29
2005	339.08	33.78	266.64	411.52
2006	553.48	62.93	418.51	688.45
2007	443.05	17.15	406.27	479.84
2008	437.31	10.97	410.47	464.14
REGSLOPE	-9.33	14.84	-41.66	23.00
SITE 3				
2002	931.92	27.54	861.13	1002.71
2003	984.76	41.58	894.16	1075.35
2004	632.75	127.62	354.68	910.82
2005	704.38	52.31	590.40	818.35
2006	928.22	64.18	788.40	1068.05
2007	722.80	15.07	689.97	755.63
2008	1164.27	27.70	1093.06	1235.48
REGSLOPE	16.74	38.22	-81.50	114.98
SITE 3A				
2007	714.10	5.58	701.94	726.27
2008	802.66	12.14	771.44	833.87
REGSLOPE	88.55	0.00	88.55	88.55
SITE 4				
1995	710.45	8.83	687.74	733.15
1996	917.33	13.38	888.18	946.47
1997	776.74	3.53	767.66	785.82
1998	841.35	6.75	824.00	858.70
1999	823.63	24.78	769.63	877.62
2000	946.97	12.51	914.80	979.14
2001	1403.91	260.13	735.22	2072.61
2002	767.85	4.37	756.63	779.08
2003	854.37	29.88	789.26	919.48
2004	843.49	37.55	761.67	925.31
2005	703.97	14.00	673.47	734.46
2006	735.05	14.01	704.53	765.57
2007	710.11	7.14	694.56	725.66
2008	739.31	9.75	714.26	764.36
REGSLOPE	-8.91	12.11	-35.30	17.47

SILICA - SLOPE

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	-15.08	0.38	-16.05	-14.12
1996	-18.05	0.32	-18.75	-17.34
1997	-14.43	0.08	-14.65	-14.21
1998	-13.83	0.07	-14.02	-13.64
1999	-13.63	0.29	-14.27	-12.99
2000	-15.08	0.18	-15.54	-14.62
2001	-17.76	0.32	-18.57	-16.94
2002	-14.38	0.26	-15.05	-13.72
2003	-17.76	0.32	-18.57	-16.94
2004	-15.68	0.25	-16.23	-15.14
2005	-13.31	0.33	-14.02	-12.61
2006	-13.88	0.76	-15.53	-12.23
2007	-14.11	1.14	-16.59	-11.62
2008	-12.59	0.66	-14.29	-10.90
REGSLOPE	0.10	0.13	-0.18	0.38
SITE 2				
1995	-13.47	2.51	-19.93	-7.00
1996	-15.62	5.15	-26.75	-4.49
1997	-16.26	0.29	-16.96	-15.56
1998	-16.11	1.08	-18.76	-13.45
1999	-13.21	2.78	-19.18	-7.23
2000	-22.06	0.80	-24.02	-20.11
2001	-35.68	2.12	-40.87	-30.49
2002	-16.54	0.86	-18.64	-14.44
2003	-14.37	0.59	-15.63	-13.11
2004	-16.23	2.73	-22.09	-10.38
2005	-9.61	0.98	-11.70	-7.52
2006	-15.82	1.83	-19.75	-11.89
2007	-12.54	0.51	-13.64	-11.45
2008	-12.50	0.32	-13.28	-11.72
REGSLOPE	0.27	0.42	-0.65	1.19
SITE 3				
2002	-26.75	0.81	-28.83	-24.68
2003	-28.10	1.21	-30.73	-25.47
2004	-18.19	3.69	-26.24	-10.14
2005	-20.11	1.51	-23.40	-16.83
2006	-26.56	1.89	-30.67	-22.46
2007	-20.60	0.44	-21.56	-19.63
2008	-33.40	0.82	-35.50	-31.31
REGSLOPE	-0.48	1.10	-3.30	2.35
SITE 3A				
2007	-20.35	0.19	-20.75	-19.94
2008	-22.92	0.40	-23.94	-21.91
REGSLOPE	-2.58	0.00	-2.58	-2.58
SITE 4				
1995	-20.55	0.27	-21.25	-19.85
1996	-26.23	0.40	-27.10	-25.37
1997	-22.27	0.11	-22.55	-21.99
1998	-24.07	0.20	-24.58	-23.56
1999	-23.50	0.73	-25.10	-21.90
2000	-27.12	0.37	-28.08	-26.16
2001	-39.92	7.42	-58.99	-20.86
2002	-21.99	0.13	-22.34	-21.65
2003	-24.36	0.91	-26.34	-22.39
2004	-24.27	1.10	-26.66	-21.88
2005	-20.11	0.41	-21.00	-19.22
2006	-20.96	0.41	-21.86	-20.06
2007	-20.27	0.23	-20.77	-19.78
2008	-21.16	0.29	-21.90	-20.42
REGSLOPE	0.26	0.34	-0.48	1.01

TABLE 7. Linear regression statistics (y-intercept and slope) of concentrations of nitrate as functions of salinity from four ocean transect sites off of the Makena Resort collected during monitoring surveys from 1995 to June 2008 (Transect Site 3 has been monitored since 2002; Trasect Site 3A since 2007). Also shown are standard errors and upper and lower 95% confidence limits around the y-intercepts and slopes. "REGSLOPE" indicates regression statistics for slope of yearly coefficients as a function of time. For location of transect sites, see Figure 1.

NITRATE -Y-INTERCEPT

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	326.50	7.10	308.25	344.75
1996	336.49	4.62	326.41	346.56
1997	406.96	1.93	402.00	411.93
1998	268.90	1.55	264.91	272.89
1999	225.24	5.32	213.66	236.83
2000	309.77	3.36	301.14	318.41
2001	336.53	9.69	311.61	361.44
2002	278.21	17.43	233.40	323.03
2003	421.29	7.81	404.28	438.30
2004	442.33	4.89	431.68	452.99
2005	296.36	7.44	280.16	312.56
2006	361.76	7.20	346.08	377.45
2007	305.06	15.88	270.45	339.67
2008	279.63	6.14	263.85	295.42
REGSLOPE	0.42	4.28	-8.90	9.75
SITE 2				
1995	119.87	12.03	88.95	150.79
1996	106.36	18.44	66.53	146.19
1997	193.75	5.64	179.95	207.55
1998	166.93	5.33	153.89	179.97
1999	116.21	14.04	86.10	146.32
2000	142.07	2.83	135.13	149.01
2001	154.93	7.65	136.21	173.64
2002	180.82	58.78	36.98	324.66
2003	163.36	6.31	149.82	176.91
2004	145.36	10.55	122.74	167.99
2005	102.66	9.11	83.13	122.19
2006	124.74	4.89	114.26	135.22
2007	134.27	3.25	127.30	141.24
2008	137.78	6.55	121.76	153.80
REGSLOPE	-0.65	1.88	-4.76	3.46
SITE 3				
2002	847.45	52.35	712.88	982.01
2003	693.24	39.54	607.10	779.38
2004	463.72	90.73	266.04	661.40
2005	535.53	47.19	432.72	638.34
2006	856.96	48.22	751.91	962.02
2007	1233.34	18.23	1193.63	1273.06
2008	1020.71	27.43	950.20	1091.22
REGSLOPE	71.19	45.84	-46.64	189.02
SITE 3A				
2007	354.33	49.92	245.56	463.11
2008	447.16	6.92	429.37	464.94
REGSLOPE	92.82	0.00	92.82	92.82
SITE 4				
1995	111.38	6.47	94.74	128.02
1996	118.34	1.63	114.79	121.89
1997	122.56	1.29	119.25	125.88
1998	112.77	1.87	107.97	117.57
1999	109.13	3.30	101.94	116.33
2000	118.51	0.75	116.58	120.43
2001	100.93	54.85	-40.08	241.94
2002	118.91	3.25	110.56	127.25
2003	113.78	2.76	107.77	119.79
2004	134.97	4.64	124.86	145.07
2005	114.59	4.47	104.85	124.33
2006	119.85	1.76	116.03	123.68
2007	269.24	10.13	247.16	291.32
2008	63.82	5.48	49.73	77.91
REGSLOPE	2.56	3.01	-4.00	9.11

NITRATE - SLOPE

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	-9.49	0.22	-10.05	-8.92
1996	-9.67	0.14	-9.97	-9.38
1997	-11.70	0.06	-11.85	-11.55
1998	-7.72	0.05	-7.84	-7.60
1999	-6.44	0.16	-6.79	-6.10
2000	-8.91	0.10	-9.17	-8.65
2001	-9.60	0.28	-10.32	-8.88
2002	-7.99	0.52	-9.31	-6.66
2003	-12.09	0.23	-12.60	-11.58
2004	-12.74	0.15	-13.06	-12.42
2005	-8.48	0.22	-8.96	-8.01
2006	-10.40	0.22	-10.89	-9.92
2007	-8.73	0.52	-9.86	-7.60
2008	-8.05	0.19	-8.53	-7.58
REGSLOPE	0.02	0.05	-0.10	0.14
SITE 2				
1995	-3.47	0.35	-4.38	-2.56
1996	-3.05	0.53	-4.20	-1.89
1997	-5.57	0.17	-5.97	-5.16
1998	-4.79	0.16	-5.17	-4.41
1999	-3.31	0.41	-4.19	-2.43
2000	-4.08	0.08	-4.29	-3.88
2001	-4.41	0.22	-4.95	-3.88
2002	-5.19	1.72	-9.40	-0.99
2003	-4.68	0.18	-5.07	-4.28
2004	-4.19	0.31	-4.84	-3.53
2005	-2.94	0.26	-3.50	-2.37
2006	-3.57	0.14	-3.88	-3.27
2007	-3.85	0.10	-4.06	-3.64
2008	-3.97	0.19	-4.44	-3.50
REGSLOPE	0.02	0.05	-0.10	0.14
SITE 3				
2002	-24.49	1.53	-28.43	-20.56
2003	-19.86	1.15	-22.36	-17.35
2004	-13.37	2.63	-19.09	-7.64
2005	-15.33	1.36	-18.29	-12.37
2006	-24.61	1.42	-27.70	-21.52
2007	-35.51	0.54	-36.68	-34.34
2008	-29.38	0.81	-31.45	-27.31
REGSLOPE	-2.04	1.33	-5.45	1.37
SITE 3A				
2007	-9.57	1.67	-13.20	-5.93
2008	-12.85	0.23	-13.43	-12.27
REGSLOPE	-3.28	0.00	-3.28	-3.28
SITE 4				
1995	-3.26	0.20	-3.77	-2.75
1996	-3.40	0.05	-3.50	-3.29
1997	-3.53	0.04	-3.63	-3.43
1998	-3.24	0.05	-3.38	-3.10
1999	-3.13	0.10	-3.34	-2.92
2000	-3.40	0.02	-3.46	-3.34
2001	-2.87	1.56	-6.89	1.15
2002	-3.44	0.10	-3.70	-3.19
2003	-3.28	0.08	-3.46	-3.09
2004	-3.89	0.14	-4.18	-3.59
2005	-3.29	0.13	-3.57	-3.00
2006	-3.43	0.05	-3.54	-3.31
2007	-7.87	0.32	-8.58	-7.17
2008	-1.82	0.16	-2.24	-1.41
REGSLOPE	-0.07	0.09	-0.27	0.12

TABLE 8. Linear regression statistics (y-intercept and slope) of concentrations of orthophosphate phosphorus as functions of salinity from four ocean transect sites off of the Makena Resort collected during monitoring surveys from 1995 to June 2008 (Transect site 3 has been monitored since 2002; Trasect Site 3A since 2007). Also shown are standard errors and upper and lower 95% confidence limits around the y-intercepts and slopes. For location of transect sites, see Figure 1.

PHOSPHATE -Y-INTERCEPT

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	1.04	0.14	0.68	1.39
1996	1.78	0.12	1.52	2.03
1997	1.40	0.12	1.10	1.69
1998	1.10	0.06	0.95	1.25
1999	1.07	0.12	0.80	1.34
2000	0.89	0.12	0.59	1.19
2001	2.16	0.76	0.22	4.11
2002	1.12	0.68	-0.64	2.88
2003	0.48	0.19	0.06	0.90
2004	2.71	0.17	2.33	3.08
2005	-0.02	0.14	-0.34	0.29
2006	1.36	0.13	1.08	1.65
2007	1.07	0.20	0.64	1.50
2008	0.10	0.07	-0.09	0.28
REGSLOPE	-0.05	0.05	-0.15	0.06
SITE 2				
1995	0.15	0.63	-1.46	1.76
1996	2.03	1.59	-1.41	5.48
1997	3.70	0.25	3.10	4.31
1998	3.55	1.44	0.03	7.07
1999	3.68	5.55	-8.22	15.58
2000	12.78	1.18	9.89	15.66
2001	30.73	3.12	23.09	38.37
2002	6.67	1.68	2.57	10.77
2003	3.57	0.31	2.90	4.24
2004	5.76	0.53	4.62	6.91
2005	-0.95	2.96	-7.31	5.40
2006	1.88	0.57	0.67	3.10
2007	0.22	0.26	-0.34	0.78
2008	3.05	1.23	0.04	6.06
REGSLOPE	-0.16	0.55	-1.36	1.04
SITE 3				
2002	4.62	2.31	-1.31	10.55
2003	7.38	0.99	5.24	9.53
2004	7.40	0.78	5.70	9.10
2005	3.17	0.53	2.03	4.32
2006	7.32	1.16	4.80	9.84
2007	4.46	0.46	3.47	5.45
2008	5.47	1.46	1.71	9.23
REGSLOPE	-0.12	0.35	-1.02	0.78
SITE 3A				
2007	2.39	0.24	1.86	2.93
2008	4.51	0.73	2.64	6.38
REGSLOPE	2.12	0.00	2.12	2.12
SITE 4				
1995	2.44	0.15	2.04	2.84
1996	3.08	0.13	2.79	3.37
1997	2.95	0.09	2.71	3.19
1998	3.50	0.46	2.32	4.67
1999	3.26	0.14	2.96	3.55
2000	3.29	0.20	2.77	3.82
2001	-19.16	22.66	-77.41	39.09
2002	3.98	0.15	3.60	4.35
2003	4.13	1.29	1.33	6.93
2004	4.75	0.79	3.04	6.47
2005	2.12	0.38	1.28	2.95
2006	2.15	0.40	1.28	3.02
2007	2.65	0.09	2.46	2.83
2008	2.85	1.24	-0.34	6.04
REGSLOPE	0.04	0.41	-0.87	0.94

PHOSPHATE - SLOPE

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	-0.03	0.00	-0.04	-0.02
1996	-0.05	0.00	-0.06	-0.04
1997	-0.04	0.00	-0.05	-0.03
1998	-0.03	0.00	-0.03	-0.02
1999	-0.03	0.00	-0.03	-0.02
2000	-0.02	0.00	-0.03	-0.01
2001	-0.06	0.02	-0.12	0.00
2002	-0.03	0.02	-0.08	0.02
2003	-0.01	0.01	-0.02	0.00
2004	-0.08	0.01	-0.09	-0.06
2005	0.00	0.00	-0.01	0.01
2006	-0.04	0.00	-0.04	-0.03
2007	-0.03	0.01	-0.04	-0.02
2008	0.00	0.00	-0.01	0.00
REGSLOPE	0.001	0.001	-0.002	0.004
SITE 2				
1995	0.00	0.02	-0.05	0.04
1996	-0.06	0.05	-0.16	0.04
1997	-0.10	0.01	-0.12	-0.09
1998	-0.10	0.04	-0.20	0.00
1999	-0.10	0.16	-0.44	0.25
2000	-0.36	0.03	-0.45	-0.28
2001	-0.87	0.09	-1.09	-0.65
2002	-0.19	0.05	-0.31	-0.07
2003	-0.10	0.01	-0.12	-0.08
2004	-0.16	0.02	-0.20	-0.13
2005	0.03	0.09	-0.15	0.21
2006	-0.05	0.02	-0.09	-0.02
2007	0.00	0.01	-0.02	0.01
2008	-0.09	0.04	-0.17	0.00
REGSLOPE	0.004	0.016	-0.030	0.039
SITE 3				
2002	-0.13	0.07	-0.30	0.04
2003	-0.21	0.03	-0.27	-0.15
2004	-0.21	0.02	-0.26	-0.16
2005	-0.09	0.02	-0.12	-0.06
2006	-0.21	0.03	-0.28	-0.13
2007	-0.13	0.01	-0.16	-0.10
2008	-0.16	0.04	-0.27	-0.05
REGSLOPE	0.00	0.01	-0.02	0.03
SITE 3A				
2007	-0.07	0.01	-0.09	-0.05
2008	-0.13	0.02	-0.19	-0.07
REGSLOPE	-0.06	0.00	-0.06	-0.06
SITE 4				
1995	-0.07	0.00	-0.08	-0.06
1996	-0.09	0.00	-0.09	-0.08
1997	-0.08	0.00	-0.09	-0.07
1998	-0.10	0.01	-0.13	-0.06
1999	-0.09	0.00	-0.10	-0.08
2000	-0.09	0.01	-0.10	-0.07
2001	0.55	0.65	-1.11	2.21
2002	-0.11	0.00	-0.12	-0.10
2003	-0.11	0.04	-0.19	-0.02
2004	-0.13	0.02	-0.18	-0.08
2005	-0.06	0.01	-0.08	-0.03
2006	-0.06	0.01	-0.08	-0.03
2007	-0.07	0.00	-0.08	-0.07
2008	-0.08	0.04	-0.17	0.01
REGSLOPE	0.00	0.01	-0.03	0.02

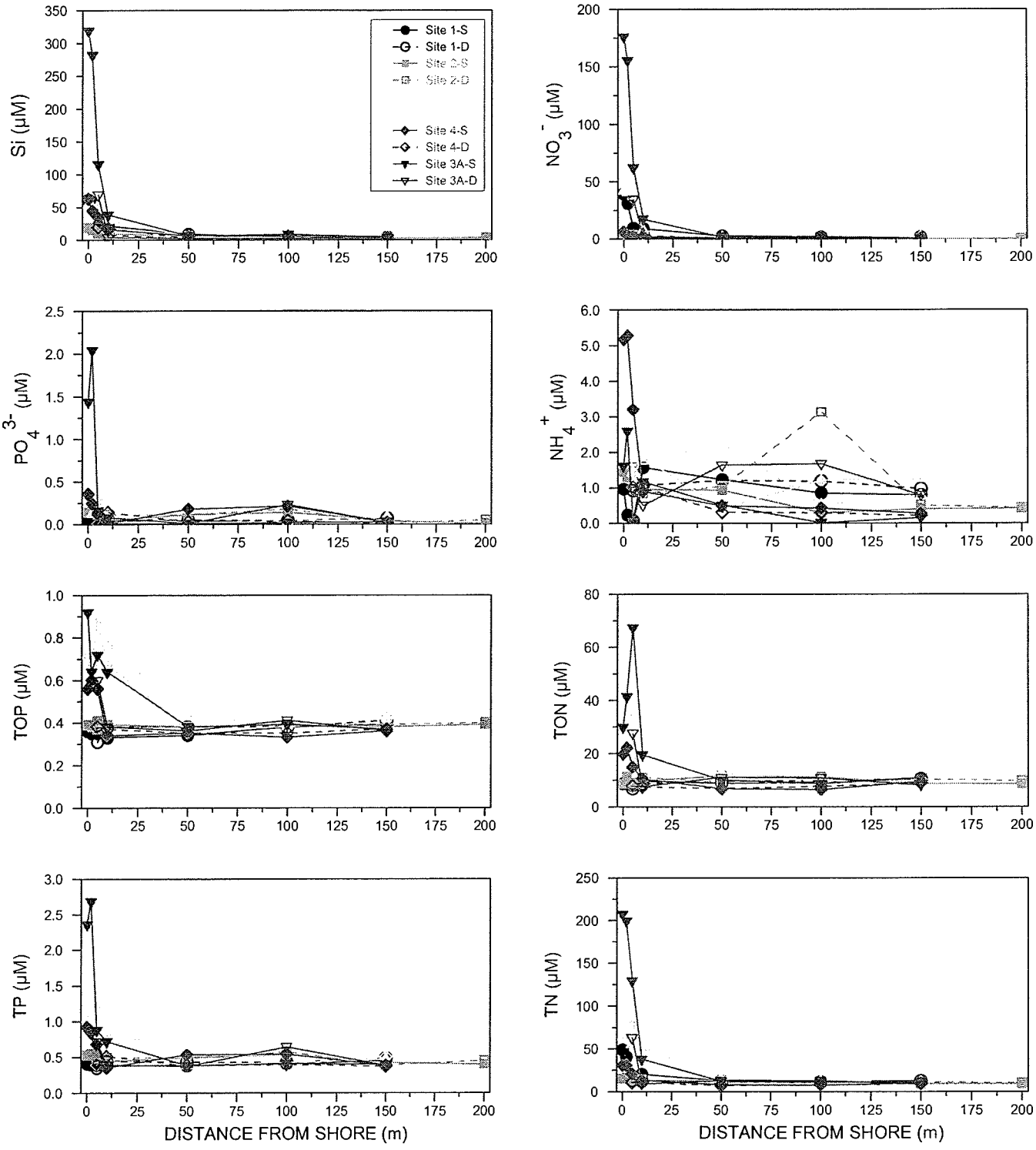

FIGURE 2. Plots of dissolved nutrients in surface (S) and deep (D) samples collected on June 29, 2008 as a function of distance from the shoreline in the vicinity of Makena Resort. For site locations, see Figure 1.

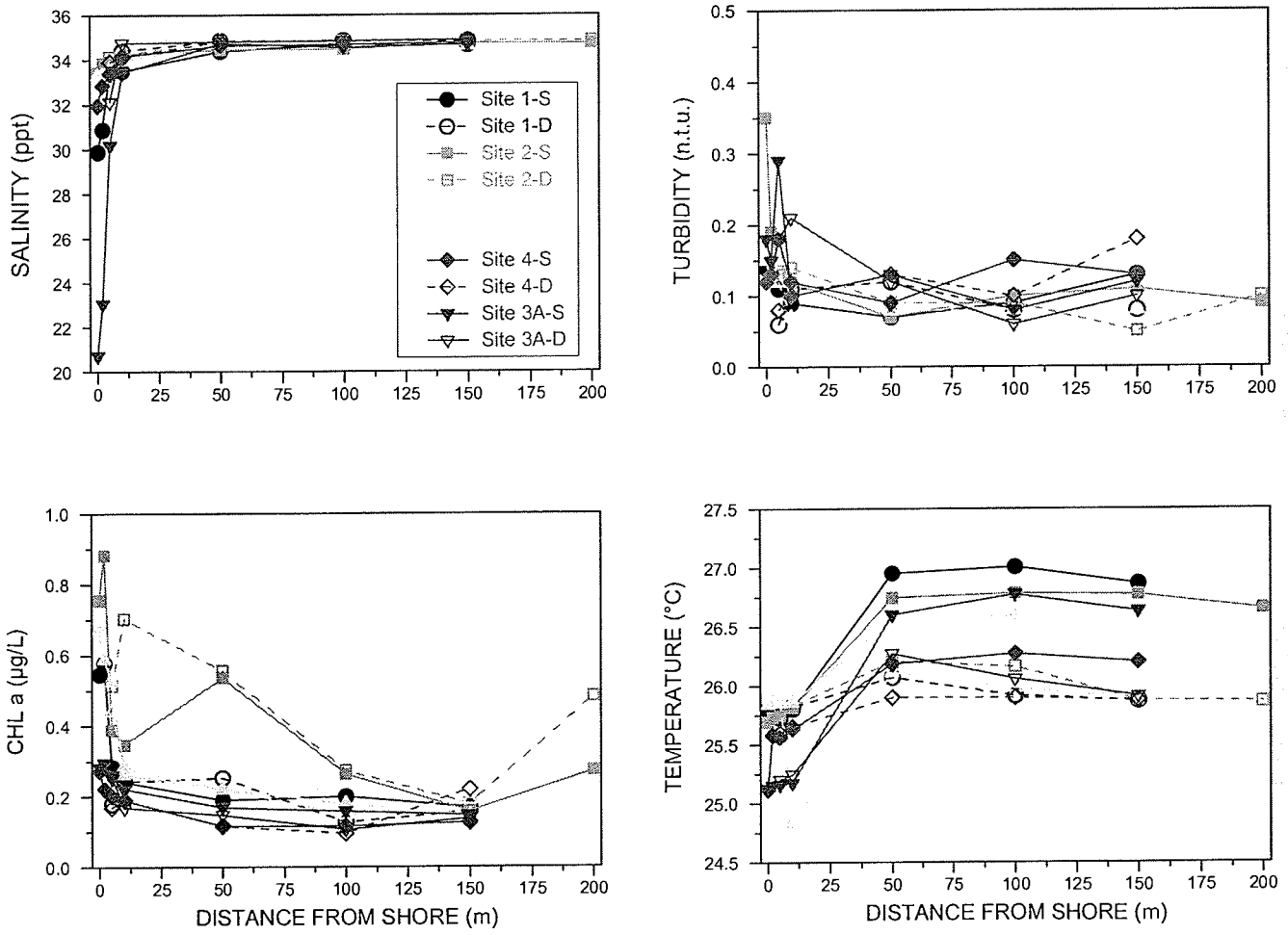

FIGURE 3. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on June 29, 2008 as a function of distance from the shoreline in the vicinity of Makena Resort. For site locations, see Figure 1.

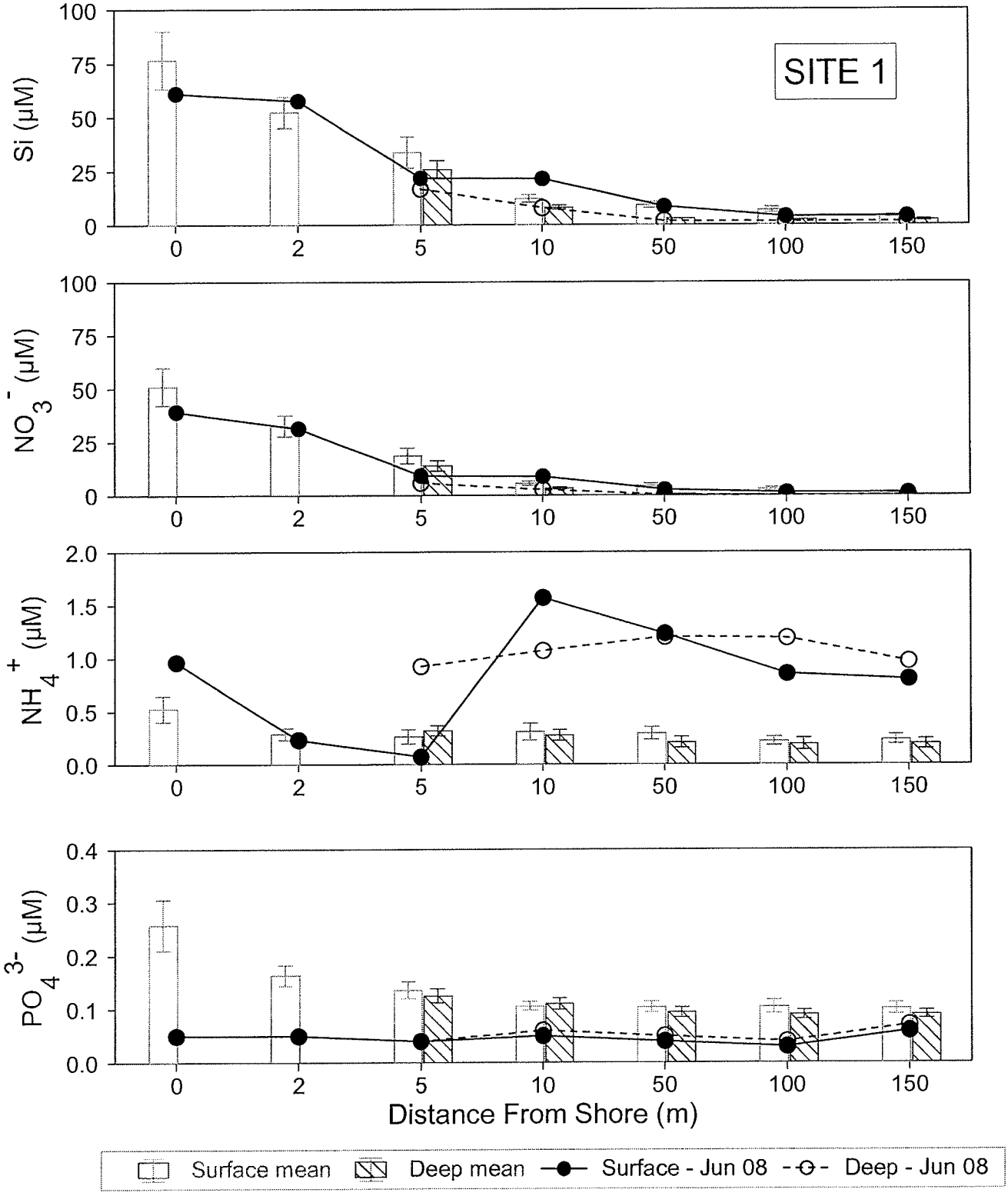

FIGURE 4. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 1, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

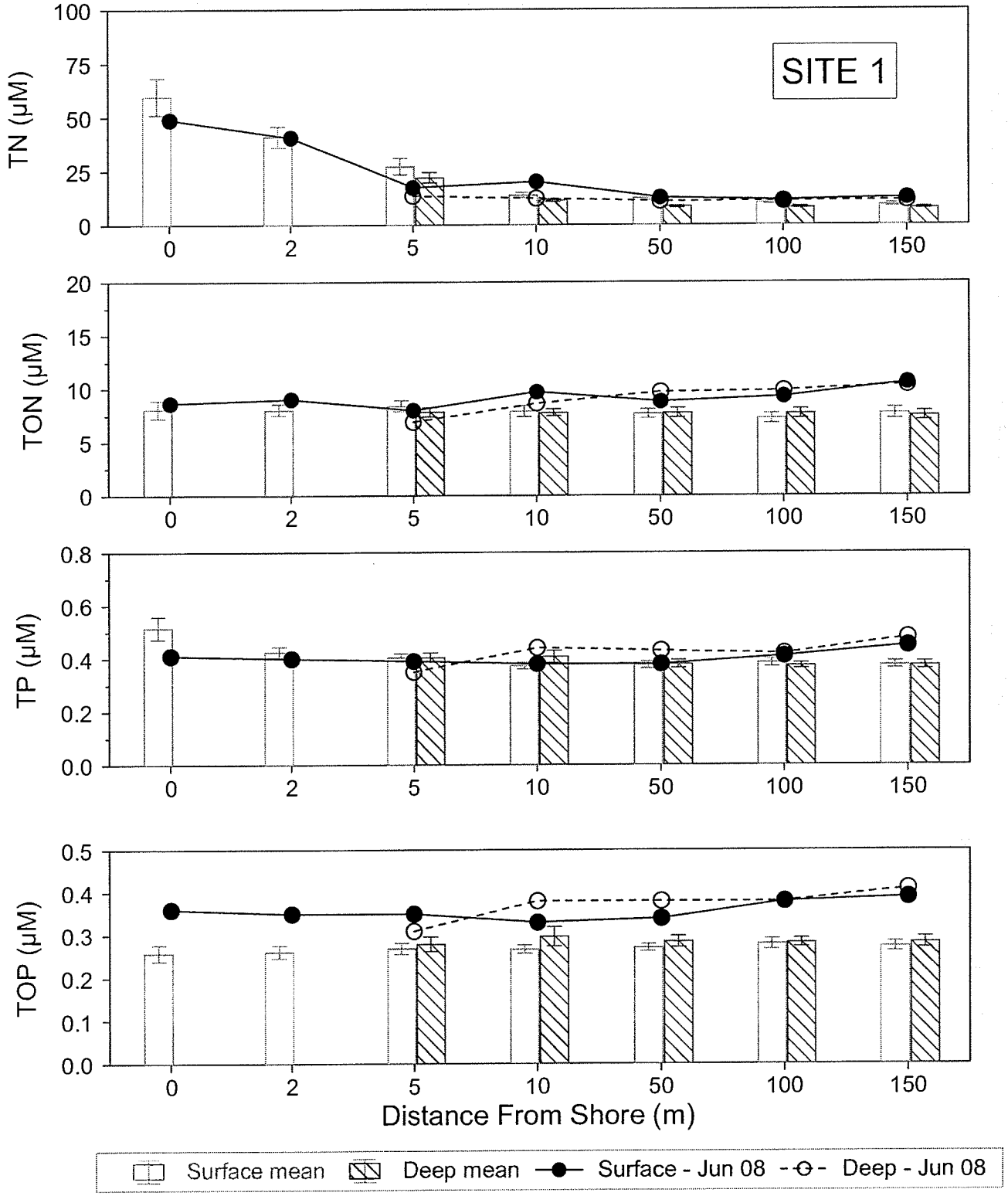

FIGURE 5. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 1, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

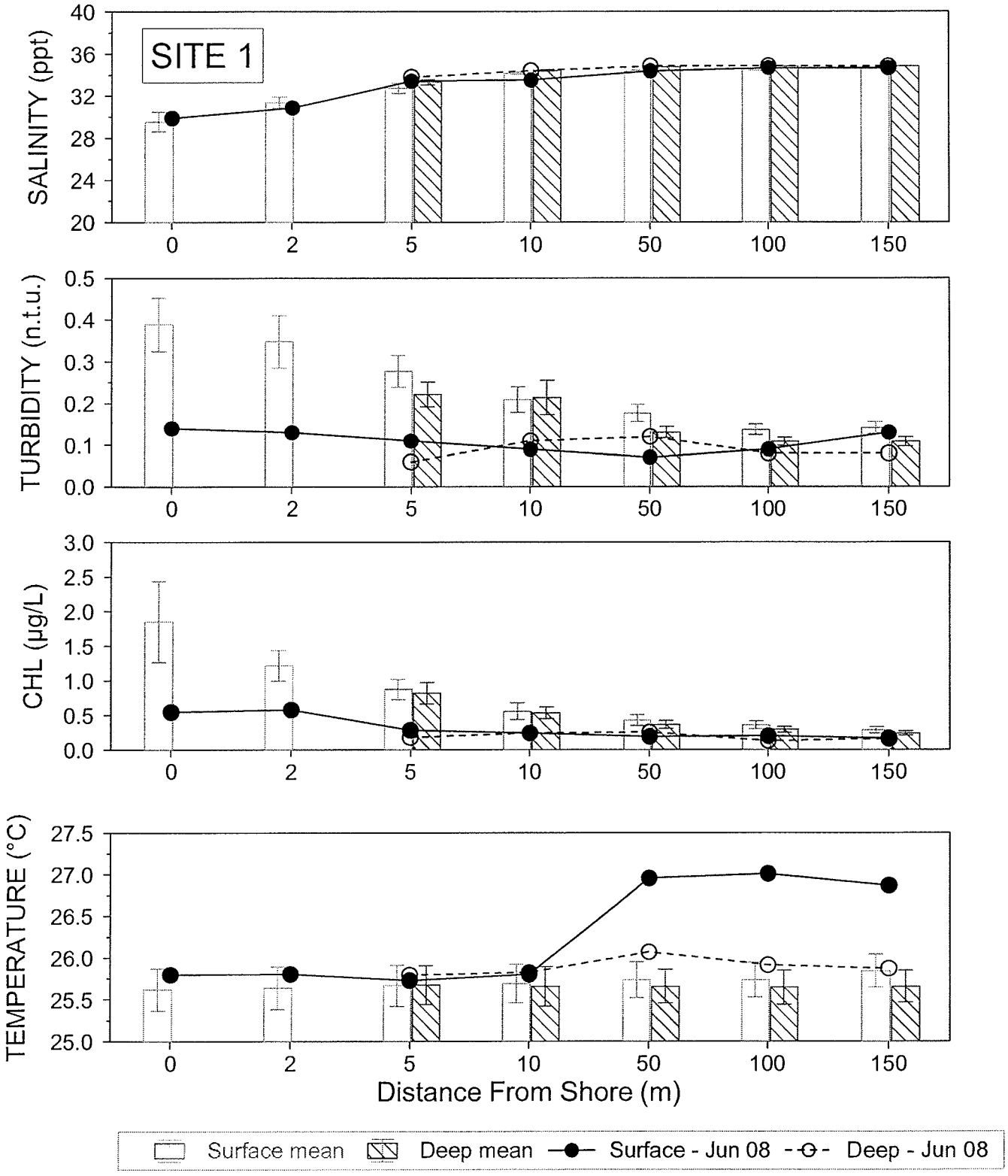

FIGURE 6. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 1, offshore of the Makena Resort. Data points and connected lines from samples collected during the most survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

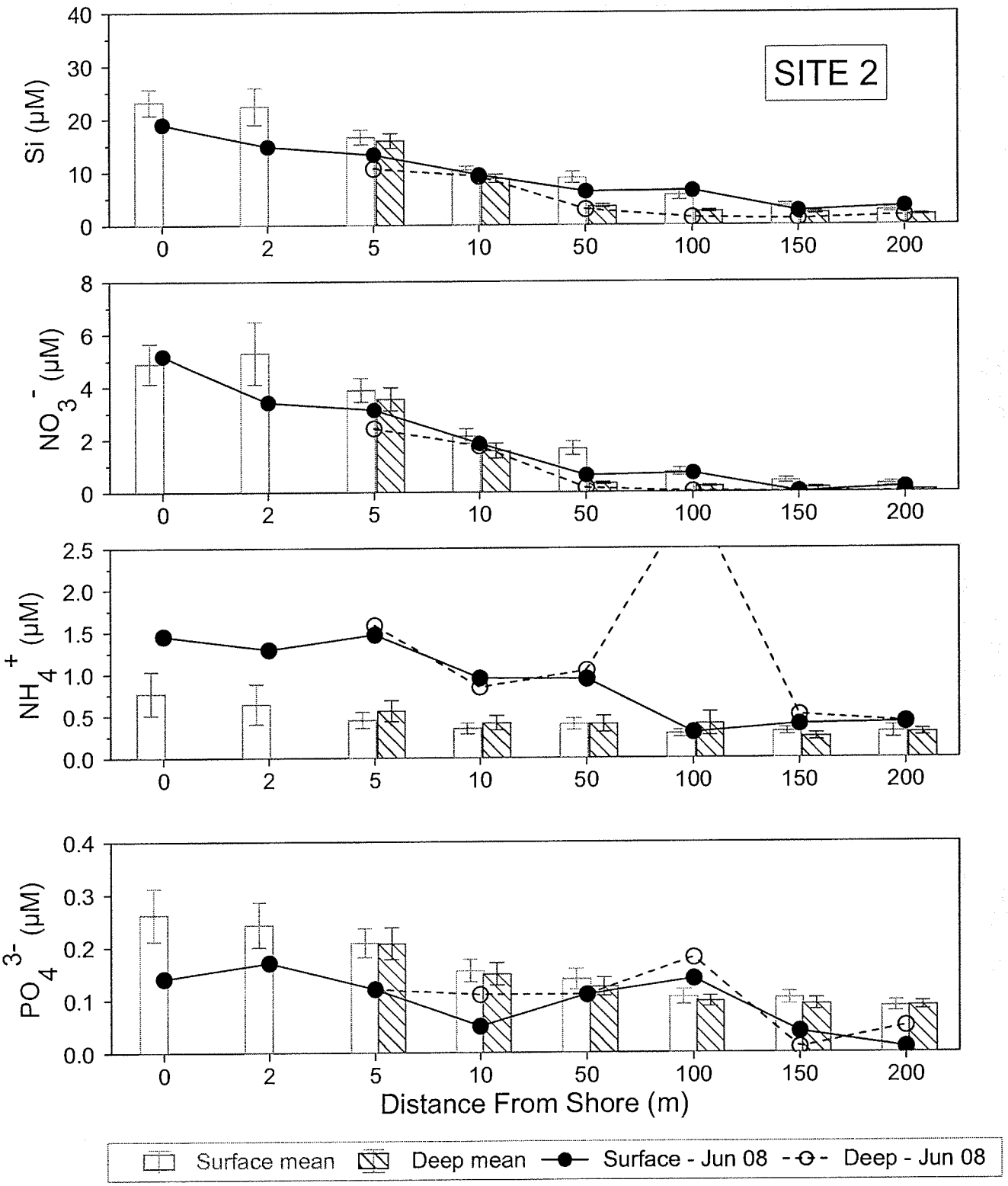

FIGURE 7. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 2, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

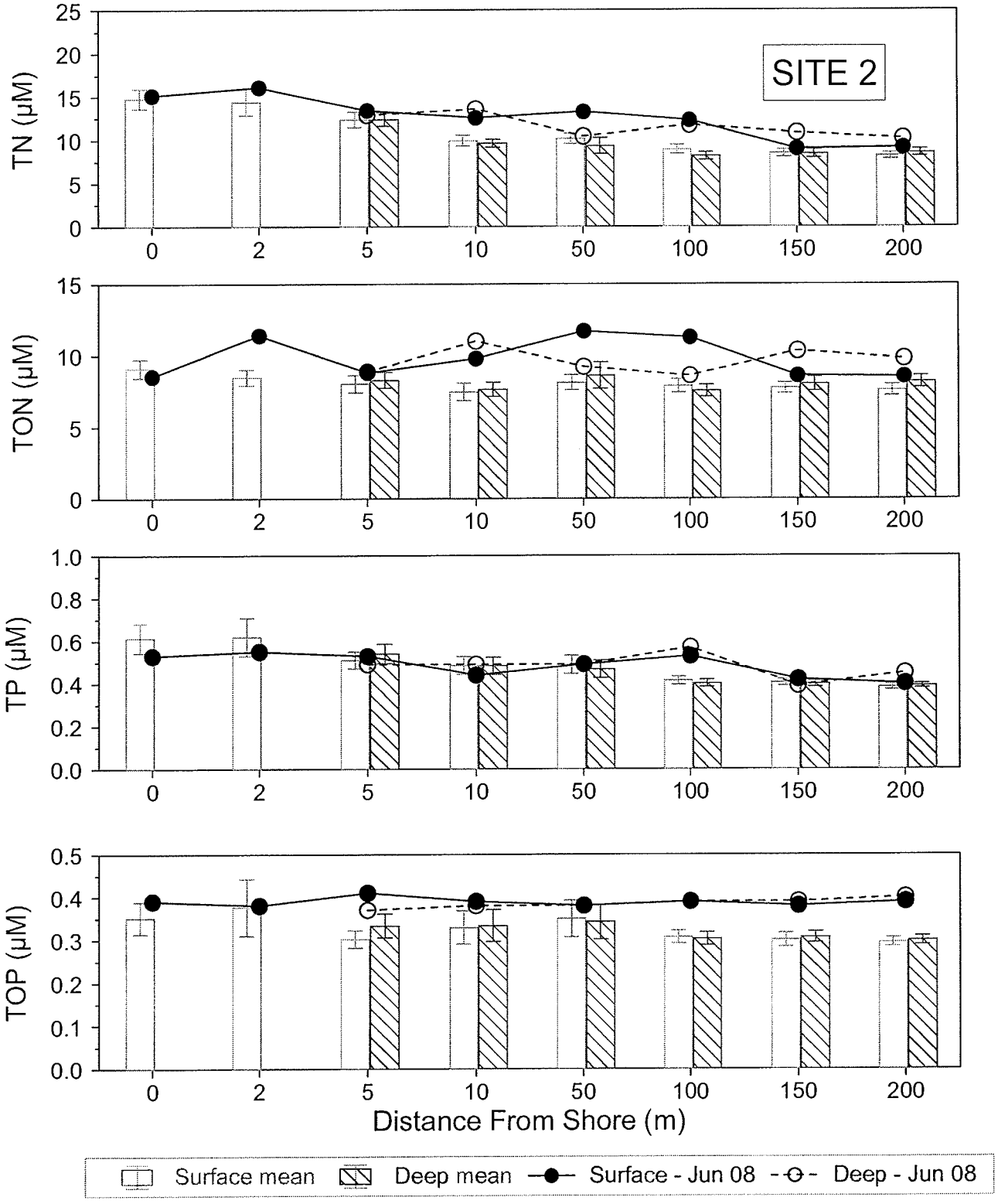

FIGURE 8. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 2, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

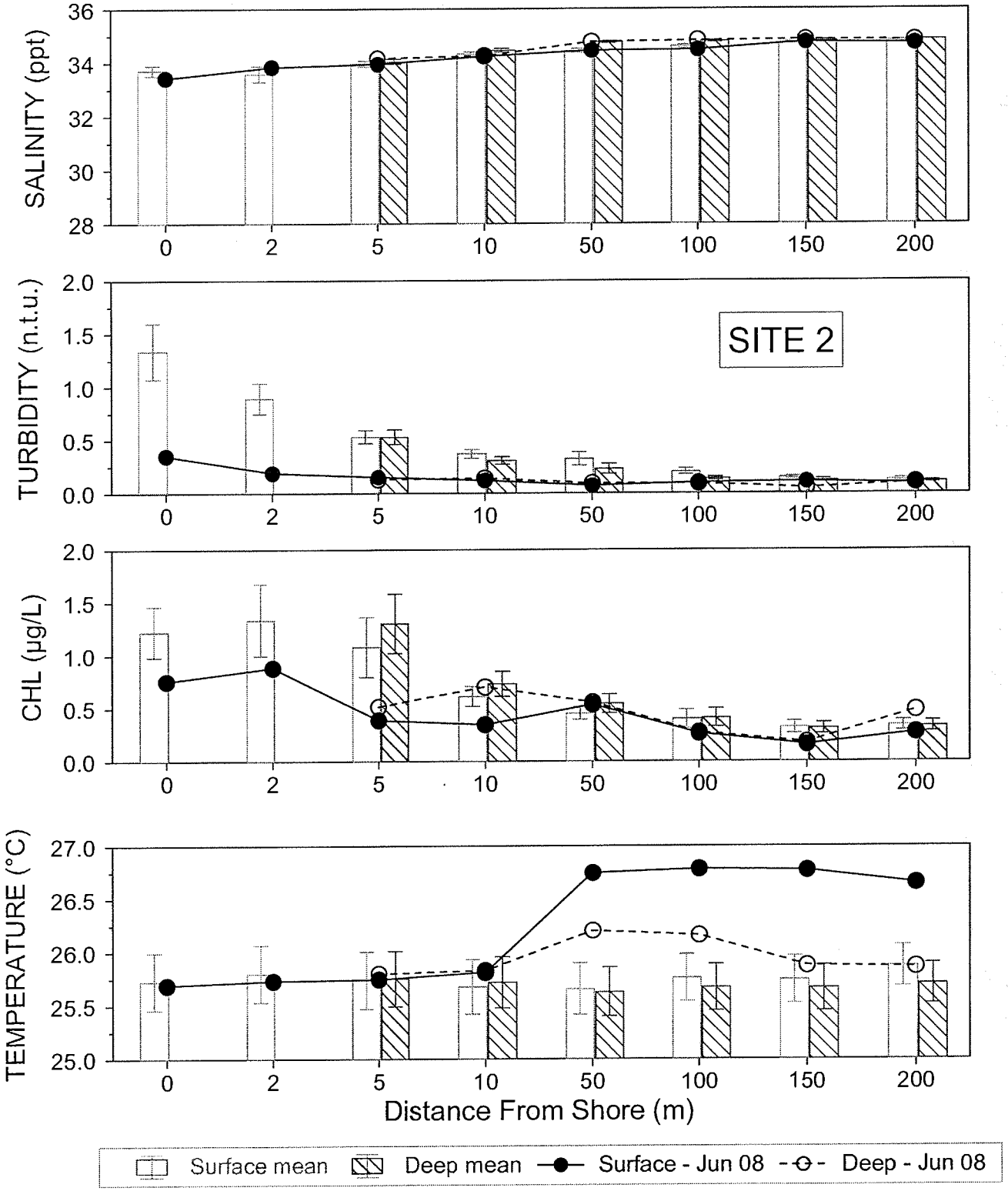

FIGURE 9. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 2, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey,bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

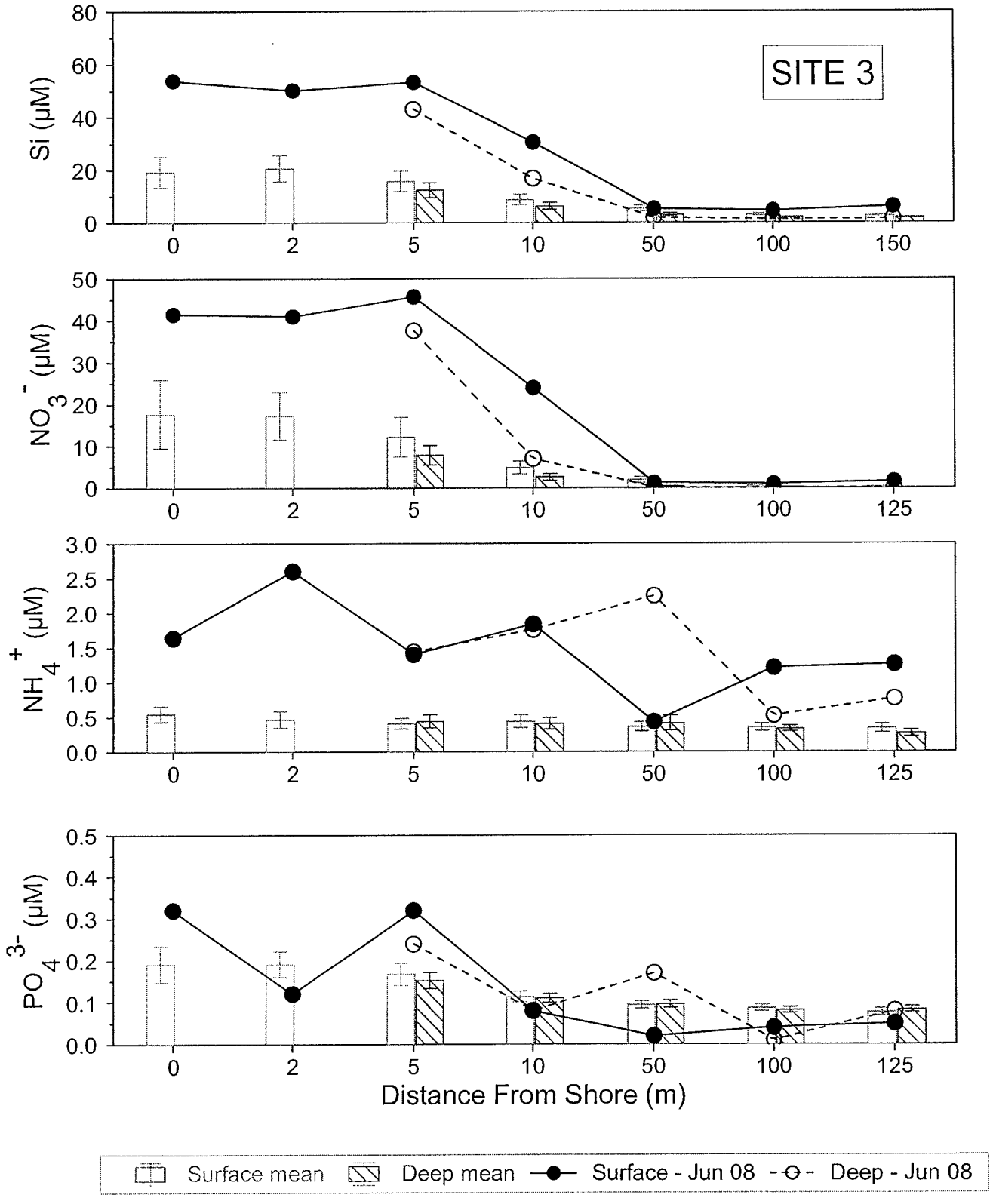

FIGURE 10. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 3, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

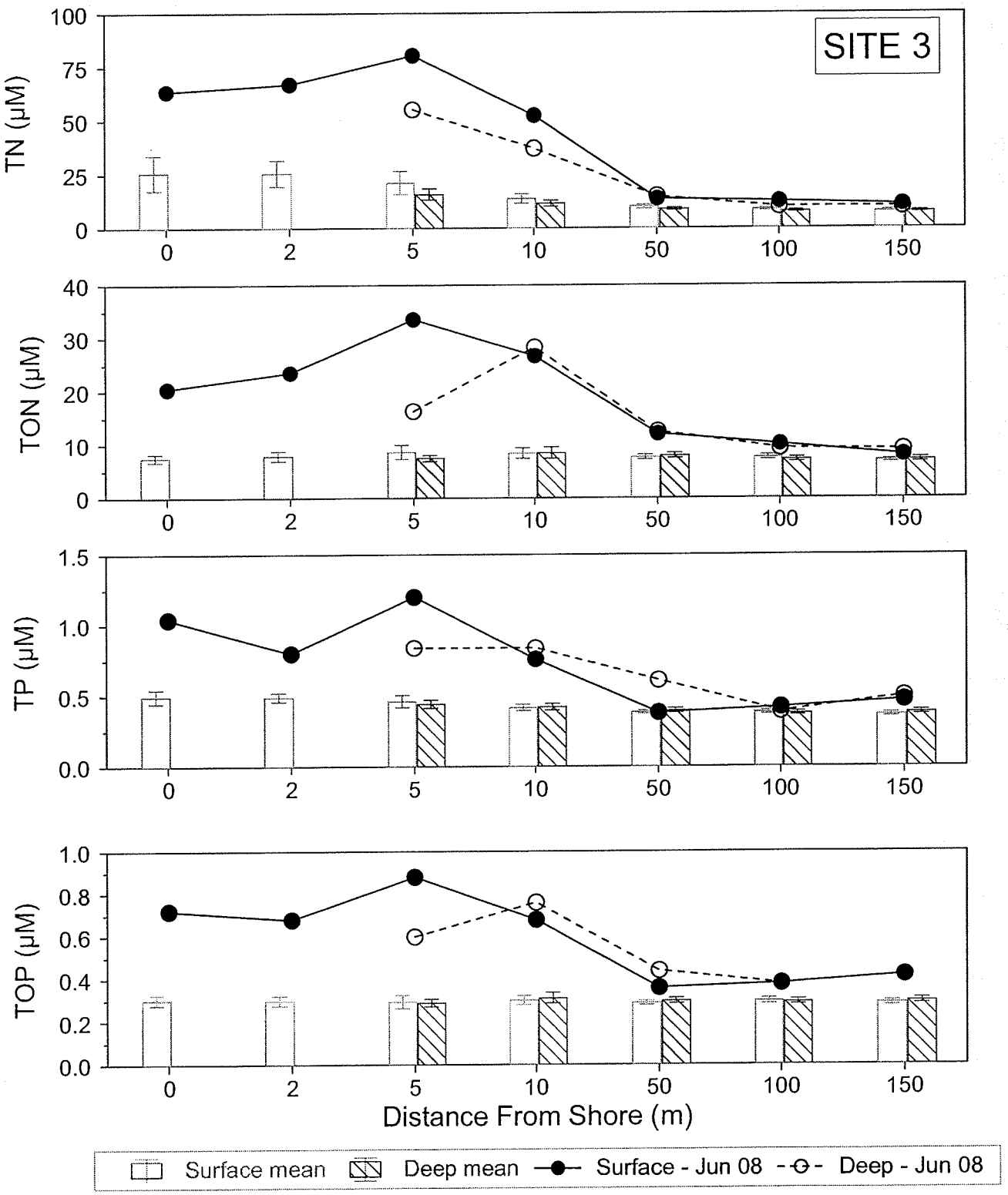

FIGURE 11. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 3, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

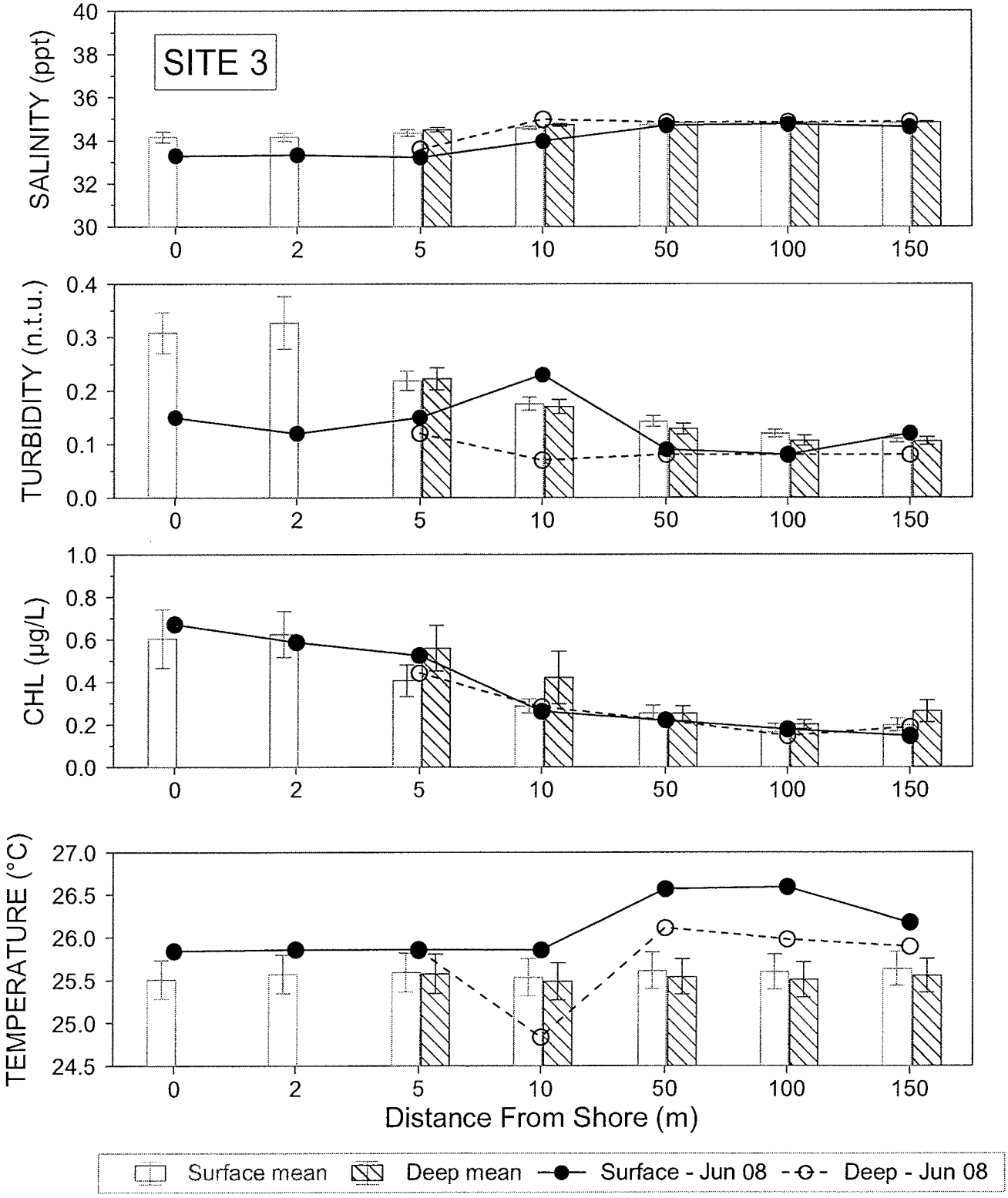

FIGURE 12. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 3, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

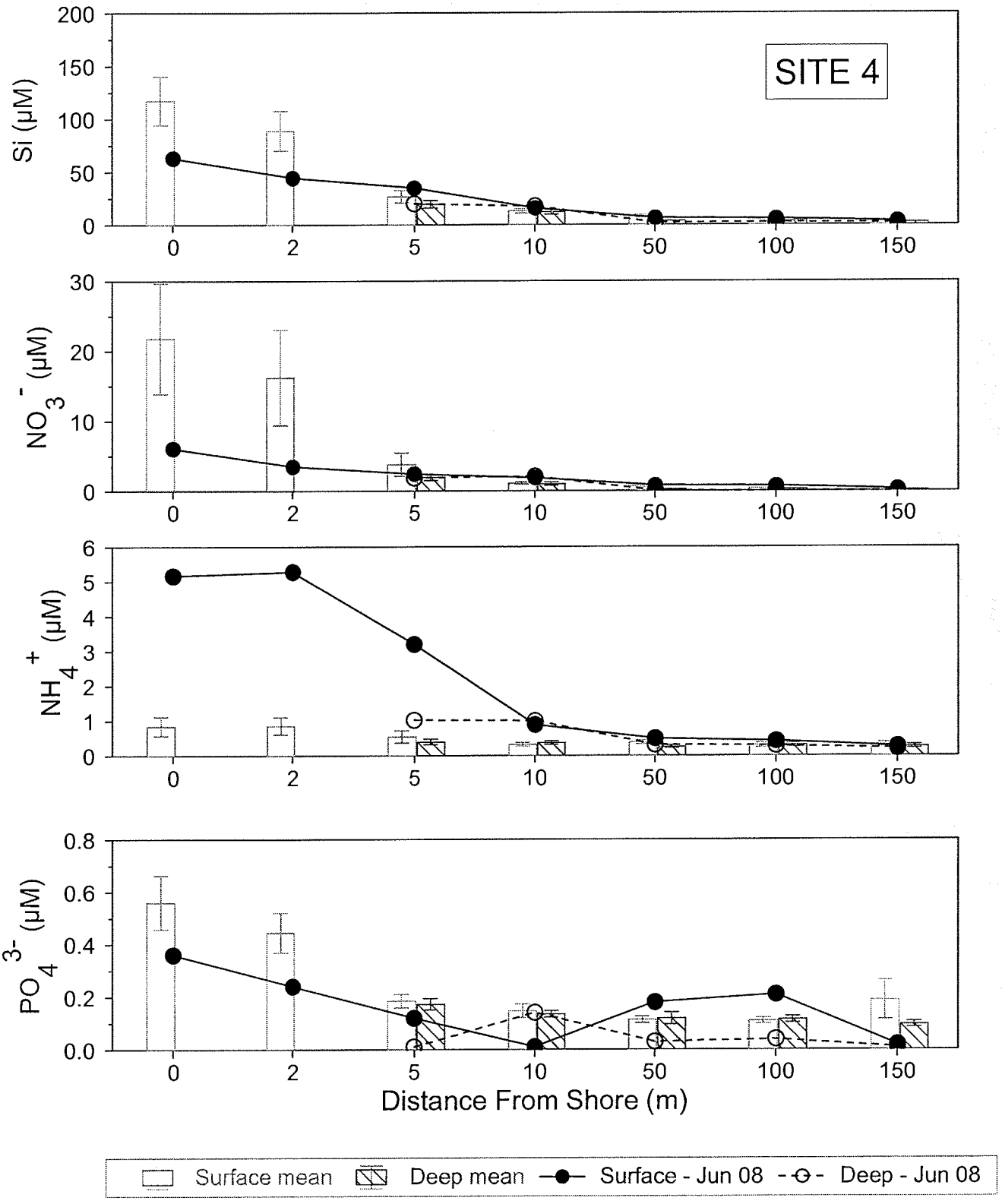

FIGURE 13. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 4, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

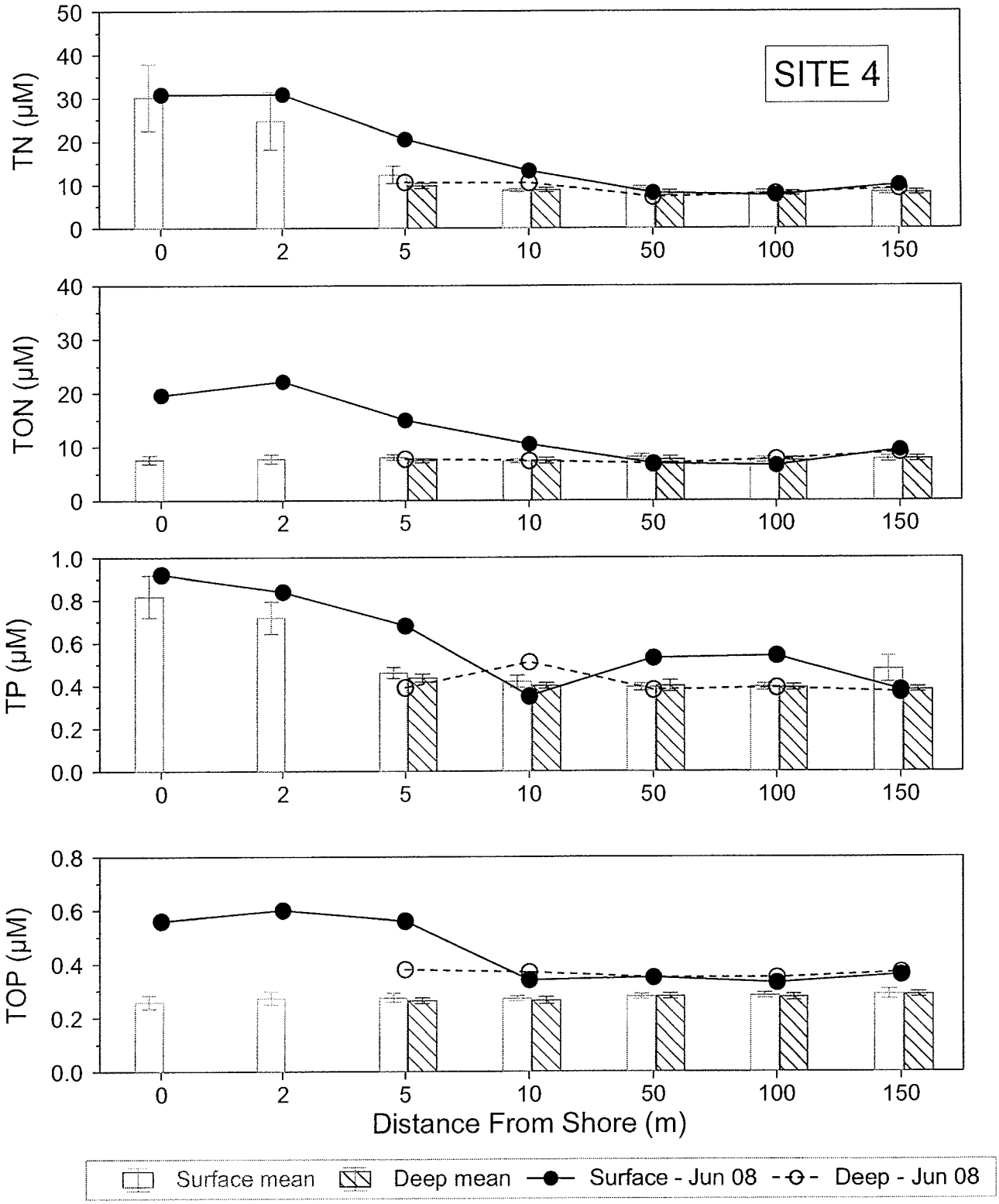

FIGURE 14. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 4, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

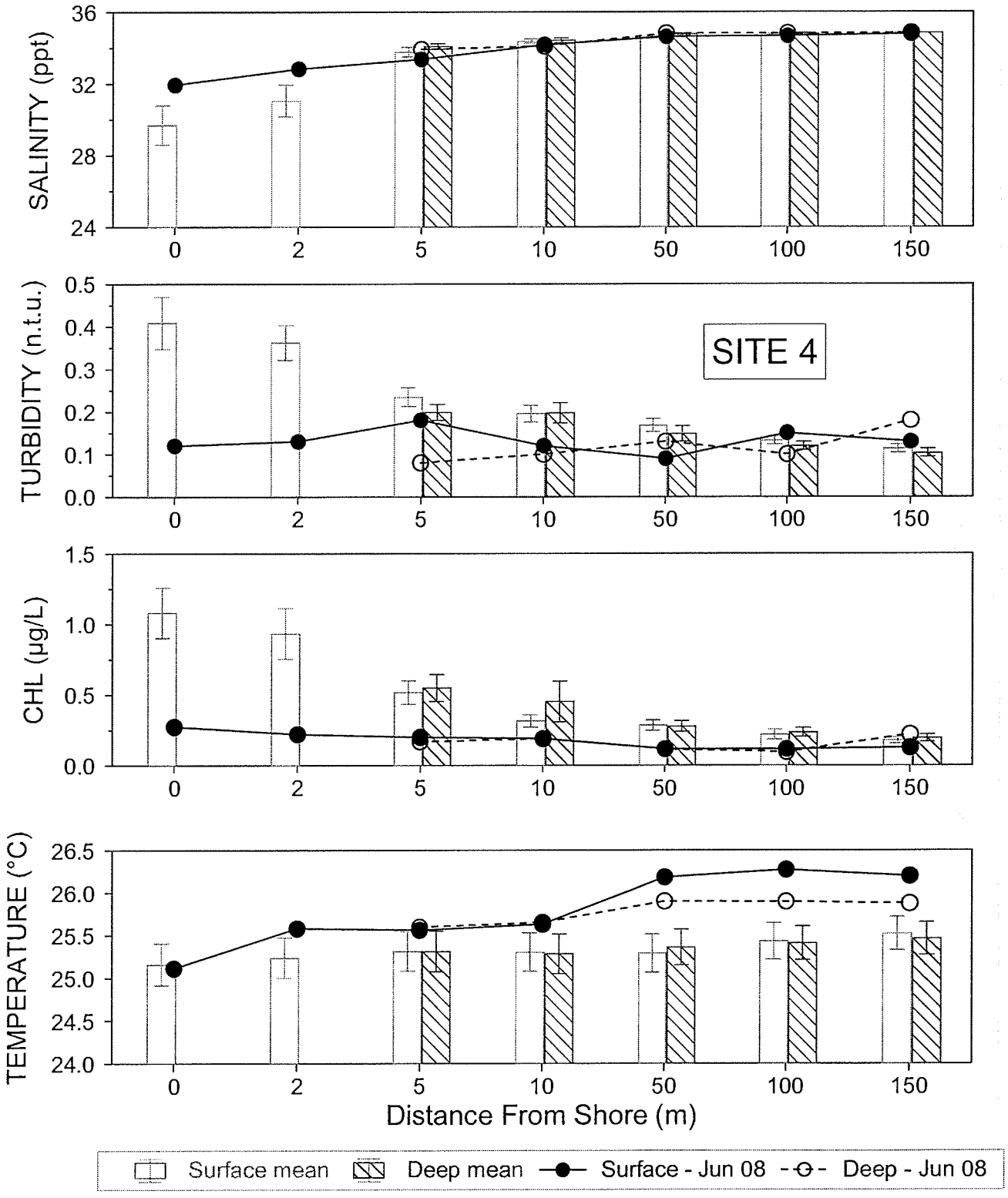

FIGURE 15. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 4, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=21). Error bars represent standard error of the mean. For site location, see Figure 1.

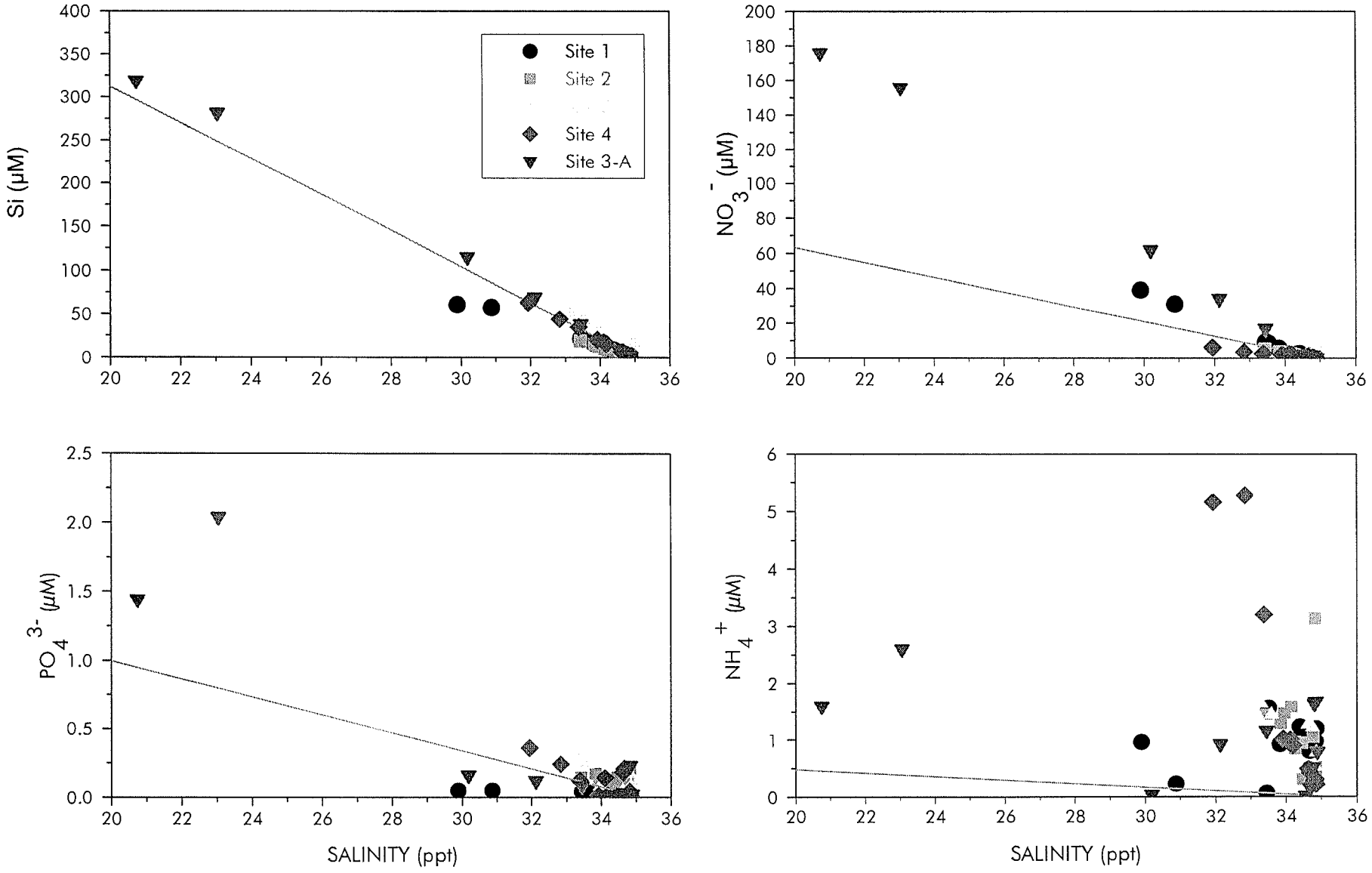

FIGURE 16. Mixing diagram showing concentration of dissolved nutrients from samples collected offshore of the Makena Resort on June 29, 2008 as functions of salinity. Solid red line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with water from an irrigation well upslope of the Makena Golf Courses. For sampling site locations, see Figure 1.

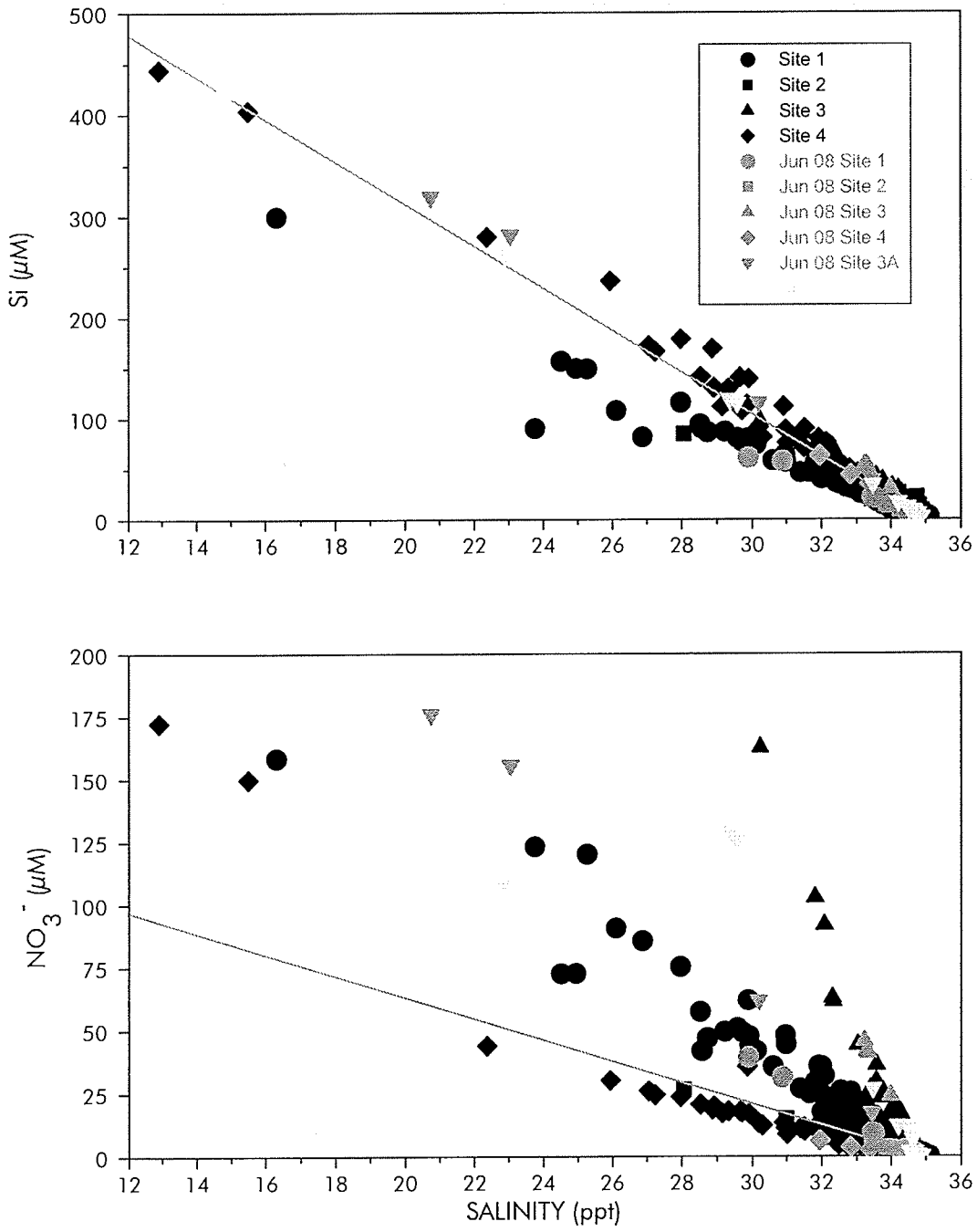

FIGURE 17. Silicate and nitrate, plotted as a function of salinity for surface samples collected since August 1995 at four sites offshore of the Makena Golf Course. Black symbols represent combined data from surveys conducted between August 1995 and December 2007. Green symbols represent data from surveys at Site 3A commencing in June 2007. Red symbols are data from most recent survey. Solid red line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with water from golf course irrigation well #4. For sampling site locations, see Figure 1.

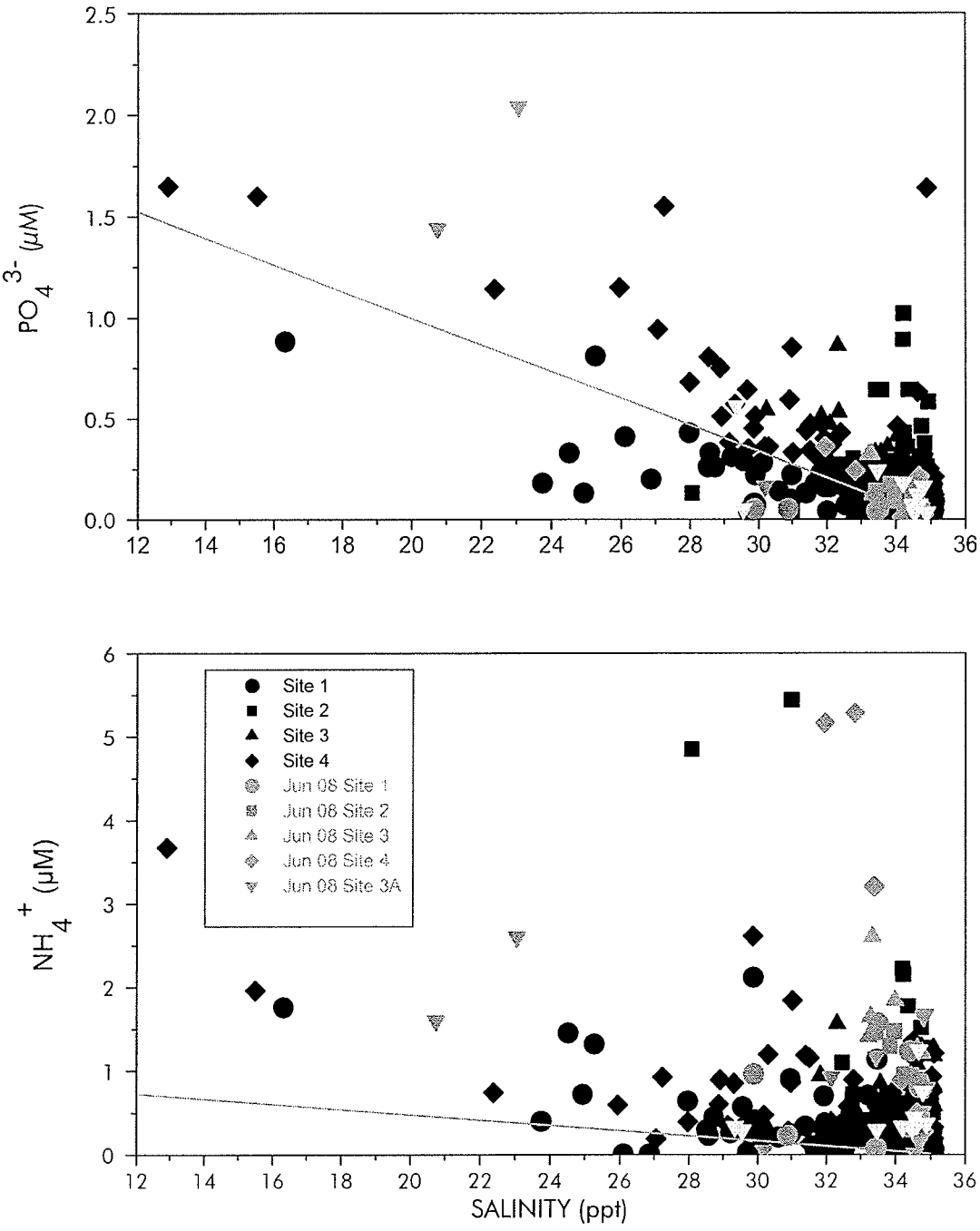

FIGURE 18. Phosphate and ammonium, plotted as a function of salinity for surface samples collected since August 1995 at four sites offshore of the Makena Golf Course. Black symbols represent combined data from surveys conducted between August 1995 and December 2007. Green symbols represent data from surveys at Site 3A commencing in June 2007. Red symbols are data from the most recent survey. Solid red line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with water from golf course irrigation well #4. For sampling site locations, see Figure 1.

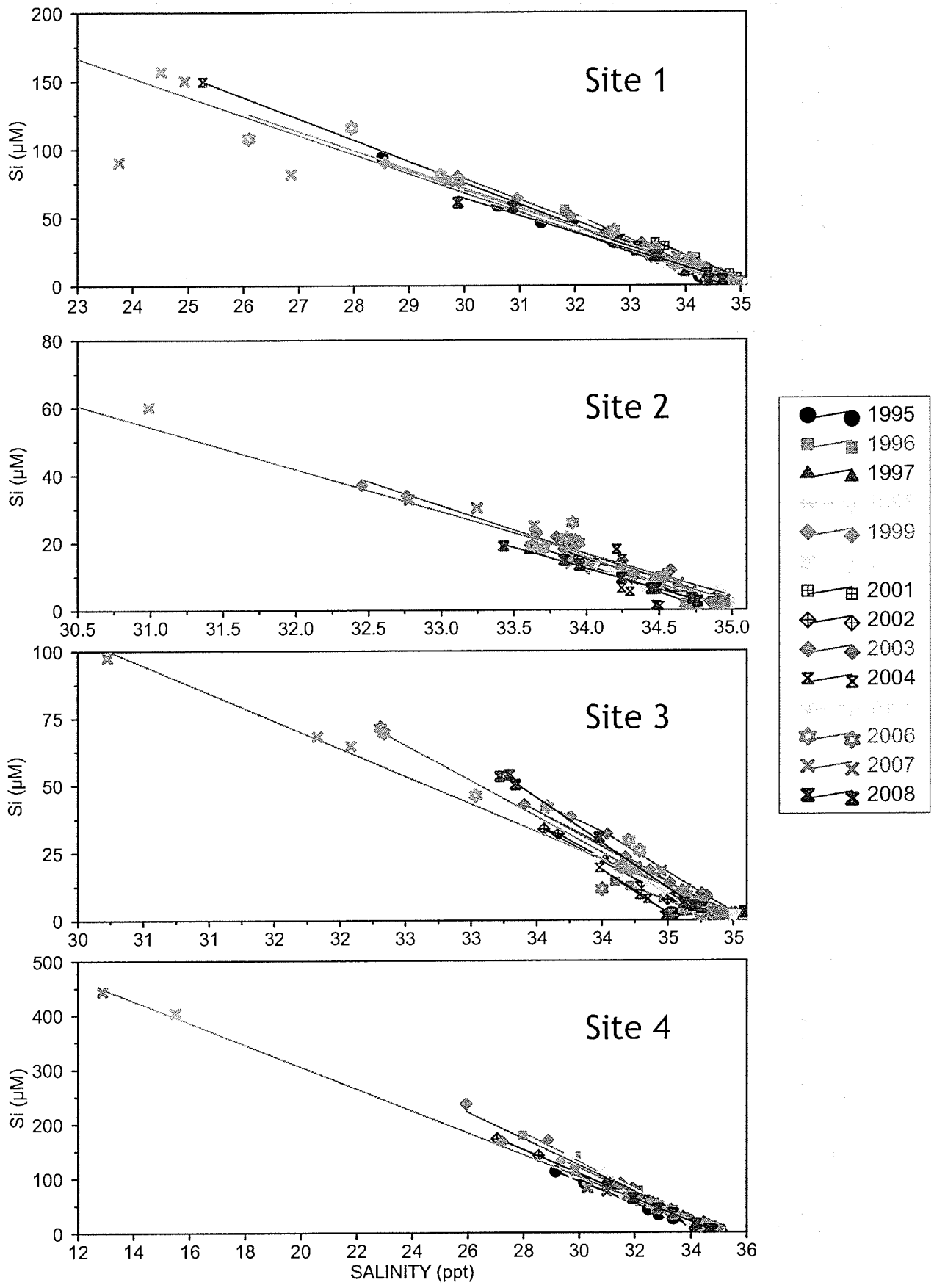

FIGURE 19. Mixing diagram showing yearly concentrations of silicata as functions of salinity from samples collected during annual monitoring surveys at four transect sites offshore of the Makena Resort. Note axis scale changes between sites. Straight lines are linear regressions through data points for each year. For sampling site locations, see Figure 1.

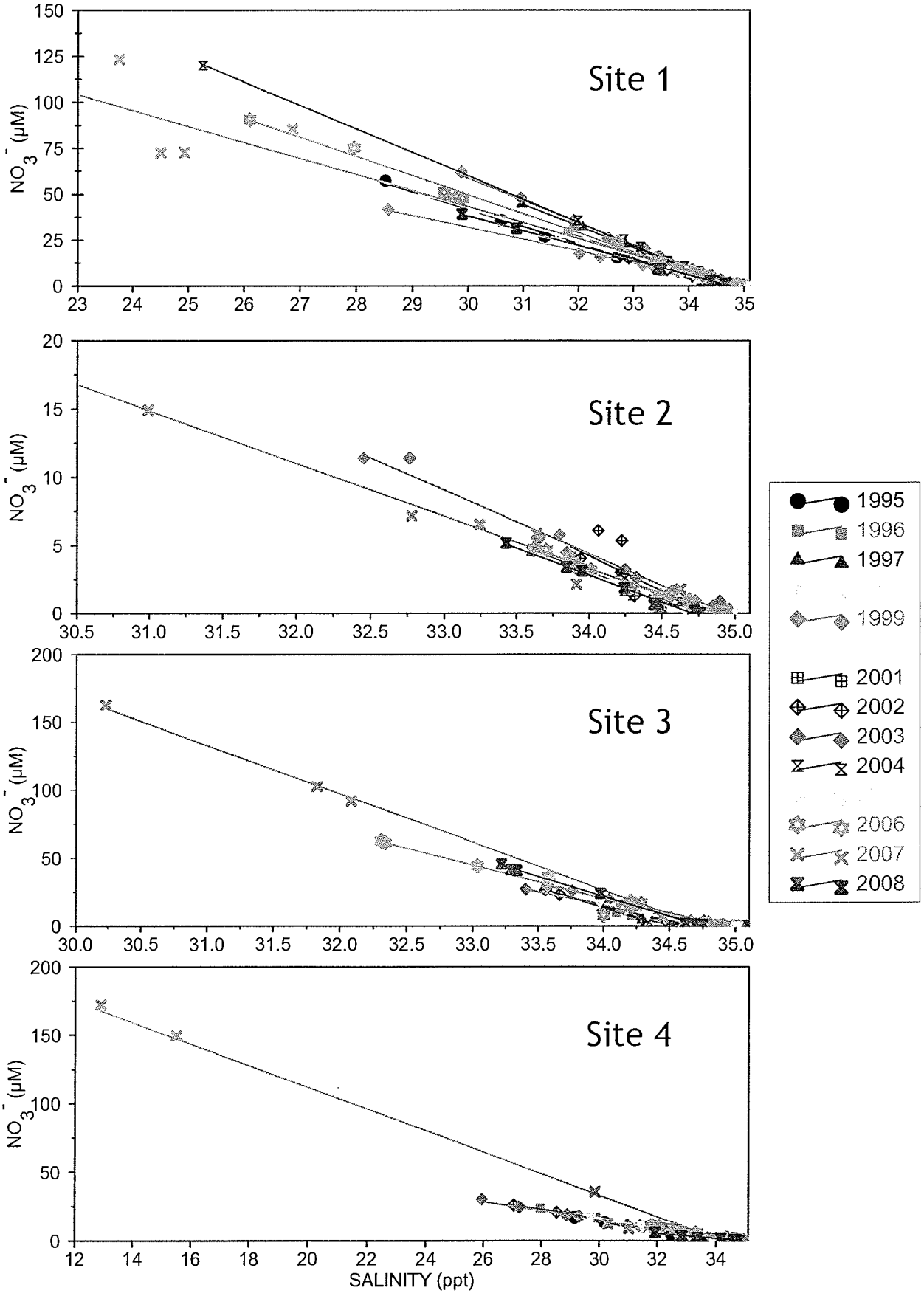

FIGURE 20. Mixing diagram showing yearly concentrations of nitrate as functions of salinity from samples collected during annual monitoring surveys at four transect sites offshore of the Makena Resort. Note axis scale changes between sites. Straight lines are linear regressions through data points for each year. For sampling site locations, see Figure 1.

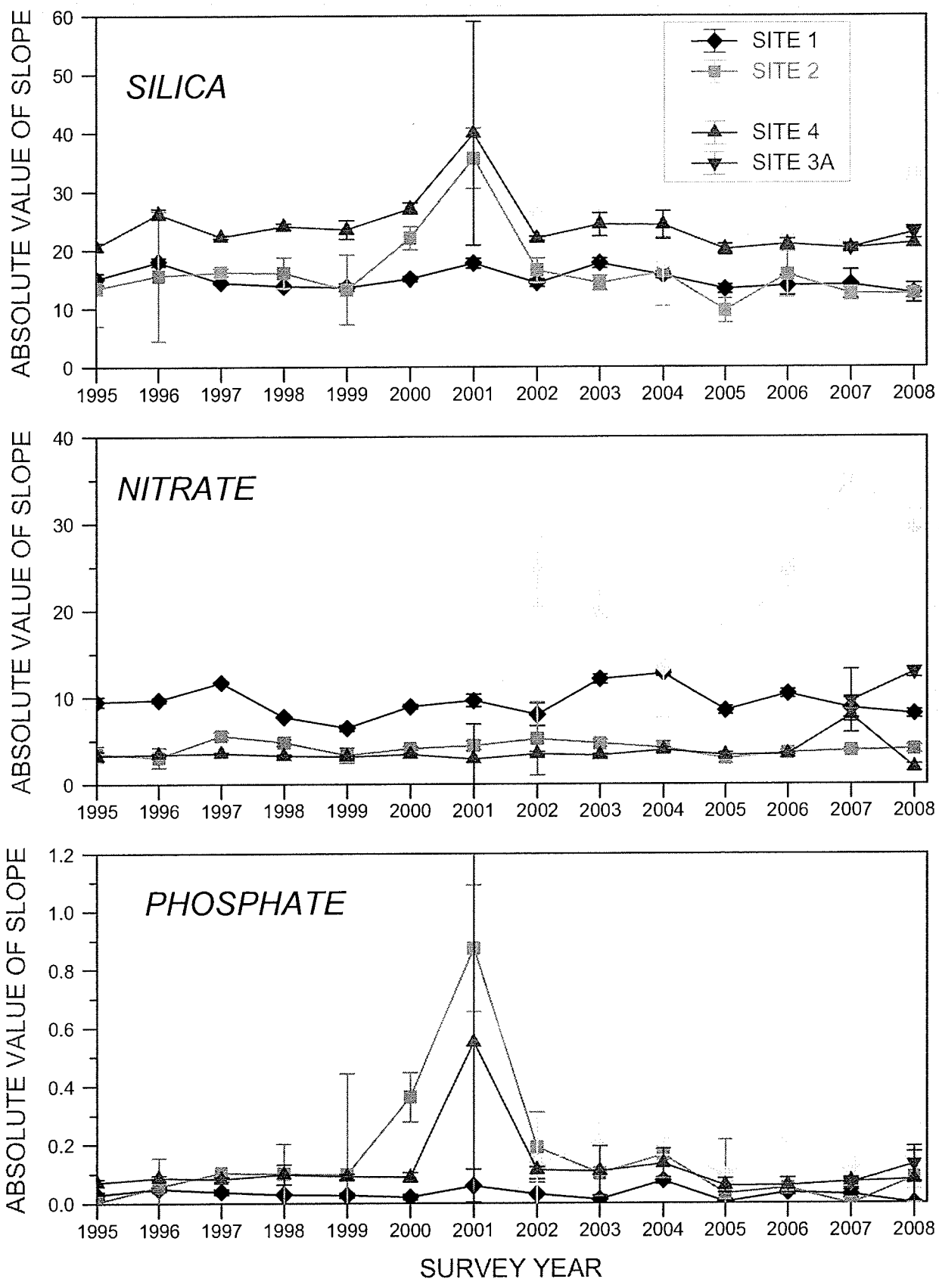

FIGURE 21. Time-course plots of absolute values of slopes of linear regressions of concentrations of silca, nitrate and phosphate as functions of salinity collected annually at each of the transect monitoring stations off the Makena Resort (Site 3A began in June 2007). Error bars are 95% confidence limits (Note error bar for Site 4 Phosphate is off scale). For locations of sampling transect sites, see Figure 1.

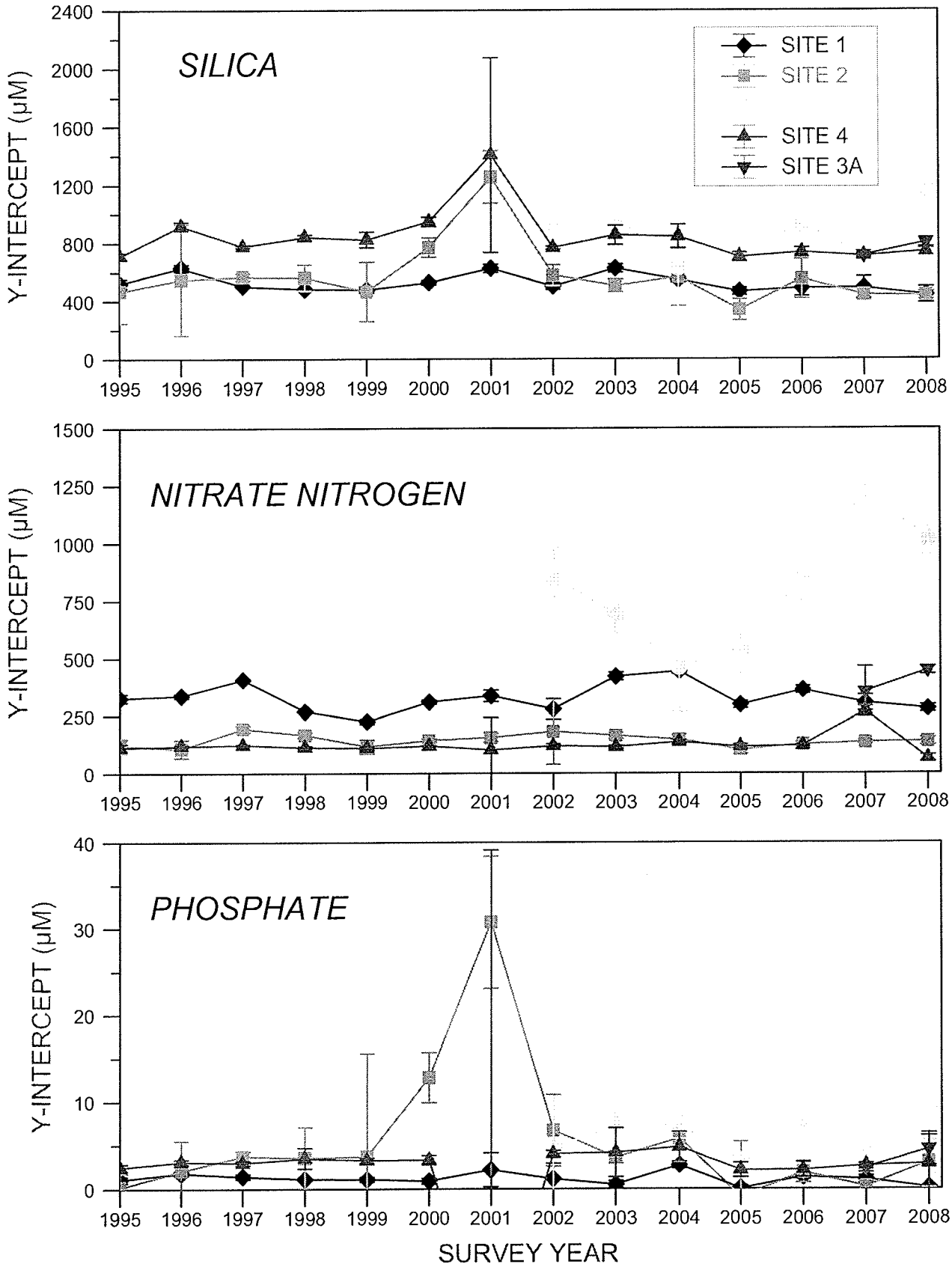

FIGURE 22. Time-course plots of Y-intercepts of linear regressions of concentrations of silca, nitrate and phosphorus as functions of salinity collected annually at each of the transect monitoring stations off the Makena Resort (Site 3A began in June 2007). Error bars are 95% confidence limits. For locations of sampling transect sites, see Figure 1.

MARINE WATER QUALITY MONITORING
MAKENA RESORT, MAKENA, MAUI
WATER CHEMISTRY
REPORT 2-2008

Prepared for

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Submitted

March 13, 2009

EXHIBIT E

I. PURPOSE

The Makena Resort fronts approximately 5.4 miles of coastline of southeastern Maui, extending from Papanui Stream (Nahuna Point) on the north and Pu`u Olai (Ahihi Bay) on the south. Within the Resort are two 18-hole golf courses (North and South Courses), as well as a hotel, sewage treatment plant and private residences. No part of the project involves direct alteration of the shoreline or nearshore marine environments.

Evaluations of other golf courses and other forms of resort development located near the ocean in the Hawaiian Islands reveal that there is detectable input to the coastal ocean of materials used for fertilization of turfgrass and landscaping (Dollar and Atkinson 1992). However, few, if any, effects that have been documented have been found to be detrimental to the marine ecosystem. Thus, there is no *a priori* reason to suspect that the construction and responsible operation of the golf courses and other components of the Makena Resort will cause any harmful changes to the marine environment. Nevertheless, in the interest of assuring maintenance of environmental quality, and as a means of ensuring that proper procedures are set forth, a condition of the Land Use Commission District Boundary Amendment for the project was the implementation of an ongoing marine monitoring program off the Makena Resort Development. The primary goals of the program are twofold: 1) to assess the degree that materials used on land to enhance turf growth and landscaping, as well as other nutrient subsidies, leach to groundwater and subsequently reach the ocean, and 2) to determine the fate of these materials within the nearshore zone. In terms of determining fate, the question that is addressed is if the materials that originate from Resort activities disperse with little or no effect, or do they cause changes in water quality sufficient to alter marine biological community structure?

The rationale of the monitoring program is to conduct repetitive evaluations of water chemistry at the same locations at regular time intervals (twice per year). This strategy allows for determination of variations in effects from the Makena Resort in both space (at different locations along the shoreline) and time. These studies also fulfill condition No. 10, Declaration of Conditions pertaining to the Amendment of the District Boundary, as required by the Land Use Commission, dated April 17, 1998. The following report presents the results of the twenty-second increment in the monitoring program, and contains data from water chemistry sampling conducted on December 13, 2008.

II. ANALYTICAL METHODS

Three survey sites directly downslope from the Makena Resort have been selected as sampling locations. A fourth site, located offshore of an area with minimal land-based development, particularly golf course operations, was selected as a control. During the June 2007 survey, another sampling location was added near the southern boundary of Maluaka Bay. It is anticipated that this station will remain part of the sampling protocol permanently. Figure 1 is a map showing the shoreline and topographical features of the Makena area, and the location of the North and South Golf Courses. All survey sites are depicted as transects perpendicular to the shoreline extending from the shoreline out to what is considered open coastal ocean (i.e., beyond the effects of activities on land). Survey Site 1 is located near the northern boundary of the project

site off Nahuna Point; Survey Site 2 bisects Makena Bay near Makena Landing. Site 3 bisects the middle of the South course on the north side of Maluaka Point. Site 3A is on the southern corner of Maluaka Bay. Site 4, which is considered the Control site, is located near the northern boundary of the 'Ahihi-Kina`u natural area reserve north of the 1790 lava flow and approximately 1-2 miles south of the existing Makena Golf courses (Figure 1). The control site was located off a shoreline area with minimal land uses (i.e., residences near the shoreline and upslope ranchlands) rather than off the completely uninhabited 1790 lava flow. This location was selected as the most appropriate control site, as it is the farthest location from the Makena Resort with the same geophysical structural of the land area. The completely different geological structure of the lava flow off the natural reserve likely results in very different groundwater dynamics compared to the land area where the Makena Resort is located, hence making the lava flow an unsuitable control site.

In July of 2002, Site 3 was relocated from a location at the southern boundary of the project offshore of Oneloa Beach to the location directly off the Makena Golf Course, as described above. The relocation of Site 3 was deemed necessary as the original location consistently showed virtually no input of groundwater to the ocean. Such lack of groundwater discharge resulted in little potential for evaluating effects from the project. The new location of Site 3 is directly downslope from both the portion of the golf course nearest to the ocean, several newly constructed private residences, and a 3-acre recently restored wetland area. As a result, the new location represents an area that reflects the maximum influence on nearshore water quality from a variety of land uses and natural habitat.

All fieldwork for the present survey was conducted on December 13, 2008, Environmental conditions during sample collection consisted of mild winds (8-10 knots), cloudy skies, and very little swell. On the night preceding the sampling, 0.5" of rainfall was measured in the Makena area.

Water samples were collected at stations along transects that extend from the highest wash of waves to between125-200 meters (m) offshore, depending on the site. Such a sampling scheme is designed to span the greatest range of salinity with respect to freshwater efflux at the shoreline. Sampling was more concentrated in the nearshore zone because this area is most likely to show the effects of land-based activities. With the exception of the two stations closest to the shoreline (0 and 2 m offshore), samples were collected at two depths; a surface sample was collected within approximately 10 centimeters (cm) of the sea surface, and a bottom sample was collected within one m of the sea floor.

Water samples from the shoreline to a distance of 10 m offshore were collected in triple-rinsed 1-liter polyethylene bottles by swimmers working from the shoreline. A digital refractometer was used to pinpoint the location of maximum groundwater flux to the ocean shoreline origin of each transect site. Water samples beyond 10 m from the shoreline were collected from a small boat using a 1.8-liter Niskin-type oceanographic sampling bottle. This bottle was lowered to the desired depth in an open position where spring-loaded endcaps were triggered to close by a messenger released from the surface. Upon recovery, each sample was placed on ice until further processing in Honolulu. Water samples were also collected from eight golf course irrigation wells

(No's 1, 2, 3, 4, 5, 6, 8, 10 and 11) and one irrigation lake on the same day as the ocean sampling.

Water quality parameters evaluated included the 10 specific criteria designated for open coastal waters in Chapter 11-54, Section 06 (Open Coastal waters) of the State of Hawaii Department of Health Water Quality Standards. These criteria include: total nitrogen (TN) which is defined as inorganic nitrogen [nitrate + nitrite nitrogen (NO_3^- + NO_2^-), ammonium (NH_4^+)], plus total organic nitrogen (TON), total phosphorus (TP) which is defined as inorganic phosphorus (PO_4^{3-}) plus total organic phosphorus, chlorophyll a (Chl *a*), turbidity, temperature, pH and salinity. In addition, orthophosphate phosphorus (PO_4^{3-}) and silica (Si) were reported because these constituents are sensitive indicators of biological activity and the degree of groundwater mixing, respectively.

Analyses for NO_3^- + NO_2^- (hereafter termed NO_3^-), NH_4^+ and PO_4^{3-}, were performed on filtered samples using a Technicon autoanalyzer according to standard methods for seawater analysis (Strickland and Parsons 1968, Grasshoff 1983). TN and TP were analyzed in a similar fashion on unfiltered samples following digestion. Total organic nitrogen (TON) and Total organic phosphorus (TOP) were calculated as the difference between TN and inorganic N, and TP and inorganic P, respectively. Limits of detection for the dissolved nutrients are 0.01 μM (0.14 μg/L) for NO_3^- and NH_4^+, 0.01 μM (0.31 μg/L) for PO_4^{3-}, 0.1 μM (1.4 μg/L) for TN and 0.1 μM (3.1 μg/L) for TP.

Chl *a* was measured by filtering 300 ml of water through glass fiber filters; pigments on filters were extracted in 90% acetone in the dark at -5°C for 12-24 hours, and the fluorescence before and after acidification of the extract was measured with a Turner Designs fluorometer (level of detection 0.01 μg/L). Salinity was determined using an AGE Model 2100 laboratory salinometer with a precision of 0.003‰.

In situ field measurements included water temperature, pH, dissolved oxygen and salinity which were acquired using an RBR Model XR-420 CTD calibrated to factory specifications. The CTD has a readability of 0.001°C, 0.001pH units, 0.001% oxygen saturation, and 0.001 parts per thousand (‰) salinity. Shoreline salinity was measured in the field using an Atago PAL-06S digital refractometer.

Nutrient, turbidity, Chl *a* and salinity analyses were conducted by Marine Analytical Specialists located in Honolulu, Hawaii. This laboratory possesses acceptable ratings from EPA-compliant proficiency and quality control testing.

III. RESULTS and DISCUSSION

A. General Overview

Table 1 shows results of all marine water chemical analyses for samples collected off Makena on December 13, 2008 with nutrient concentrations reported in micromolar units (μM). Table 2

shows similar results with nutrient concentrations presented in units of micrograms per liter (µg/L). Tables 3 and 4 show geometric means of ocean samples for 22 surveys at Sites 1,2 and 4, 13 surveys at Site 3, and 4 surveys from Site 3-A, with nutrient concentrations shown in µM and µg/L, respectively. Table 5 shows water chemistry measurements (in units of µM and µg/L) for samples collected from irrigation wells and one irrigation lake located on the Makena Resort Golf Courses. Concentrations of twelve chemical constituents in surface and deep-water samples from the December 2008 sampling are plotted as functions of distance from the shoreline in Figures 2 and 3. Mean concentrations (±standard error) of twelve chemical constituents in surface and deep water samples as functions of distance from the shoreline at Sites 1-4 collected since 1995 are plotted in Figures 4-15. In addition, data from the most recent sampling in December 2008 are also plotted on Figures 4-15.

During the December 2008 sampling, nearshore concentrations of dissolved Si, NO_3^-, PO_4^{3-}, TP and TN on all five transects were elevated up to three orders of magnitude compared to samples collected at the sampling stations farthest from shore (Figure 2, Tables 1 and 2). The horizontal gradients of nutrients were steepest on transect Sites 1 and 3-A where NO_3^- at the shoreline (162 µM and 71 µM, respectively) decreased by more than three orders of magnitude between the shoreline and 150 m offshore (0.02 µM and 0.01 µM, respectively). At transect Sites 2, 3, and 4, peak values of NO_3^- at the shoreline were between 2 and 11 µM, with values at the most offshore stations ranging from 0.03 to 0.08 µM. (Figure 2, Table 1). Salinity displayed mirror images of the patterns for nutrients, with lowest salinity at the shoreline of Sites 1 and 3-A (18 and 3‰, respectively), with rapidly increasing values with increasing distance from shore to near oceanic values (34.9‰) at the ends of the transects (Figure 3, Table 1). Distinct horizontal gradients extended to a distance of 100 m from the shoreline at all five transect sites (Tables 1 and 2).

Horizontal gradients in the surface concentrations of phosphate phosphorus (PO_4^{3-}) were also evident with the highest values in the samples collected near the shoreline, and progressively lower concentrations with increasing distance from shore. While there were distinct gradients in the concentrations of PO_4^{3-}, the magnitude of the range in values was far less than for Si, NO_3^- and TN (Figure 2, Tables 1 and 2) and the gradient extended out only to a distance of 5 -10 m from the shoreline.

With no streams in the sampling area, nor sheet flow drainage, the pattern of elevated Si, NO_3^-, PO_4^{3-} and TN with corresponding reduced salinity indicates groundwater entering the ocean near the shoreline. Low salinity groundwater, which contains high concentrations of Si, NO_3^-, TN and PO_4^{3-} (see values for well waters in Table 5), percolates to the ocean near the shoreline, resulting in a distinct zone of mixing in the nearshore region. The zone of mixing is discernible by distinct decreasing gradients of nutrients and increasing gradients of salinity with distance from shoreline. During periods of low tide when sea conditions are calm, the zone of mixing between groundwater and ocean water is most pronounced. The December 2008 sampling was conducted at low tide (+0.1 ft) with calm winds, resulting in a marked zone of mixing extending approximately 150 m from shore. Past monitoring surveys at Makena Resort conducted during periods of high tide and strong winds (e.g. December 2005) showed substantially smaller horizontal gradients than the present survey. Comparing the results of surveys conducted during different sea conditions clearly indicates that tidal state, as well as wind and wave energy, greatly affect groundwater mixing in the nearshore zone.

Dissolved nutrient constituents that are not associated with groundwater input (NH_4^+, TON, TOP) showed varying results with respect to distance from the shoreline (Figure 2). Concentrations of NH_4^+ in the surface waters varied at different locations along each transect, but did not show any distinct pattern with respect to distance from the shoreline (Figure 2). Noticeably higher concentrations of NH_4^+ were recorded in the shoreline samples at Sites 1 and 3-A (1.8 μM and 1.4 μM, respectively) compared to the other transect sites where NH_4^+ concentrations fell between 0.01 and 0.68 μM (Table 1). Concentrations of TOP and TON were nearly constant along the length of each transect, showing no indications of consistent horizontal gradients (Tables 1 and 2).

Turbidity was highest near the shoreline at all five transect sites with Sites 1, 2 and 3 showing higher concentrations compared to Sites 3-A and 4 (Table 1, Figure 3). With the exception of Site 2, turbidity values decreased to a constant level within 10 m of the shoreline. The horizontal gradient in turbidity at Site 2 extended nearly the whole length of the transect during December 2008. In previous surveys, turbidity has generally been highest on Transect 2 compared to the other sites. Transect 2 bisects Makena Bay, which is semi-enclosed embayment with a silt/sand bottom rather than the predominantly "hard" reef or sand bottoms that occur at the other transect sites. In addition, it has been observed that during flash floods originating in the ranch lands upslope of the Makena Resort, terrigenous sediment may flow to the ocean in Makena Bay. As a result of wave-induced resuspension of the naturally occurring silt/sand substratum, as well as terrigenous runoff which may be partially retained within the embayment, turbidity has often been elevated at Transect 2 relative to the other transect sites. It is important to note that in surveys conducted since July 2002, water clarity in Makena Bay has improved greatly compared to preceding surveys in 2001 which reflected conditions following substantial input of terrigenous materials from a flash-flood that occurred in October 1999. Since that time, a large retention basin has been constructed on the upper slopes of Makena Resort in the watershed that flows into Makena Bay.

Patterns in the concentrations of Chl a showed higher values near the shoreline compared to offshore values at Sites 1, 3-A and 4 (Figure 3). At Sites 2 and 3, Chl a showed a slight dip in concentration between 10 m and 100 m from the shoreline with higher values at the shoreline and offshore.

Surface water temperature ranged between 24.1°C and 25.4°C during the December 2008 survey with the lowest measurement in the shoreline sample at Site 1(Tables 1 and 2). At Sites 1 and 3-A, temperatures were lowest at the shoreline and steadily increased with distance offshore with gradients of 1.2 °C and 0.4 °C, respectively (Table 1 and Figure 3). At Sites 2, 3 and 4 temperature remained nearly constant along the length of each transect varying by only 0.1 – 0.2°C.

In many areas of the Hawaiian Islands, input of low salinity groundwater to the nearshore ocean creates a distinct buoyant surface lens that can persist for some distance offshore. Buoyant surface layers are generally found in areas where turbulent processes (primarily wave action) are insufficient to completely mix the water column in the nearshore zone. Figures 2 -15 and Tables 1 and 2 show concentrations of water chemistry constituents with respect to vertical stratification.

During the December 2008 survey, vertical stratification was evident for Si, NO_3^-, TN and salinity along all transects with the most pronounced gradients.

With respect to the other constituents of water chemistry, variations between surface and deep samples were generally small and showed no apparent trend with distance offshore (Figures 2-15). One anonymously low temperature measurement was recorded in the deep sample at Site 4 at the 10 m from shore location (Figure 3).

B. Temporal Comparison of Monitoring Results

Figures 4-15 show mean concentrations (±standard error) of water chemistry constituents from surface and deep samples at Transect Sites 1-4 from the twenty-two monitoring surveys conducted from 1995 to 2008. In addition, the results of the most recent survey in December 2008 are also shown on each plot. Because Site 3-A was not added to the sampling regime until June 2007, data from this site is not yet included in Figures 4–15.

With a few exceptions, surface concentrations of most constituents during the December 2008 survey were within the mean ranges of past surveys (Figure 7-15). At Site 1, the Si, NO_3^-, PO_4^{3-}, TP and TN within 5 m of the shoreline were substantially higher, and salinity lower, during the most recent survey compared to mean values (Figures 4 -6). Concentrations of NH_4^+ and turbidity were also higher during the most recent survey compared to the surface mean values at Site 1. These variations can be a result of sampling during a period of particularly low mixing of groundwater and ocean water in the nearshore zone, or may reflect an increase in nutrient subsidies to groundwater as a result of activities on land. Distinctions between the mean values and the most recent survey were also visible for turbidity in samples collected within 10 m of the shoreline at Site 3 (Figure 12).

C. Conservative Mixing Analysis

A useful treatment of water chemistry data for interpreting the extent of material input from land is application of a hydrographic mixing model. In the simplest form, such a model consists of plotting the concentration of a dissolved chemical species as a function of salinity. Comparison of the curves produced by such plots with conservative mixing lines provides an indication of the origin and fate of the material in question (Officer 1979, Dollar and Atkinson 1992, Smith and Atkinson 1993).

Figure 16 shows plots of concentrations of four chemical constituents (Si, NO_3^-, PO_4^{3-}, and NH_4^+) as functions of salinity for samples collected in December 2008. Figures 17 and 18 show the same type of plot with data pooled by transect site for a composite of all past surveys at Sites 1-4. In addition, data from the three surveys at Site 3-A, as well as for the most recent survey are shown in Figures 17 and 18. Each graph also shows four conservative mixing lines that are constructed by connecting the end member concentrations of open ocean water with irrigation well No. 4 located on the upper North Course of the Makena Resort (representative of groundwater upslope of the Makena Resort).

If the parameter in question displays purely conservative behavior (no input or removal from any process other than physical mixing), data points should fall on, or very near, the conservative mixing line. If, however, external material is added to the system through processes such as leaching of fertilizer nutrients to groundwater, data points will fall above the mixing line. If material is being removed from the system by processes such as uptake by biotic metabolic processes, data points will fall below the mixing line.

Dissolved Si represents a check on the model as this material is present in high concentration in groundwater, but is not a major component of fertilizer. In addition, Si is not utilized rapidly within the nearshore environment by biological processes. It can be seen in Figure 16 that when concentrations of Si are plotted as functions of salinity, all but one data point fall on or near the conservative mixing line created by connecting endpoint concentrations from water collected from the upslope irrigation well and the open ocean. Such good agreement indicates that marine waters at the five transect sites are primarily a mixture of groundwater flowing beneath the project and ocean water. The data point that deviates from the mixing line occurred in a low salinity sample and Site 1 and suggests either input of another source of groundwater in this area, or uptake of Si in the nearshore zone. Over the course of monitoring, data points from Site 1 have consistently been below the Si mixing lines in a similar manner as noted in December 2008 (Figure 17). These results indicate that with the exception of Transect 1, groundwater endmembers from upslope Well No. 4 provides a valid representation of groundwater that enters the ocean following flow through the Makena development. Over the course of monitoring since 1995, the relationship between salinity and Si has remained nearly constant (Figure 17).

NO_3^- is the form of nitrogen most common in fertilizer mixes that are used for enhancing turf growth. When the concentrations of NO_3^- are plotted as functions of salinity, data from different transect prescribes distinctly different patterns (Figure 16). Data points from Transects 2 (Makena Bay) and 4 (Control transect) lie on the well water-ocean mixing line. The position of these data arrays indicates that the source of NO_3^- entering the ocean at these sites contains little or no subsidies from activities on land. Inspection of the long-term mixing data (Figure 17) indicates that with the exception of two data points, all of the values of NO_3^- from Control site 4 fall on, or very near, the conservative mixing line. Such a result validates that Site 4 is indeed a good "control" area. Conversely, data points from the nearshore samples at Transects 1, 3, and 3-A all fall above the mixing line, indicating various subsidies of NO_3^- to the ocean from sources on land. Data points for Sites 3 and 3-A are similar in slope, and are slightly steeper in slope than data points from Site 1 (Figure 16). Such relationships indicate subsidies of NO_3^- at Transect sites 1, 3 and 3-A that are likely a result of leaching of golf course fertilizers to the groundwater lens. In addition to the golf courses, however, residences near the shoreline at Site 1 include landscaping and lawns, while residences and a wetland lie directly inshore from Site 3.

Transect Site 1 has also been used as a monitoring station for a similar evaluation of the effects of the Wailea Golf Courses on water chemistry that commenced in 1989. The lowest concentrations of NO_3^- relative to salinity at Transect site 1 occurred during the initial two years of study, with subsequent higher concentrations since 1992. Hence, there appears to have been an increase of NO_3^- in nearshore waters since 1992 that was not occurring in 1989-1991. Completion of the Wailea Gold Course occurred in December 1993, while completion of the Makena North Course occurred in November 1993. As the southern region of the Wailea Course and the northern part

of the Makena Course abut each other in the makai-mauka direction landward of ocean Transect 1, the increased concentrations of NO_3^- evident in Figure 16 may be a result of leaching of fertilizer materials from the combined golf courses to groundwater that enters the ocean in the sampling area.

Mixing analyses also indicate an ongoing input of NO_3^- at the shoreline of Stations 3 and 3A located off the existing Makena Golf Course as well as several new residences that have been constructed adjacent to the Golf Course (Figures 16 and 17). Such subsidies have been noted in past surveys, and it can be seen in Figure 17 that the magnitude of the slope of data points in the December 2008 survey is distinctly lower than in previous surveys. Hence, these data indicate that the subsidies of NO_3^- are not progressively increasing. In June 2008, renovation of the golf course fairways directly adjacent to the ocean began which included the complete removal of all turf and re-shaping of the fairways. Application of fertilizer was also curtailed and is not expected to be resumed for over one year. Future monitoring will clarify if the trend of NO_3^- input to the ocean is indeed decreasing.

While the data reveal a long-term subsidy to the concentration of NO_3^- in groundwater and the nearshore zone at several of the sampling sites, the concentrations of NO_3^- fall in clearly linear relationship as functions of salinity. The linearity of the data array indicates that there is no detectable uptake of this material by the marine environment. Such lack of uptake indicates that the nutrients are not being removed from the water column by metabolic reactions that could change the composition of the marine environment. Rather, the nutrient subsidies are diluted to background oceanic levels by physical processes of wind and wave mixing. As a result, the increased nutrients do not appear to have the potential to cause alteration in biological community composition or function.

Similar situations have also been observed in other locales in the Hawaiian islands where nutrient subsidies from golf course leaching result in excess NO_3^- in the nearshore zone. At Keauhou Bay on the Big Island, it was shown that owing to the distinct vertical stratification in the nearshore zone, the excess nutrients never come into contact with benthic communities, thereby limiting the potential for increased uptake by benthic algae. In addition, the residence time of the high nutrient water was short enough within the embayment to preclude phytoplankton blooms. As a result, while NO_3^- concentrations doubled as a result of golf course leaching for a period of at least several years, there was no detectable negative effect to the marine environment (Dollar and Atkinson 1992). Owing to the unrestricted nature of circulation and mixing off the Makena project (no confined embayments) it is reasonable to assume that the excess NO_3^- subsidies that are apparent in the present study will not result in alteration to biological communities.

Indeed, surveys of the nearshore marine habitats off of Makena reveal a generally healthy coral reef that does not appear to exhibit any negative effects from nutrient loading, particularly in the form of abundant algal biomass (Marine Research Consultants 2006). In addition to the lack of negative impacts to offshore coral communities, inspection of the entire shoreline fronting the Makena Resort revealed that there are no areas where excessive algal growth is presently occurring.

The other form of dissolved inorganic nitrogen, NH_4^+, generally does not show a linear pattern of distribution with respect to salinity for either the December 2008 survey (Figure 16) or the entire

monitoring program (Figure 18). Some samples with near oceanic salinity also displayed the highest concentrations of NH_4^+. The lack of a correlation between salinity and concentration of NH_4^+ suggests that this form of nitrogen is not present in the marine environment as a result of mixing from groundwater sources. Rather, NH_4^+ is generated by natural biotic activity in the ocean waters off Makena. However, during the December 2008 survey, the highest measurements for NH_4^+ occurred in low salinity nearshore water from Sites 1 and 3-A.

PO_4^{3-} is also a major component of fertilizer, but is usually not found to leach to groundwater to the extent of NO_3^-, owing to a high absorptive affinity of phosphorus in soils. During December 2008, two data points from Site 1 fall below the mixing line while two data points from Site 3-A fall above the mixing line. Most of the data points representing PO_4^{3-} vs. salinity do not show consistent linearity with respect to the conservative mixing line. In fact, nearly all data points for control Site 4 lie above the mixing line. Thus, the elevated NO_3^-, which is likely a result of golf course and residential landscaping, is not reflected in similar subsidies of PO_4^{3-}.

D. Time Course Mixing Analyses

While it is possible to evaluate temporal changes from repetitive surveys conducted over time in terms of concentrations of water chemistry constituents (See Section C), a more informative and accurate method of evaluating changes over time is to utilize the results of scaling nutrient concentrations to salinity. As discussed above, the simple hydrographic mixing model consisting of plotting concentrations of nutrient constituents versus salinity eliminates the ambiguity associated with comparing only the concentrations of samples collected during multiple samplings at different stages of tide and weather conditions. Figures 19 and 20 show plots of Si and NO_3^-, respectively, as functions of salinity collected during each year of sampling (1995-2008). Also shown in Figures 19 and 20 are straight lines that represent the least squares linear regression fitted through concentrations of Si and NO_3^- as functions of salinity at each monitoring site for each year. Tables 6-8 show the numerical values of the Y-intercepts, slopes, and respective upper and lower 95% confidence limits of linear regressions fitted through the data points for Si, NO_3^-, and PO_4^{3-} as functions of salinity for each year of monitoring at Transect Sites 1-4. Site 3-A has only been sampled four times. Data from Site 3-A is included in this comparison, and is shown in a different color.

The magnitude of the contribution of nutrients originating from land based activities to groundwater will be reflected in both the steepness of the slope and the magnitude of the Y-intercept of the regression line fitted through the concentrations scaled to salinity (the Y-intercept can be interpreted as the concentration that would occur at a salinity of zero if the distribution of data points is linear). This relationship is valid because with increasing contributions from land, nutrient concentrations in any given parcel of water will increase with no corresponding change in salinity. Hence, if the contribution from land to groundwater nutrient composition is increasing over time, there would be progressive increases in the absolute value of the slopes, as well as the Y-intercepts of the regression lines fitted through each set of annual nutrient concentrations when plotted as functions of salinity. Conversely, if the contributions to groundwater from land are decreasing, there will be decreases in the absolute values of the slopes and Y-intercepts.

Plots of the values of the slopes (Figure 21) and Y-intercepts (Figure 22) of regression lines fitted though concentrations of Si, NO_3^- and PO_4^{3-} scaled to salinity during each survey year provide an indication of the changes that have been occurring over time in the nearshore ocean off the Makena Resort. As stated above, Si provides the best case for evaluating the effectiveness of the method, as Si is present in high concentration in groundwater but is not a component of fertilizers. NO_3^- and PO_4^{-3} are the forms of nitrogen and phosphorus, respectively, found in high concentrations in groundwater relative to ocean water, and are the major nutrient constituents found in fertilizers.

Examination of Figures 21 and 22, as well as Tables 6-8 reveal that none of the slopes or Y-intercepts of Si, NO_3^- and PO_4^{3-} from 1995 to 2008 at any of the transect sites exhibit any indication of progressively increasing or decreasing values over the course of monitoring. The term "REGSLOPE" in Tables 6-8 denotes the values of the slopes and 95% confidence limits of linear regressions of the values of the yearly slopes and Y-intercepts as a function of time. For all sites, the upper and lower 95% confidence limits of the REGSLOPE coefficients are not significantly different than zero, indicating that there is no statistically significant increase or decrease in the salinity-scaled concentrations of Si, NO_3^- and PO_4^{3-} over the course of the monitoring program (Tables 6-8).

For all three nutrients, there is little variation in either slopes or Y-intercepts during any year at Site 1, located off the "5 Graves" area downslope from the juncture of the Wailea and Makena Resorts (Figures 21 and 22). Such lack of variation indicates relatively consistent concentrations of Si, NO_3^- and PO_4^{3-} in groundwater entering the ocean over the thirteen years of monitoring. Sites 2 (Makena Landing) and 4 ('Ahihi-Kina`u) also show relative constant trends with time with the exception of 2001 which is marked by large spikes in Si and PO_4^{3-}. Such a fluctuation is not present for NO_3^- in 2001. Sampling in 2001 was conducted during a period of rough winter sea conditions marked by vigorous mixing of the water column. As a result, there was very weak linear relationship between nutrient concentrations and salinity.

At Site 3, located directly downslope for the point of the Makena Golf Course closest to the ocean, there is a trend of decreasing NO_3^- between 2002 and 2004, an increasing trend from 2004 to 2007, followed by another downturn in 2008 (Figures 21 and 22). As a result of these reversing trends, there is no overall significant change over the six-year period of monitoring. The multiple reversing trend may reflect changes in land use, such as variation in fertilizer application or construction-related activities in 2002-2004 versus 2004-2007.

F. Compliance with DOH Standards

Tables 1 and 2 also show samples that exceed DOH water quality standards for open coastal waters under "wet" and "dry" conditions. These criteria are applied depending upon whether the area is likely to receive less than (dry) or greater than (wet) 3 million gallons of groundwater and/or surface water input per mile per day. As it is not possible to accurately estimate groundwater and surface water discharge, both wet and dry standards are considered. DOH standards include specific criteria for three situations; criteria that are not to be exceeded during either 10% or 2% of the time, and criteria that are not to be exceeded by the geometric mean of

samples. With twenty-two samplings collected to date, comparison of the 10% or 2% of the time criteria for any sample is not statistically meaningful. However, comparing sample concentrations to these criteria provide an indication of whether water quality is near the stated specific criteria.

Boxed values in Tables 1 and 2 show instances where measurements exceed the DOH standards under dry conditions, while boxed and shaded values show instances where measurements exceed DOH standards under wet conditions.

Results from the December 2008 survey indicated several measurements of NO_3^- and NH_4^+ along all five transect sites exceeded the 10% DOH criteria under wet or dry conditions (Tables 1 and 2). All of the instances where the DOH criteria for NO_3^- was exceeded were from samples collected within 50 m of the shoreline. One measurement of TP, six measurements of TN and turbidity and seven measurements of Chl a exceeded the 10% DOH criteria under dry conditions. Under "wet" criteria, no measurements of TP or turbidity were exceeded, and only five measurements of TN and one of Chl a exceeded the "wet" standards. It is of interest to note that at Transect Site 4, which is considered the control station beyond the influence of the Makena Resort, exceedance of DOH criteria for NO_3^-, NH_4^+ and Chl a was noted.

Tables 3 and 4 show geometric means of samples collected at the same locations during the twenty-two increments of the monitoring program at Sites 1, 2 and 4. Geometric means of samples collected over thirteen increments of sampling at Site 3 and three increments of sampling at Site 3-A are also shown. These tables also specify the samples that exceed the DOH geometric mean limits for open coastal waters under "dry" (boxed) and "wet" (boxed and shaded) conditions. For NO_3^-, NH_4^+, and TN numerous dry and wet standards were exceeded on all transects. Six samples of TP and fifteen samples of turbidity exceeded standards. All but four samples exceed the geometric mean standards for Chl a.

Site 4 is considered a control transect, in that it is not located offshore of a resort, golf course or dense residential development. It can be seen in Tables 3 and 4, however, that the number of samples that exceed geometric mean criteria at Site 4 are comparable to the other three sites, all of which are located downslope from the Makena Resort. Hence, Resort activities, including golf courses cannot be attributed as the sole (or even major) factor causing water quality to exceed geometric mean standards.

Several comments can be made regarding the present DOH water quality standards and how they apply to the monitoring program at the Makena Resort. As noted above, the category of water quality standards that are applicable for the Makena Monitoring program are "Open Coastal Waters." As the name implies, these standards apply to "open" waters that can be reasonably defined as "waters beyond the direct influence of land." In order to evaluate the effects of land uses on the nearshore ocean off Makena, the selected sampling regime collects water within a zone that extends from the shoreline to the open coastal ocean. As a result, sampling takes place within the region of ocean that is directly influenced by land. If the monitoring protocol were changed to include only those sampling locations beyond 50-100 m from shore (i.e., open coastal waters), which is completely valid with respect to meeting DOH regulatory compliance, virtually all of factors discussed above relating to the effects of activities on land to the nearshore ocean would not be observed.

Initial steps have been taken by DOH to rectify this situation. During revision of the Department of Health water quality standards in 2004, a unique set of monitoring criteria was added for the West Coast of the Island of Hawaii (i.e., "Kona standards"). The rationale for these unique standards was the recognition that existing numerical "standards" represent offshore coastal waters that are beyond the natural confluence of land and the nearshore ocean. As a result, the West Hawaii standards recognize that groundwater entering the ocean at the shoreline contains substantially elevated nutrients relative to open coastal waters. As a result, the Kona criteria provide the potential to meet water quality standards with elevated nutrient concentrations resulting from natural sources of groundwater input. As the same processes of groundwater discharge to the coastal ocean have been documented in Maui, it is hopeful that similar new provisions of the water quality standards with soon be applicable to the South Maui area.

III. SUMMARY

- The twenty-second phase of water chemistry monitoring of the nearshore ocean off the Makena Resort was carried out on December 13, 2008. Sixty-two ocean water samples were collected on four transects spaced along the project ocean frontage and on one control transect. Site 1 was located at the northern boundary of the project, Site 2 was located near the central part of the Makena North Golf Course in the center of Makena Bay, Site 3-A (initiated during the June 2007 survey) was located near the southern boundary of Maluaka Bay, Site 3 was downslope from the part of Makena South Golf Course that comes closest to the shoreline, and Control Site 4 was located to the south of Makena Resort near the northern boundary of the 'Ahihi-Kina`u Natural Area Reserve. Sampling transects extended from the shoreline out to the open coastal ocean. Water samples were analyzed for chemical criteria specified by DOH water quality standards, as well as several additional criteria. In addition, water samples were collected from nine irrigation wells and an irrigation lake.

- Water chemistry constituents that occur in high concentration in groundwater (Si, NO_3^- and PO_4^{3-}) displayed distinct horizontal gradients with high concentrations nearest to shore and decreasing concentrations moving seaward. Groundwater input (based on salinity) was greatest at Sites 1 and 3-A, but was also evident at the other three sites. As Site 4 was not located in the vicinity of the Makena Resort, it is apparent that groundwater input is not solely a function of Resort land usage.

- Vertical stratification of the water column was also evident on all transects during December 2008, with many surface samples displaying higher nutrient and lower salinities than the corresponding bottom samples. The strong vertical and horizontal patterns of distribution indicate that physical mixing processes generated by tide, wind, waves and currents were insufficient to completely mix the water column throughout the sampling area during the time of the monitoring survey.

- Chl *a* was elevated near the shoreline at Sites 1, 3-A and 4 compared to offshore samples. At Sites 2 and 3, Chl *a* was lowest in a mid-zone between 10 and 100 m offshore. Turbidity was elevated in the shoreline samples at all five sites and was higher in magnitude at Sites 1, 2 and 3 compared to Sites 3-A and 4. Site 2 is located at the point where sediment-

laden storm water runoff entered the ocean following a flash flood in October 1999. While the highly turbid conditions associated with the runoff event are no longer evident, normal processes of circulation (tidal exchange, wave mixing) and the silt/sand bottom have often resulted in slightly more turbid conditions in Makena Bay (Site 2) compared to the other sampling sites that occur in areas with predominantly hard reef substrata. At sampling stations beyond 2 m from the shoreline, turbidity levels at Site 2 were not elevated relative to other transect sites.

- Other organic water chemistry constituents that do not occur in high concentrations in groundwater (NH_4^+, TON, TOP) did not show any distinctive patterns with respect to horizontal gradients.

- Scaling nutrient concentrations to salinity indicates that there were measurable subsidies of NO_3^- to groundwater that enters the nearshore ocean at three Transect sites. Results of the December 2008 monitoring indicated that these subsidies were greatest in magnitude at Sites 3A and 3, followed by Site 1. No subsidies of NO_3^- were apparent at Site 2 (Makena Landing) or Site 4 ('Ahihi-Kina`u). These subsidies, which are likely a result of land uses involving fertilizers, substantially increase the concentration of NO_3^- with respect to salinity in groundwater flowing to the ocean compared to natural groundwater. The area shoreward of Site 1 includes the juncture of the southern part of the Wailea Gold Course and the northern part of the Makena North Course, as well as residential development. Sites 3 and 3A are directly downslope from the Makena South Course in an area were the golf course extends to the shoreline. In addition, private residences are near completion upslope of Transect 3, and it is possible that a cesspool remains from a house that was recently torn down. Hence, the subsidies of NO_3^- noted at these sites may result from a combination of sources.

- Linear regression statistics of nutrient concentration plotted as functions of salinity are useful for evaluating changes to water quality over time. When the regression values of nutrient concentrations versus salinity are plotted as a function of time, there are no statistically significant increases or decreases over the thirteen years of monitoring at any of the survey sites. The lack of increases in these slopes and intercepts indicate that there has been no consistent change in nutrient input from land to groundwater that enters the ocean from 1995 to 2008 (2002 to 2008 at Site 2). At Site 3 off the Makena Resort South Golf Course, there was a progressive decrease in NO_3^- input between 2002 and 2004, followed by an increase between 2004 and 2007, and another decrease in 2008. Further monitoring at this site will be of interest to note the future direction of the oscillating trends noted in the last six years.

- Comparing water chemistry parameters to DOH standards revealed that several measurements of NO_3^- and NH_4^+, a few measurements of TN, turbidity and Chl a, and one measurement of TP exceeded the DOH "not to exceed more than 10% of the time" criteria for dry and wet conditions of open coastal waters. It is apparent that the concentrations of NO_3^- in nearshore marine waters that contains a mixture of seawater and natural groundwater may exceed DOH criteria with no subsidies from human activities on land. Numerous values of NO_3^-, NH_4^+, TN, turbidity and Chl *a* exceeded specified limits for geometric means. Such exceedances occurred at all survey sites, including the control site that was far from any golf course influence. The consistent exceedance of water quality standards is in large part a

consequence of the standards not accounting for the natural effects of groundwater discharge to the nearshore ocean and resultant zones of mixing.

- As in past surveys, there is a subsidy of dissolved inorganic nutrients (e.g., NO_3^- and sometimes to a lesser extent PO_4^{3-}) to groundwater that enters the nearshore ocean at sampling sites downslope from parts of the Makena Resort. Without question, such input is a consequence of various land use activities. However, none of these inputs have increased significantly over time, although there is an indication of the beginning of a declining trend in the most recent data. Monitoring of coral reef community structure that is part of the ongoing monitoring, as well as the noted lack of any nuisance algal aggregations in the nearshore area indicate that the nutrient subsidies are not detrimental to marine community structure.
- The next phase of the Makena Resort monitoring program is scheduled for the June of 2009.

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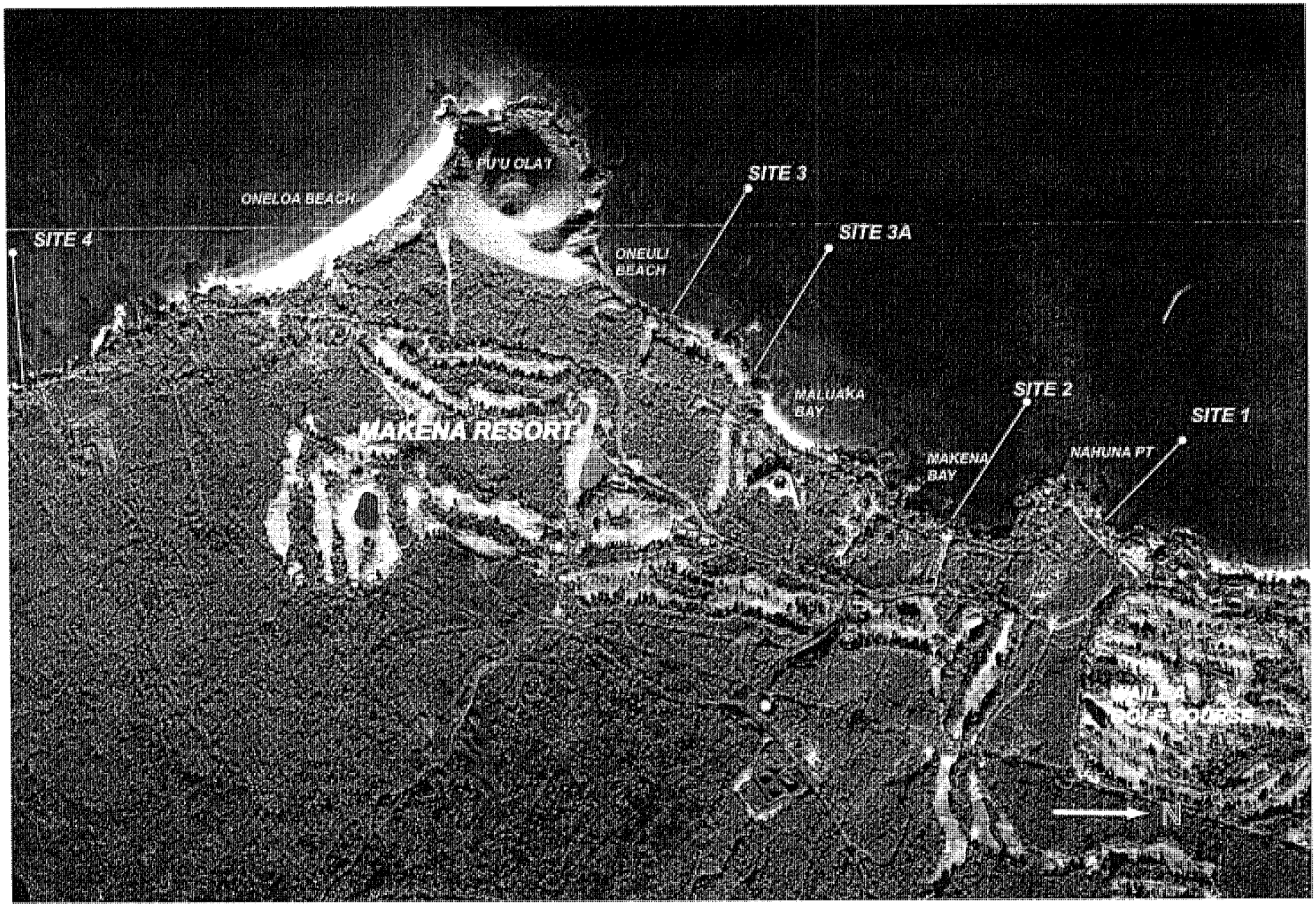

FIGURE 1. Aerial photograph of Makena Resort on southwest coastline of Maui. Also shown are locations of five water sampling transects that extend from the shoreline to 150-200 m from shore. The southern end of the Wailea golf course is visible at right.

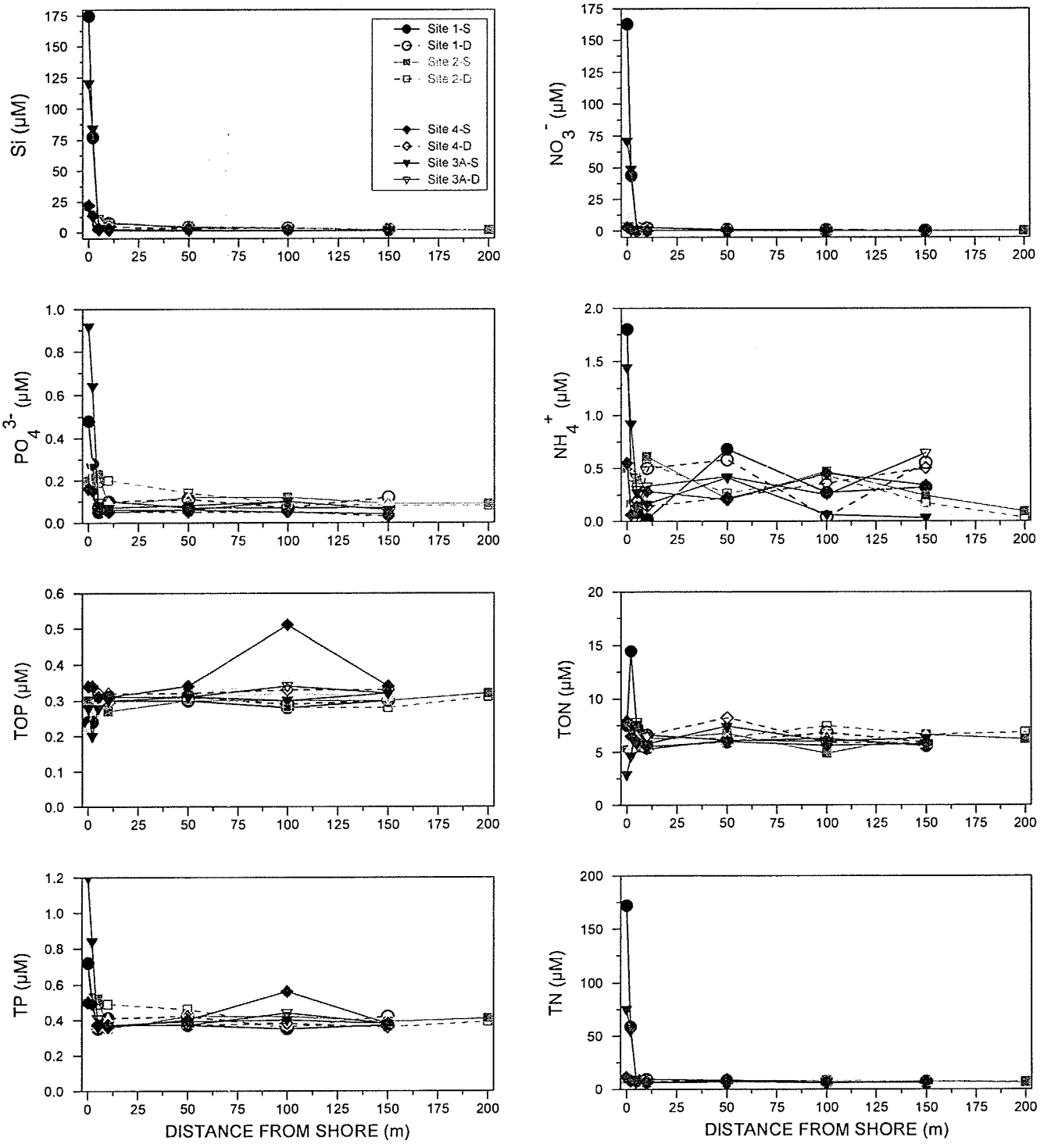

FIGURE 2. Plots of dissolved nutrients in surface (S) and deep (D) samples collected on December 13, 2008 as a function of distance from the shoreline in the vicinity of Makena Resort. For site locations, see Figure 1.

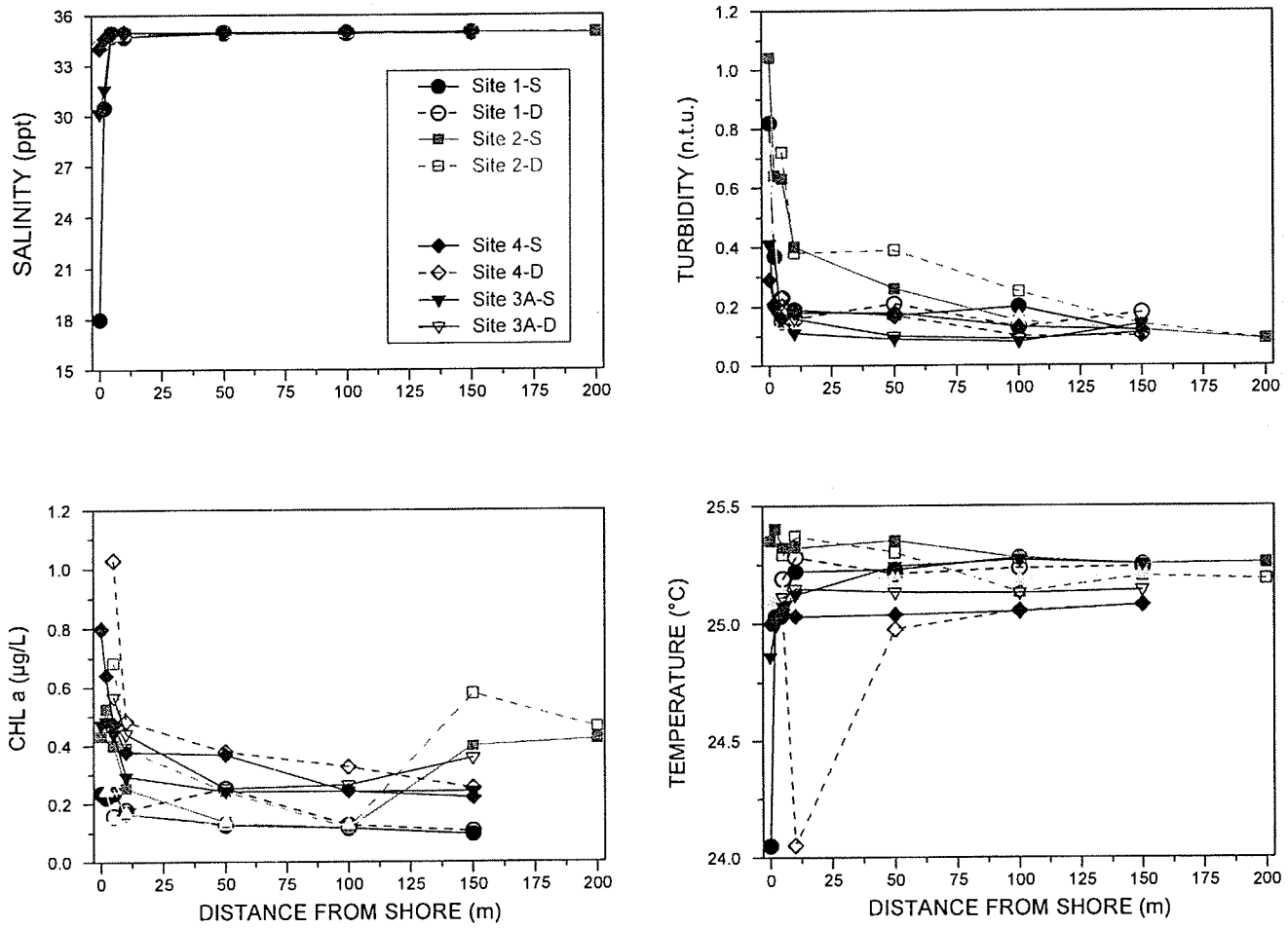

FIGURE 3. Plots of water chemistry constituents in surface (S) and deep (D) samples collected on December 13, 2008 as a function of distance from the shoreline in the vicinity of Makena Resort. For site locations, see Figure 1.

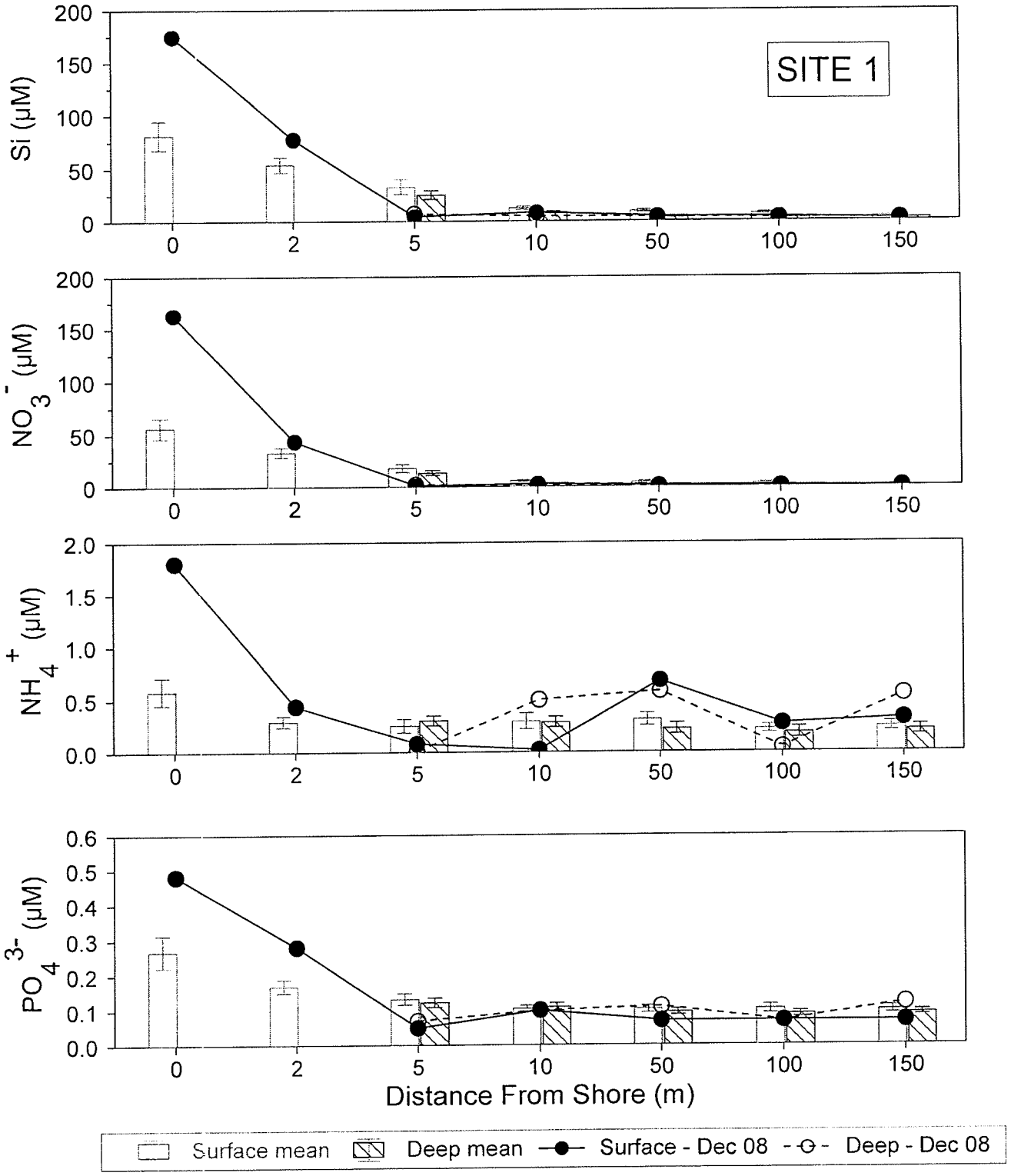

FIGURE 4. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 1, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

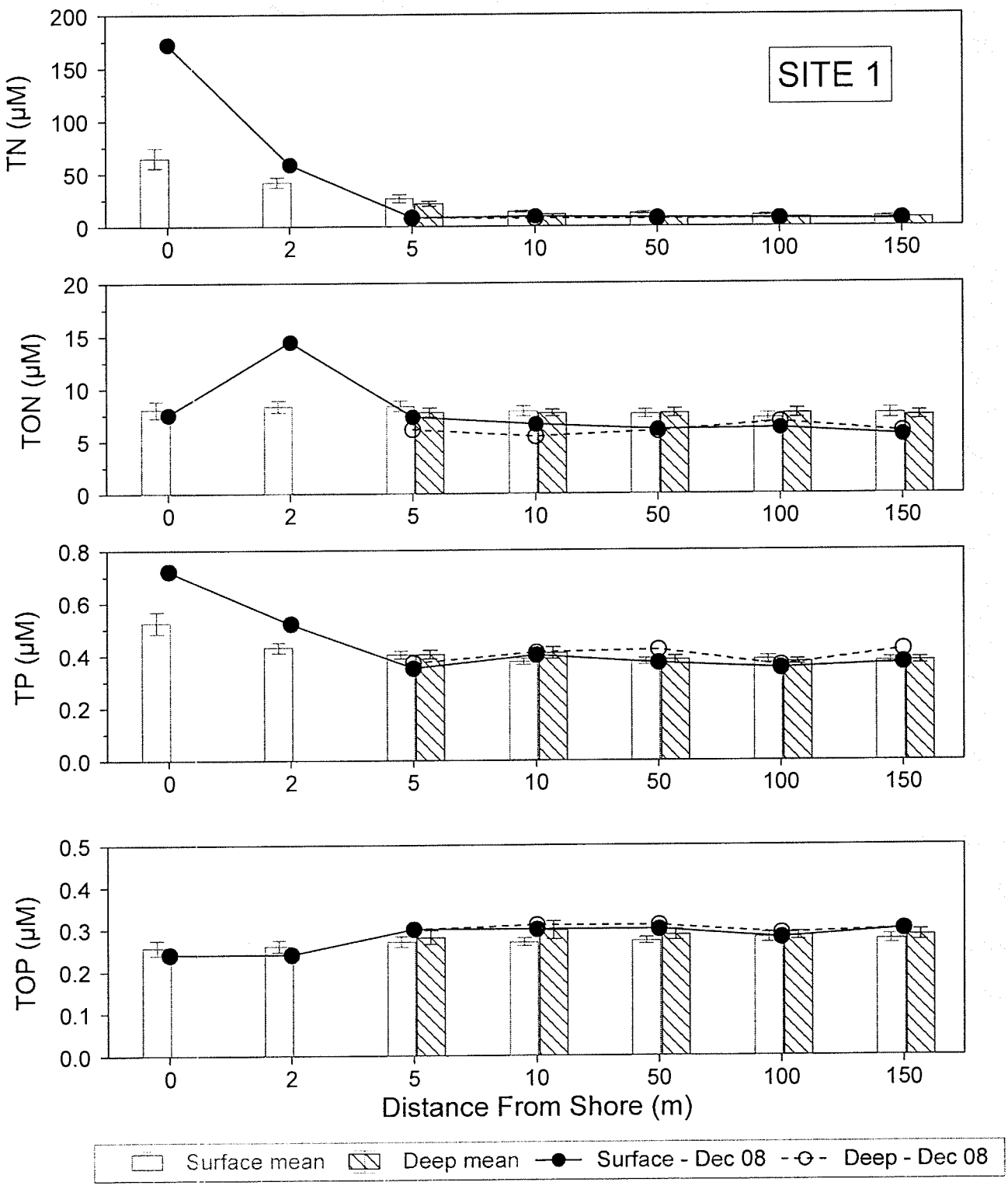

FIGURE 5. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 1, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

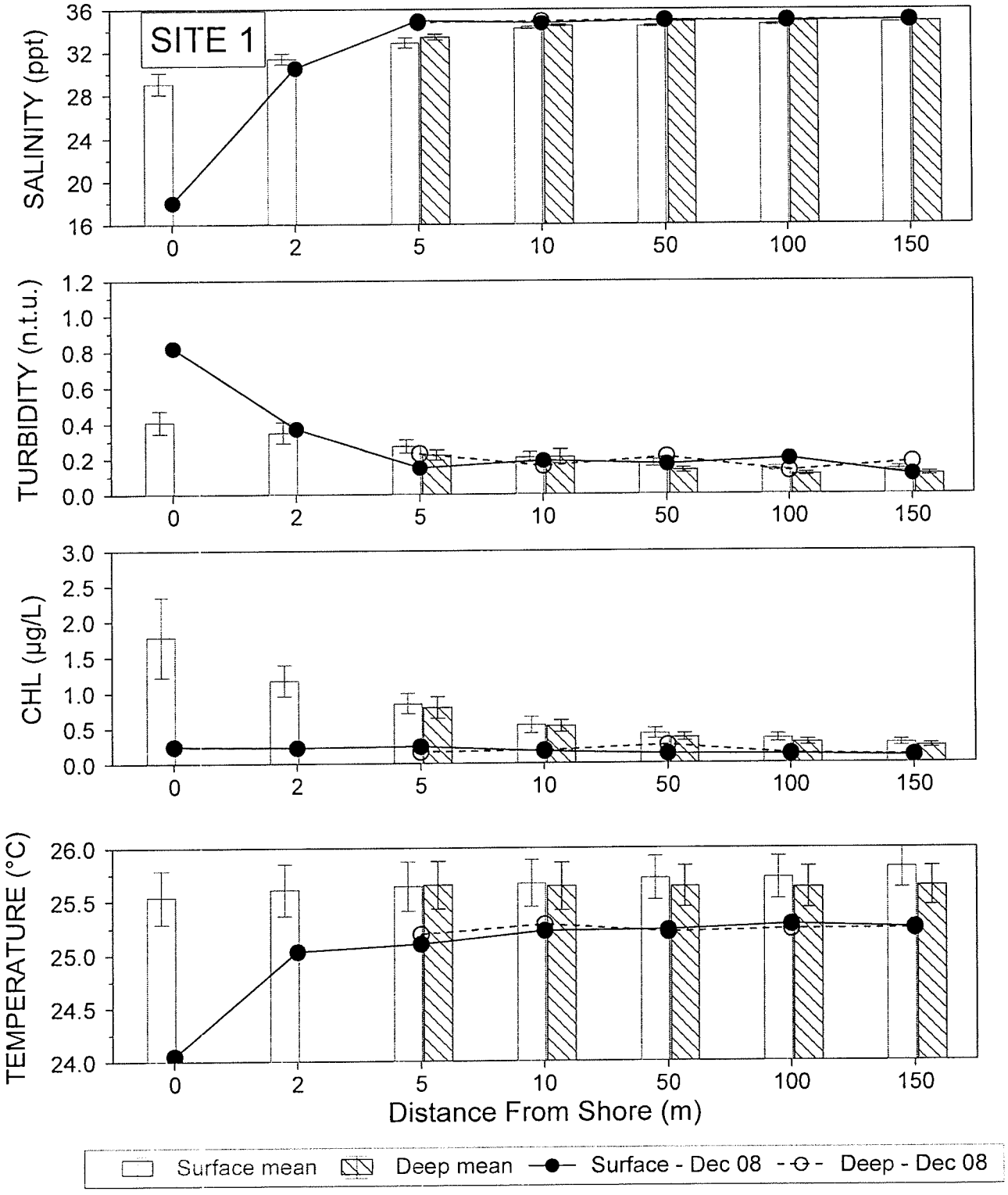

FIGURE 6. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 1, offshore of the Makena Resort. Data points and connected lines from samples collected during the most survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

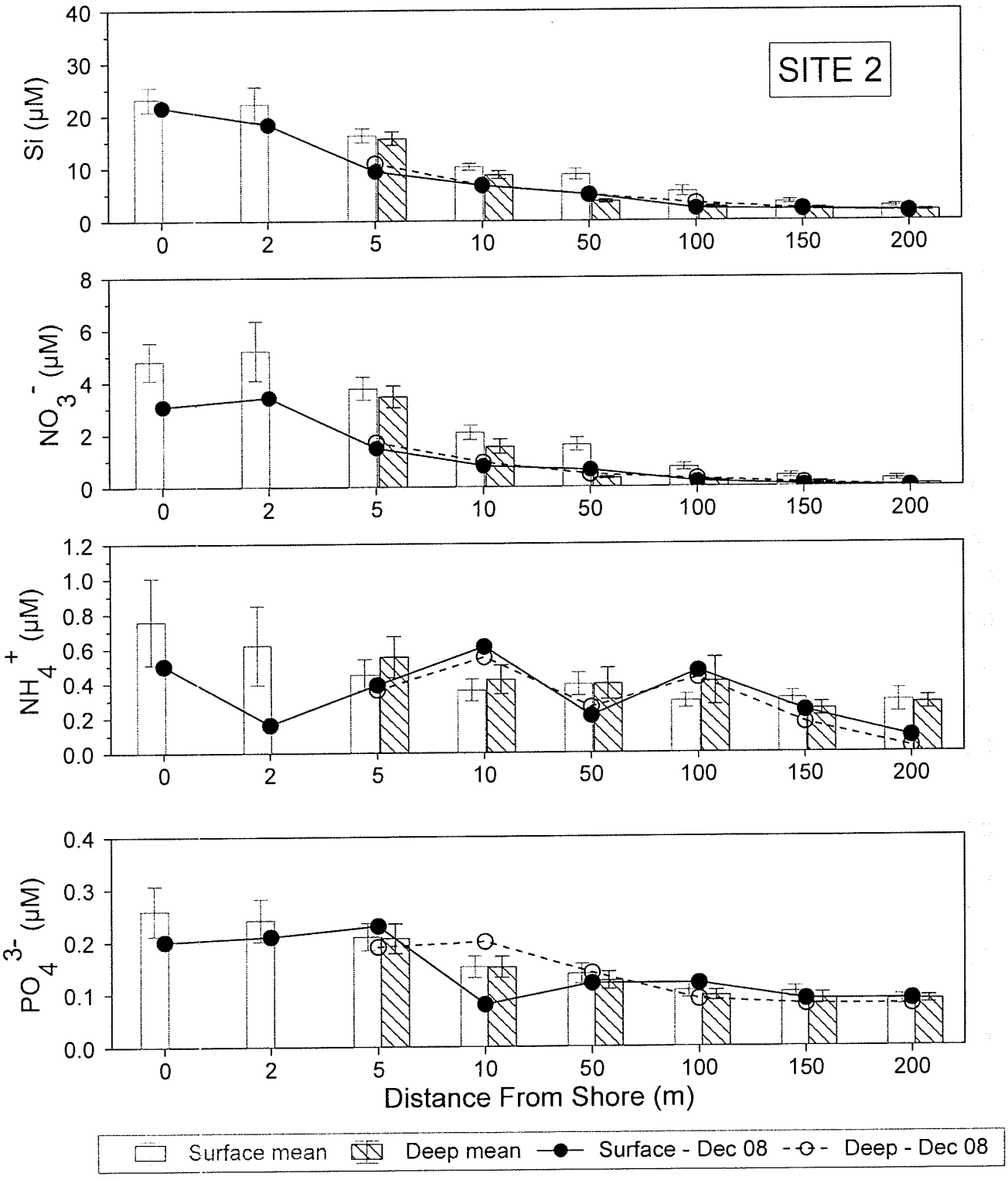

FIGURE 7. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 2, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

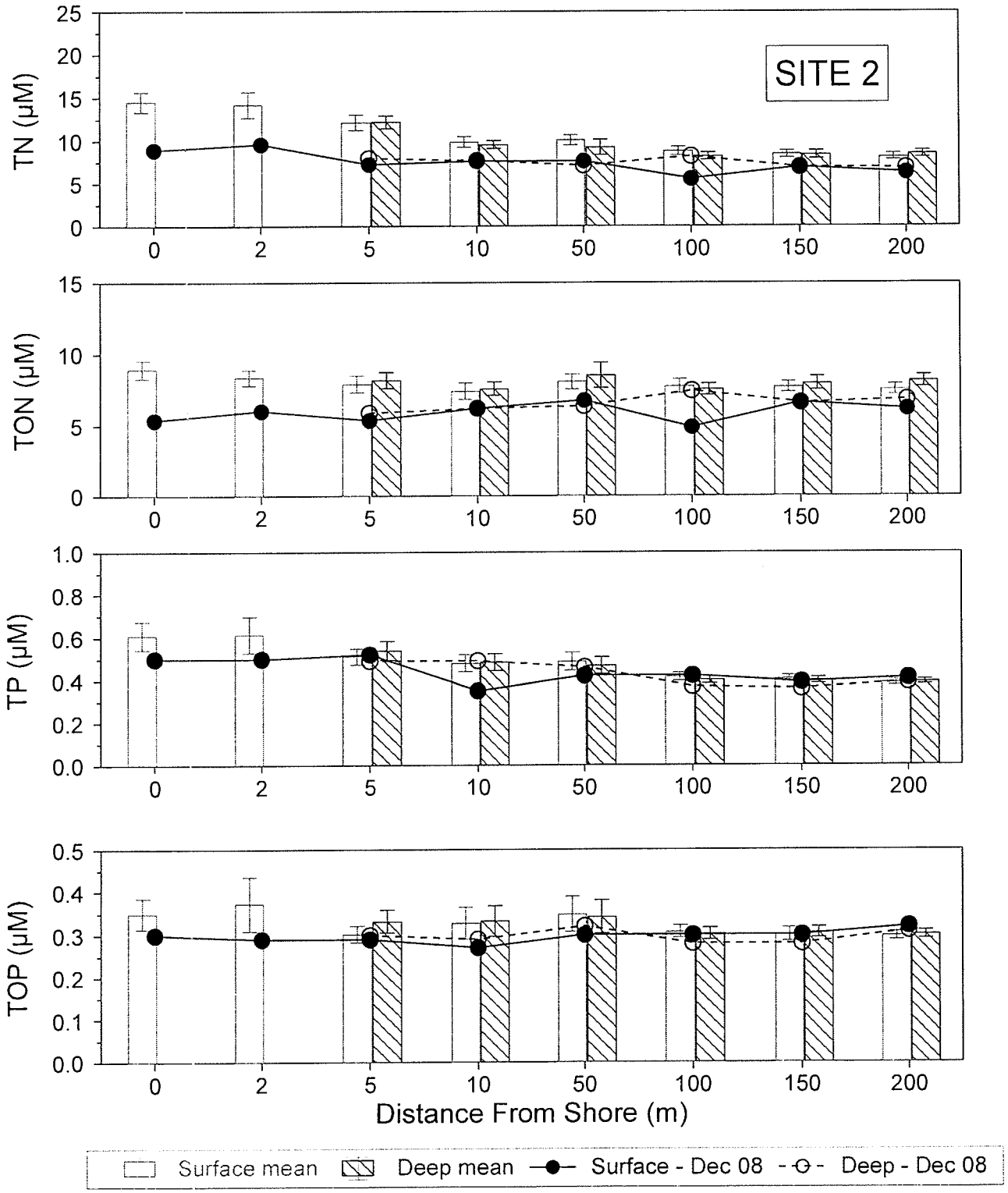

FIGURE 8. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 2, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at ecch sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

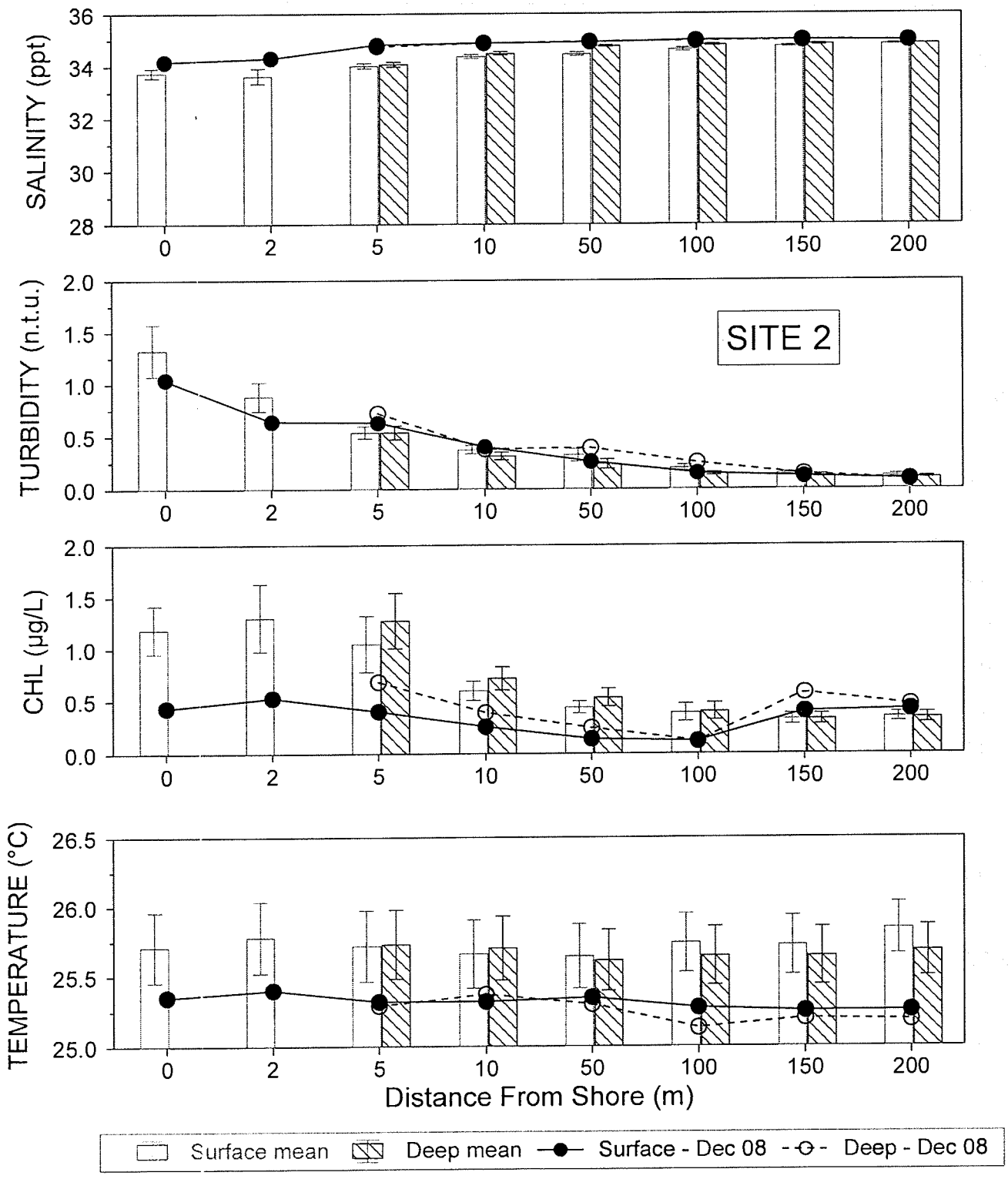

FIGURE 9. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 2, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey,bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

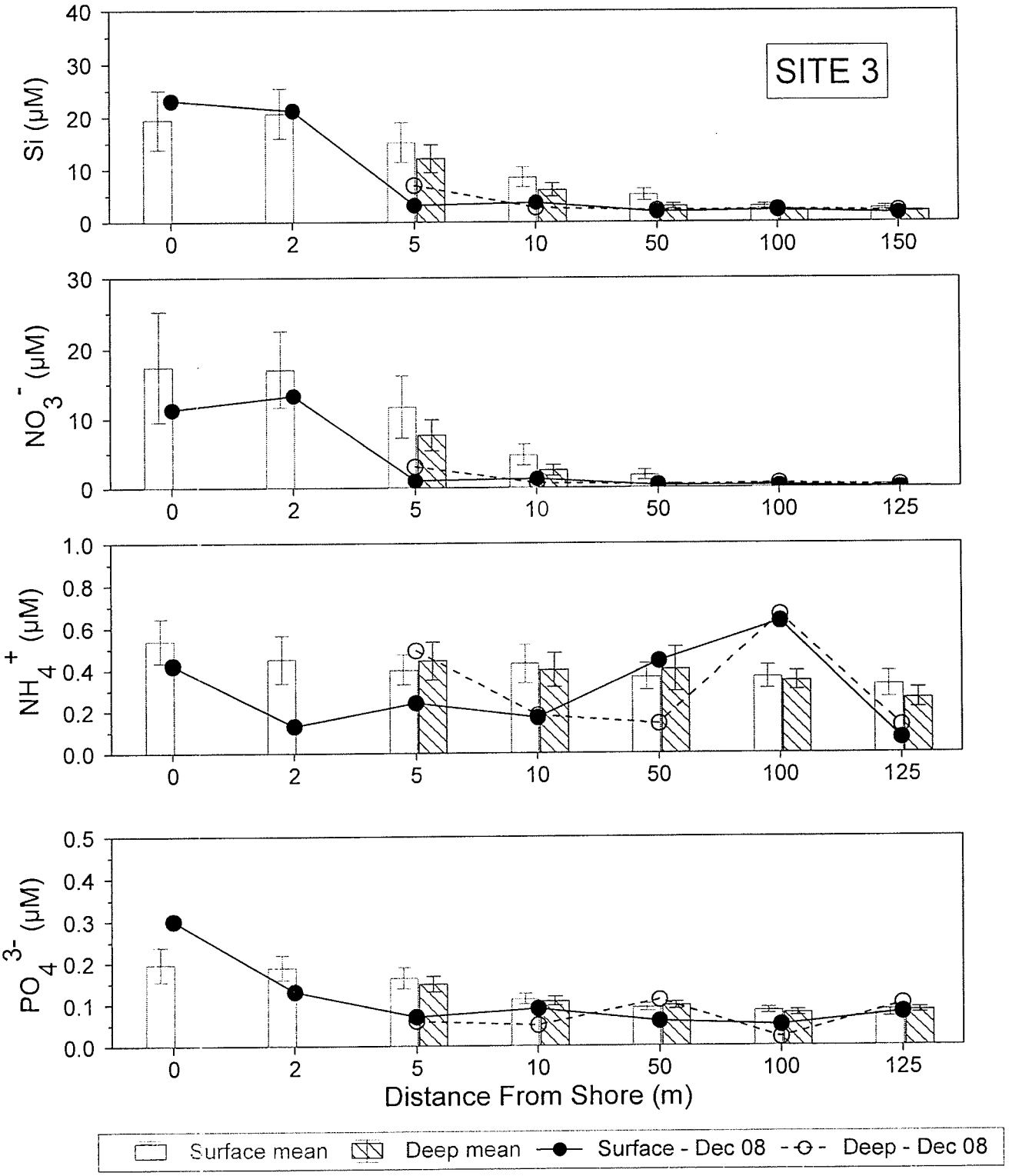

FIGURE 10. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 3, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

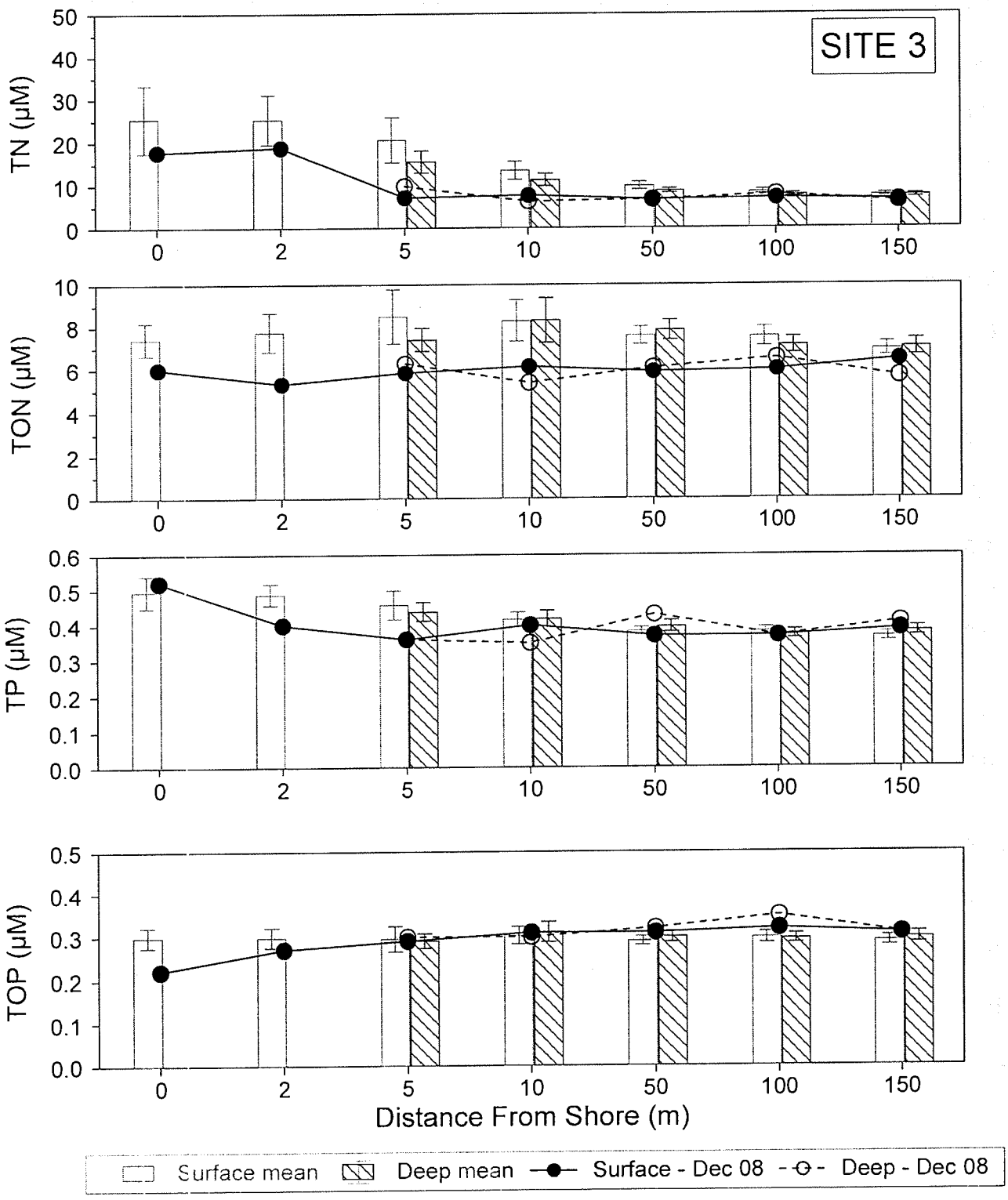

FIGURE 11. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 3, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

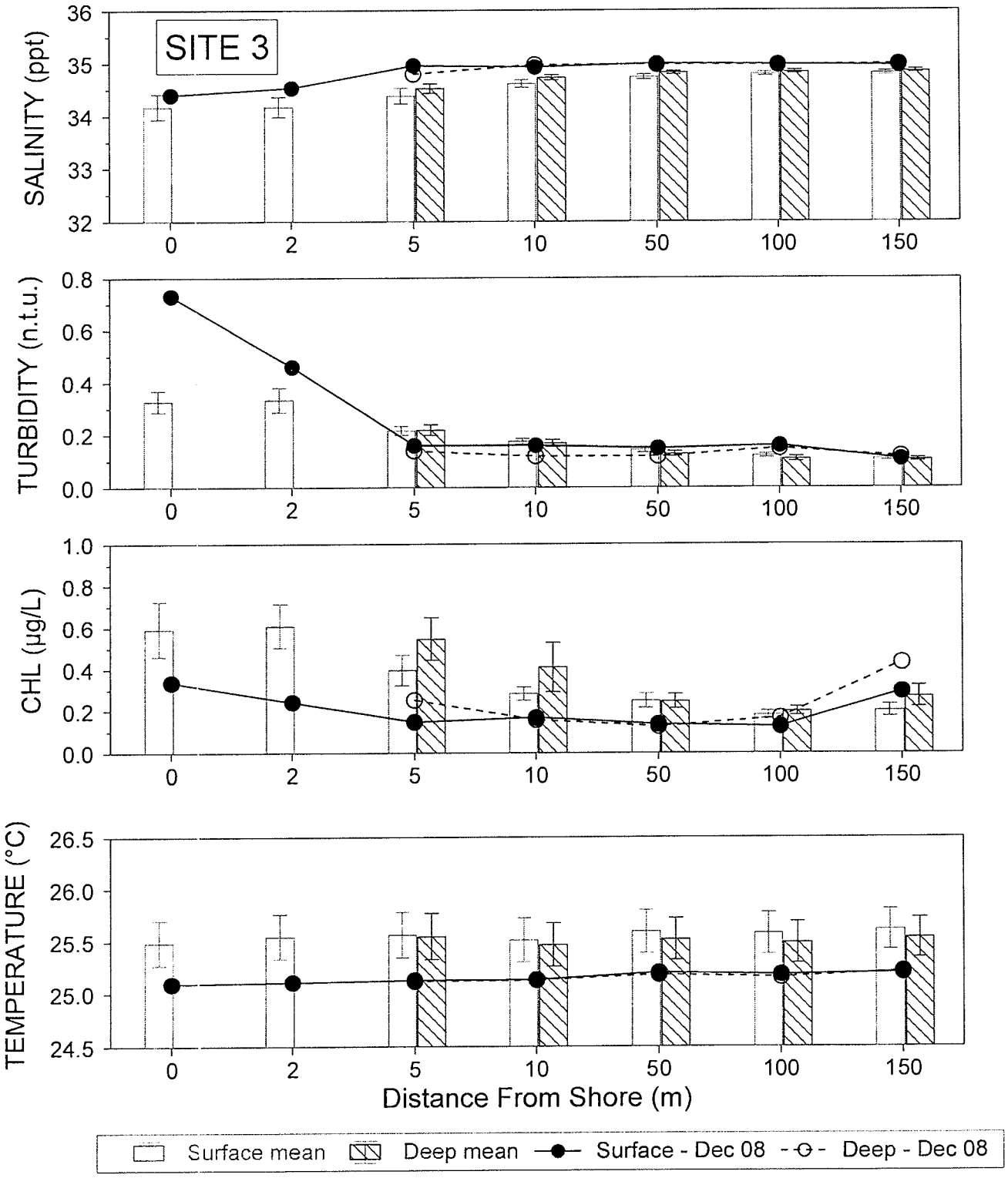

FIGURE 12. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 3, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

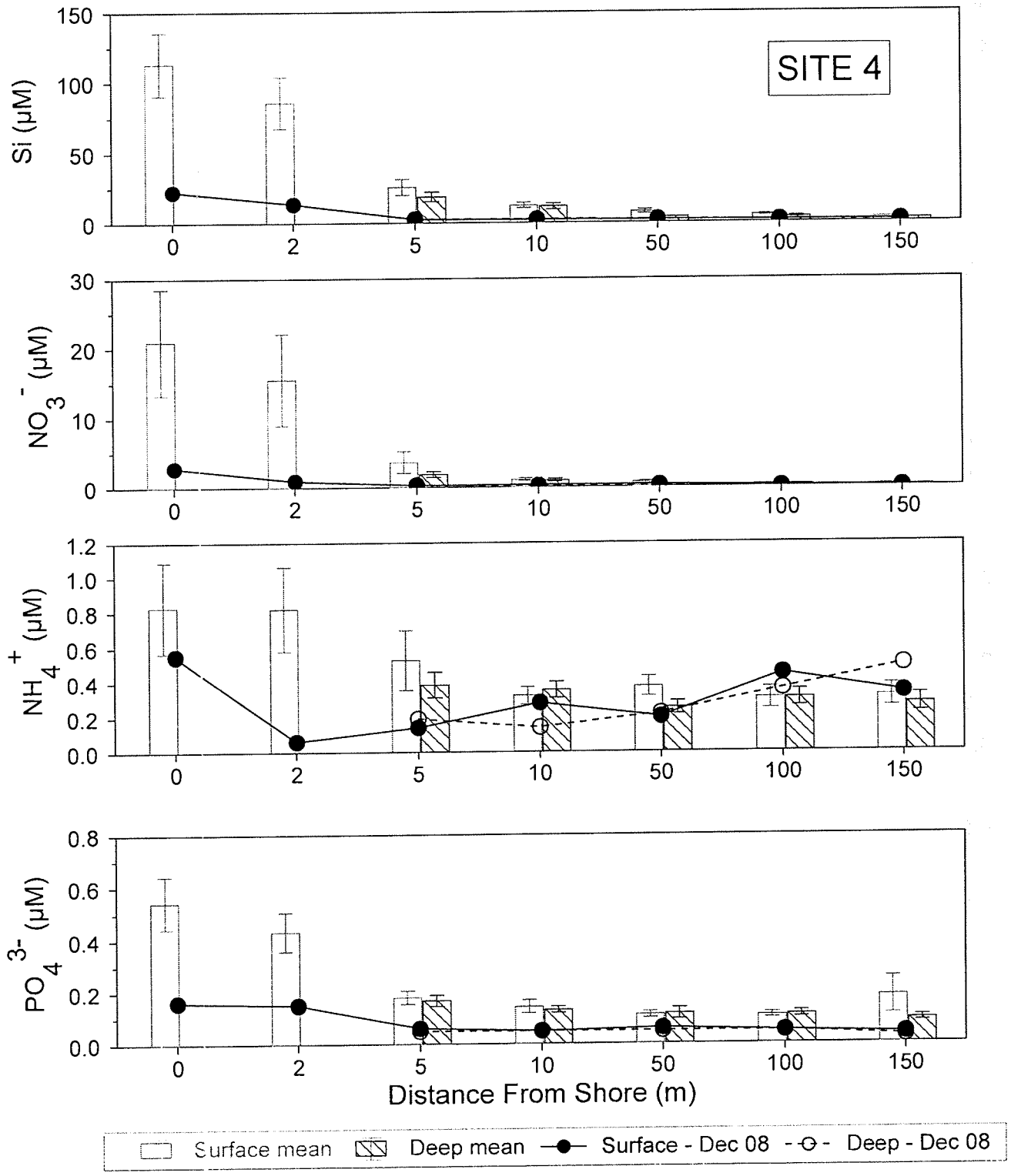

FIGURE 13. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 4, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

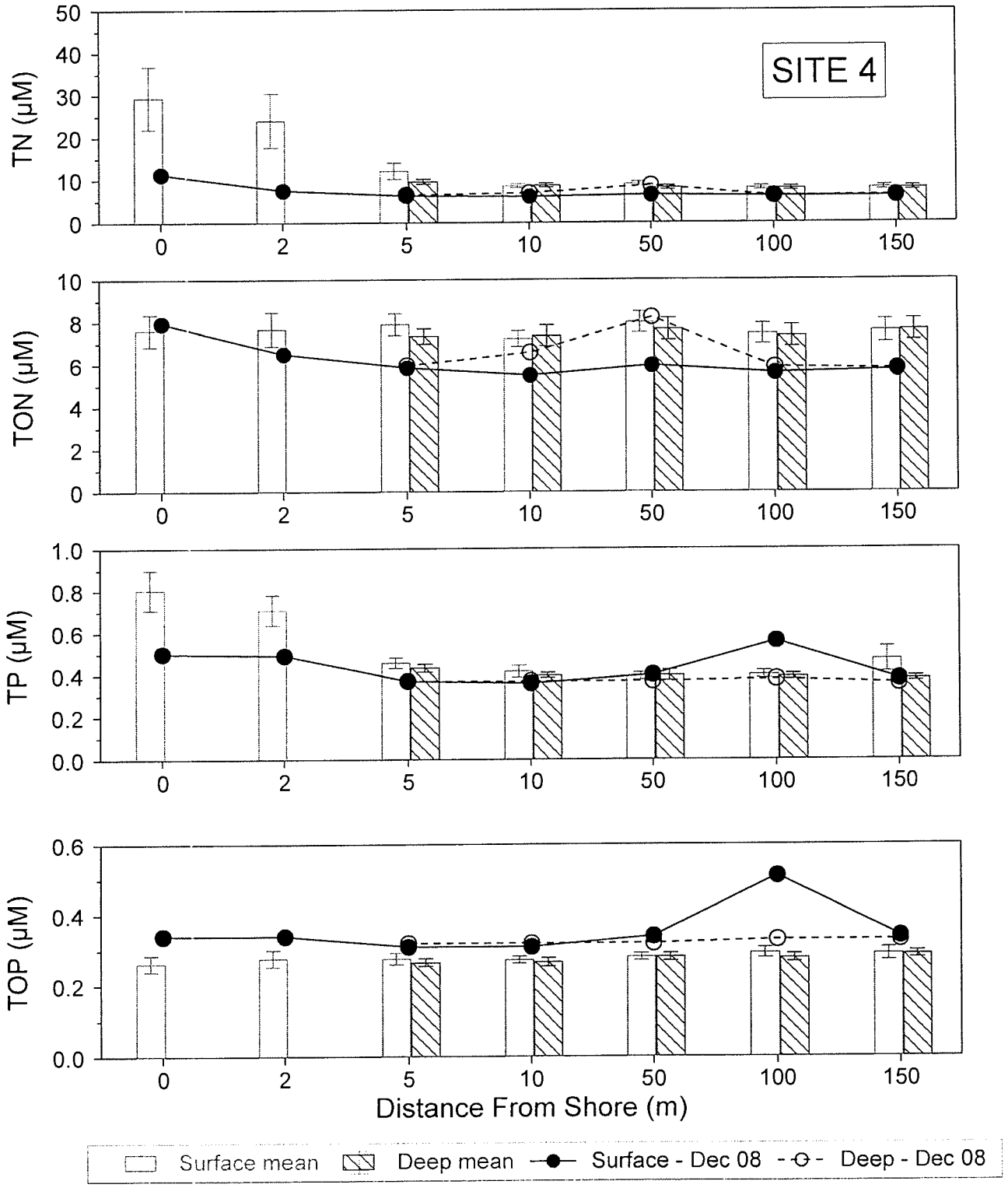

FIGURE 14. Plots of dissolved nutrient constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 4, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

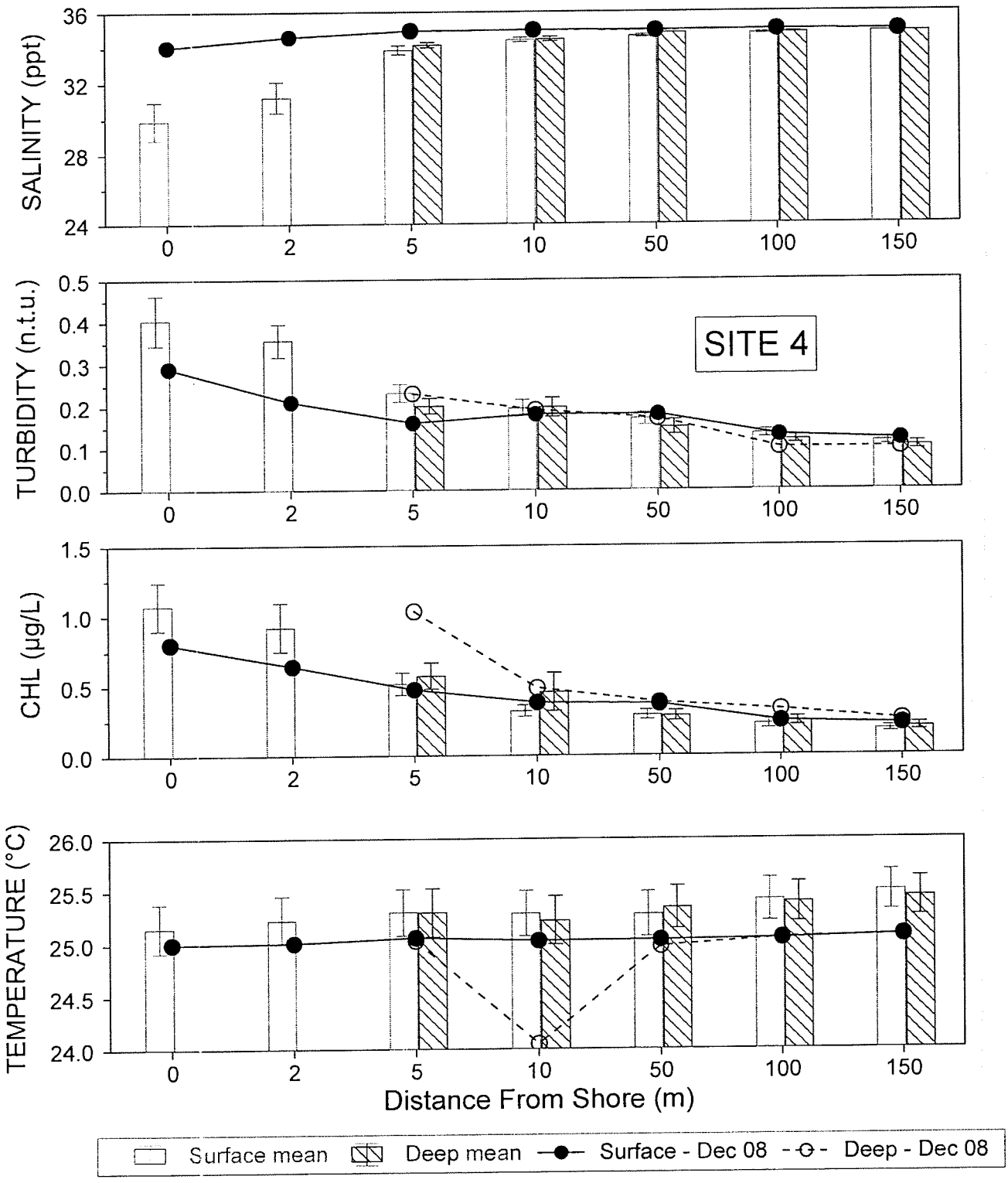

FIGURE 15. Plots of water chemistry constituents measured in surface and deep water samples as a function of distance from the shoreline at Site 4, offshore of the Makena Resort. Data points and connected lines from samples collected during the most recent survey, bar graphs represent mean values at each sampling station for surveys conducted since August 1995 (N=22). Error bars represent standard error of the mean. For site location, see Figure 1.

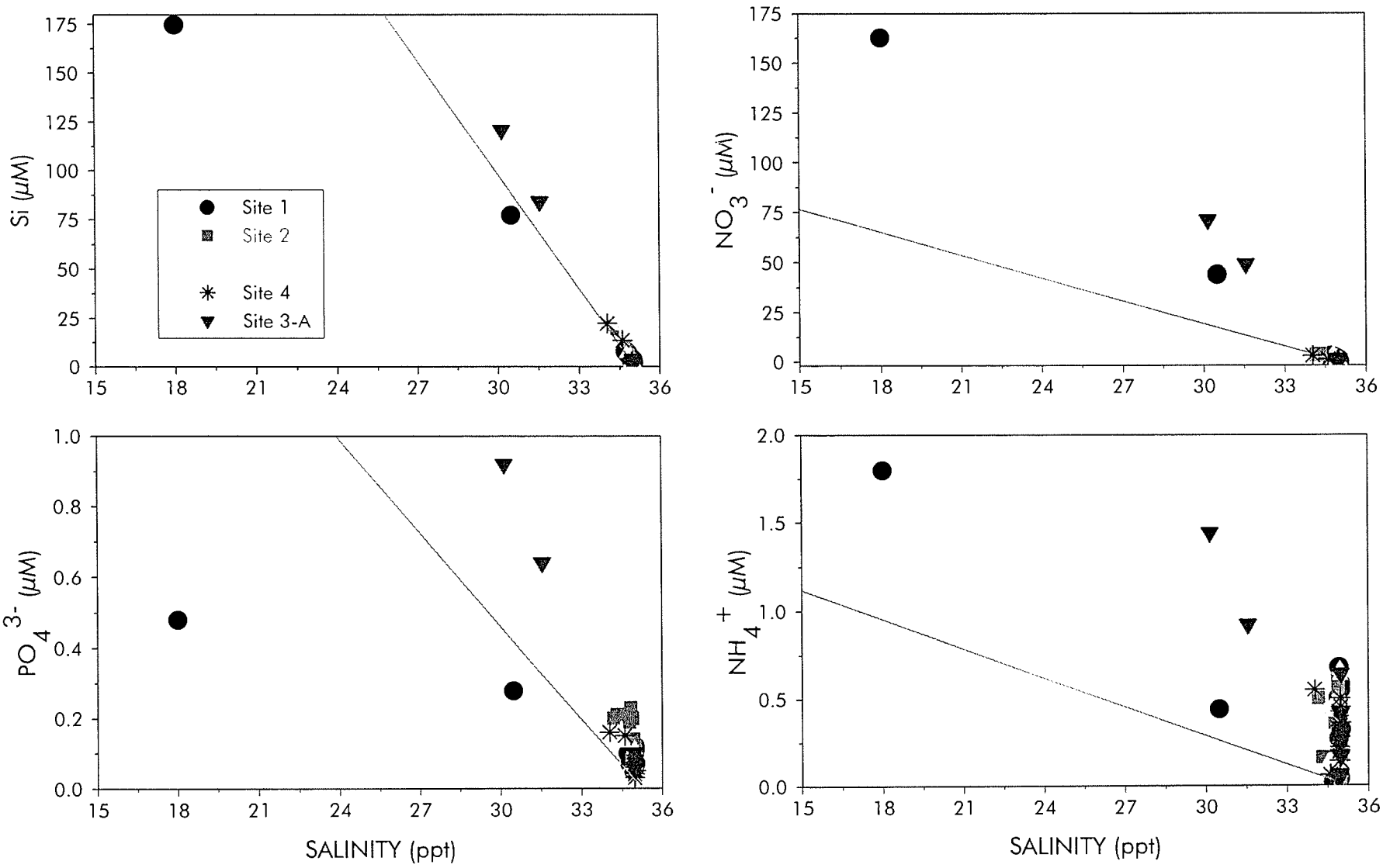

FIGURE 16. Mixing diagram showing concentration of dissolved nutrients from samples collected offshore of the Makena Resort on Dec 13, 2008 as functions of salinity. Solid red line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with water from an irrigation well upslope of the Makena Golf Courses. For sampling site locations, see Figure 1.

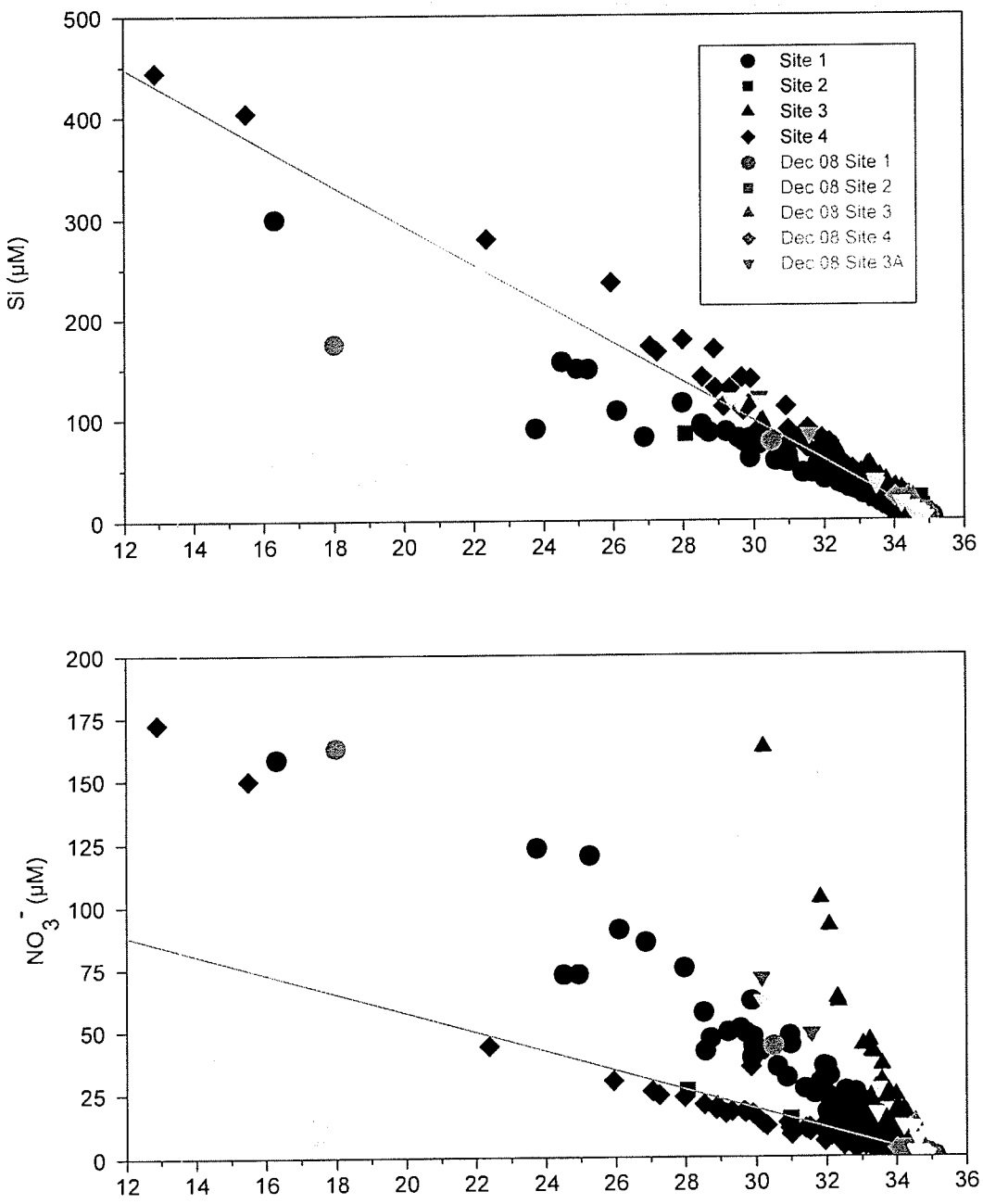

FIGURE 17. Silicate and nitrate, plotted as a function of salinity for surface samples collected since August 1995 at four sites offshore of the Makena Golf Course. Black symbols represent combined data from surveys conducted between August 1995 and June 2008. Green symbols represent data from surveys at Site 3A commencing in June 2007. Red symbols are data from most recent survey. Solid red line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with water from golf course irrigation well #4. For sampling site locations, see Figure 1.

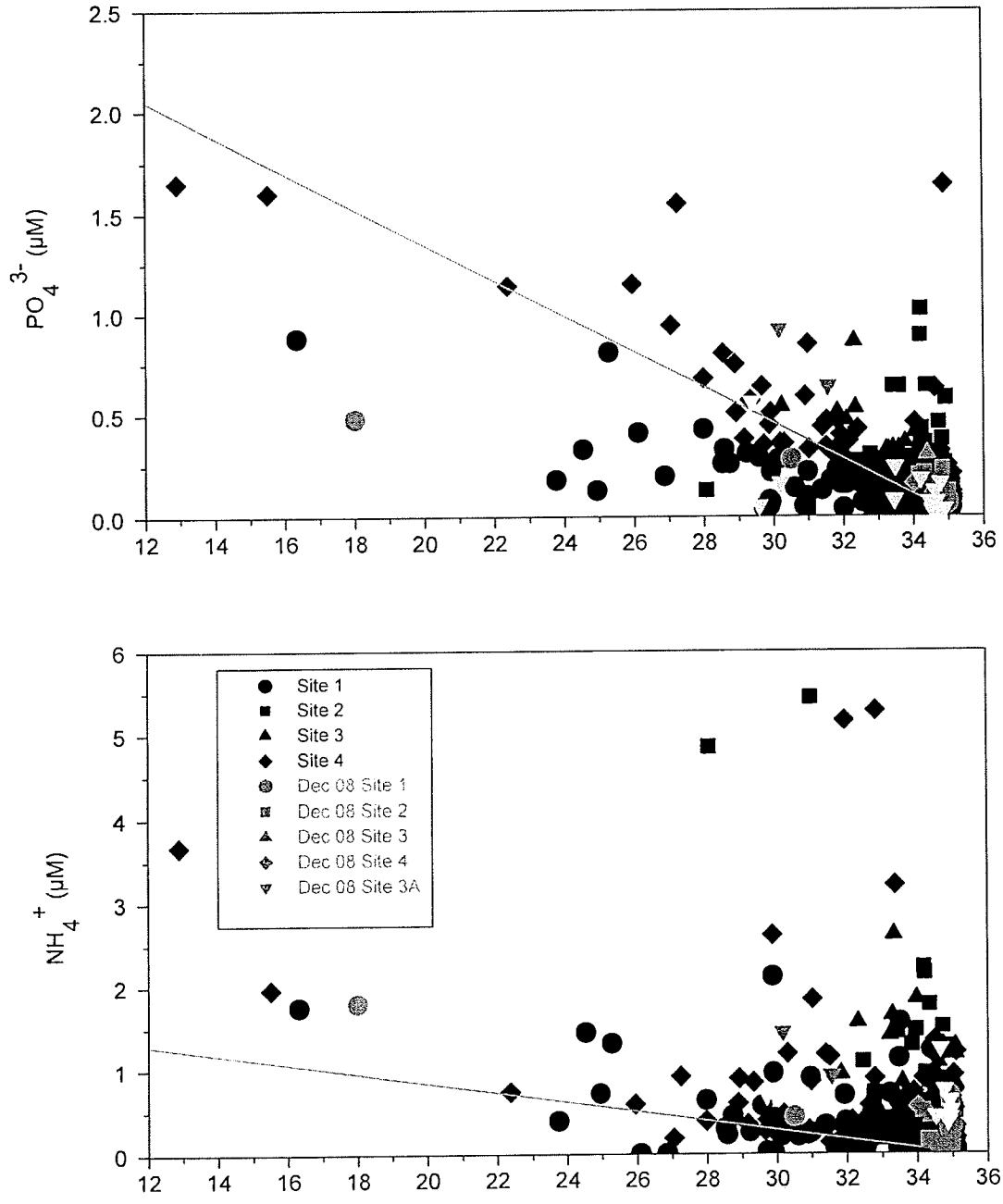

FIGURE 18. Phosphate and ammonium, plotted as a function of salinity for surface samples collected since August 1995 at four sites offshore of the Makena Golf Course. Black symbols represent combined data from surveys conducted between August 1995 and June 2008. Green symbols represent data from surveys at Site 3A commencing in June 2007. Red symbols are data from the most recent survey. Solid red line in each plot is conservative mixing line constructed by connecting the concentrations in open coastal water with water from golf course irrigation well #4. For sampling site locations, see Figure 1.

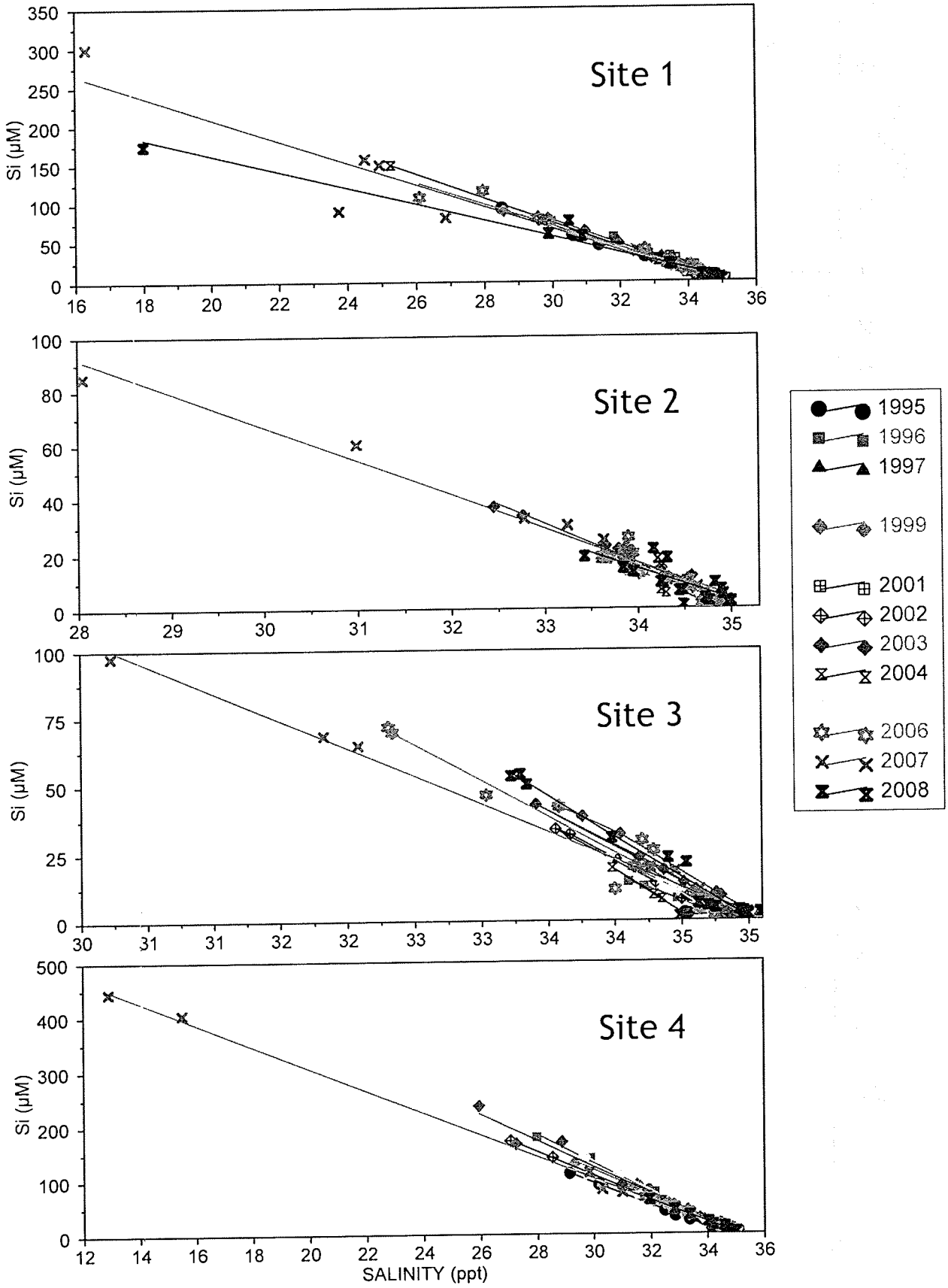

FIGURE 19. Mixing diagram showing yearly concentrations of silicata as functions of salinity from samples collected during annual monitoring surveys at four transect sites offshore of the Makena Resort. Note axis scale changes between sites. Straight lines are linear regressions through data points for each year. For sampling site locations, see Figure 1.

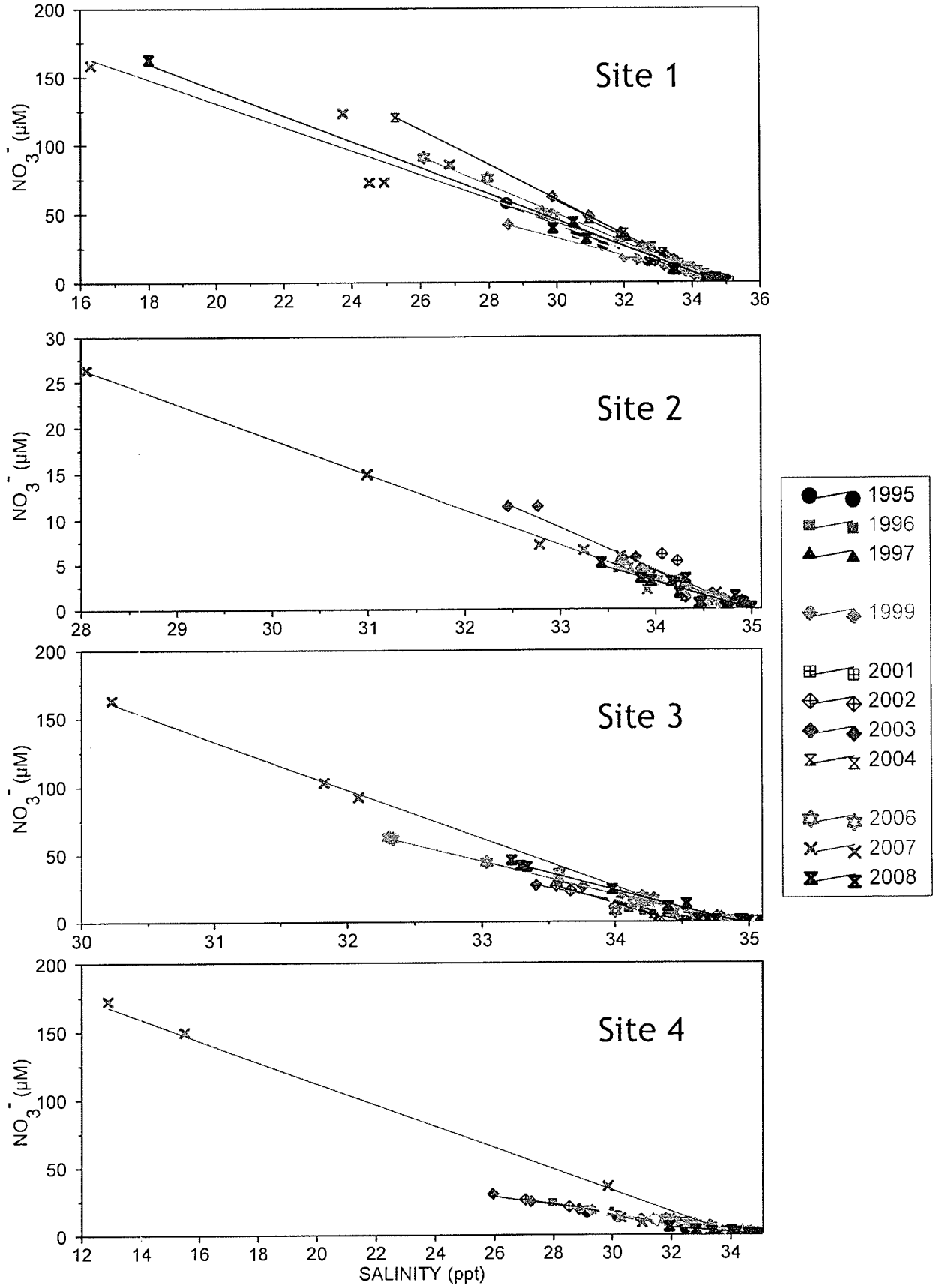

FIGURE 20. Mixing diagram showing yearly concentrations of nitrate as functions of salinity from samples collected during annual monitoring surveys at four transect sites offshore of the Makena Resort. Note axis scale changes between sites. Straight lines are linear regressions through data points for each year. For sampling site locations, see Figure 1.

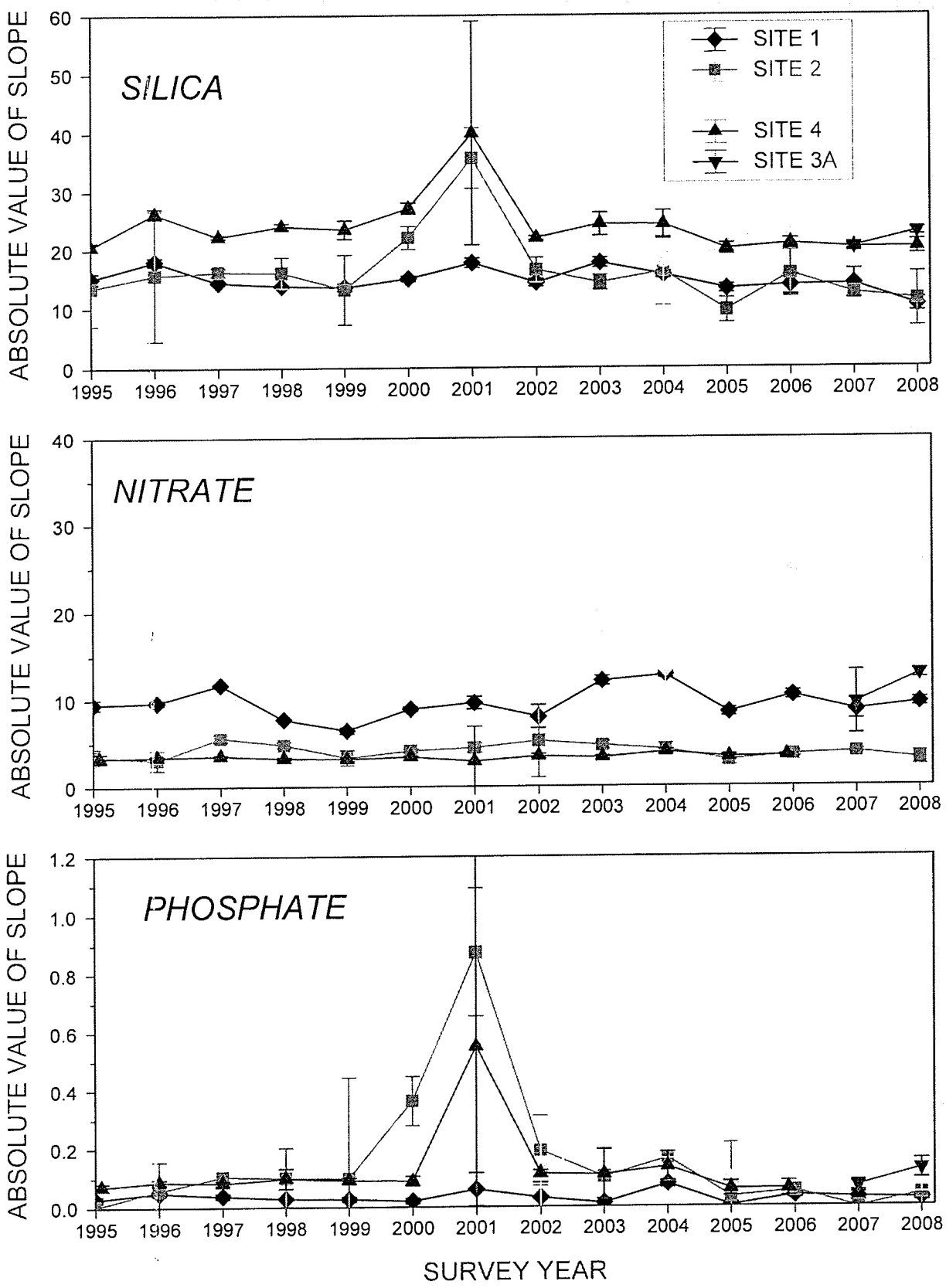

FIGURE 21. Time-course plots of absolute values of slopes of linear regressions of concentrations of silca, nitrate and phosphate as functions of salinity collected annually at each of the transect monitoring stations off the Makena Resort (Site 3A began in June 2007). Error bars are 95% confidence limits (Note error bar for Site 4 Phosphate is off scale). For locations of sampling transect sites, see Figure 1.

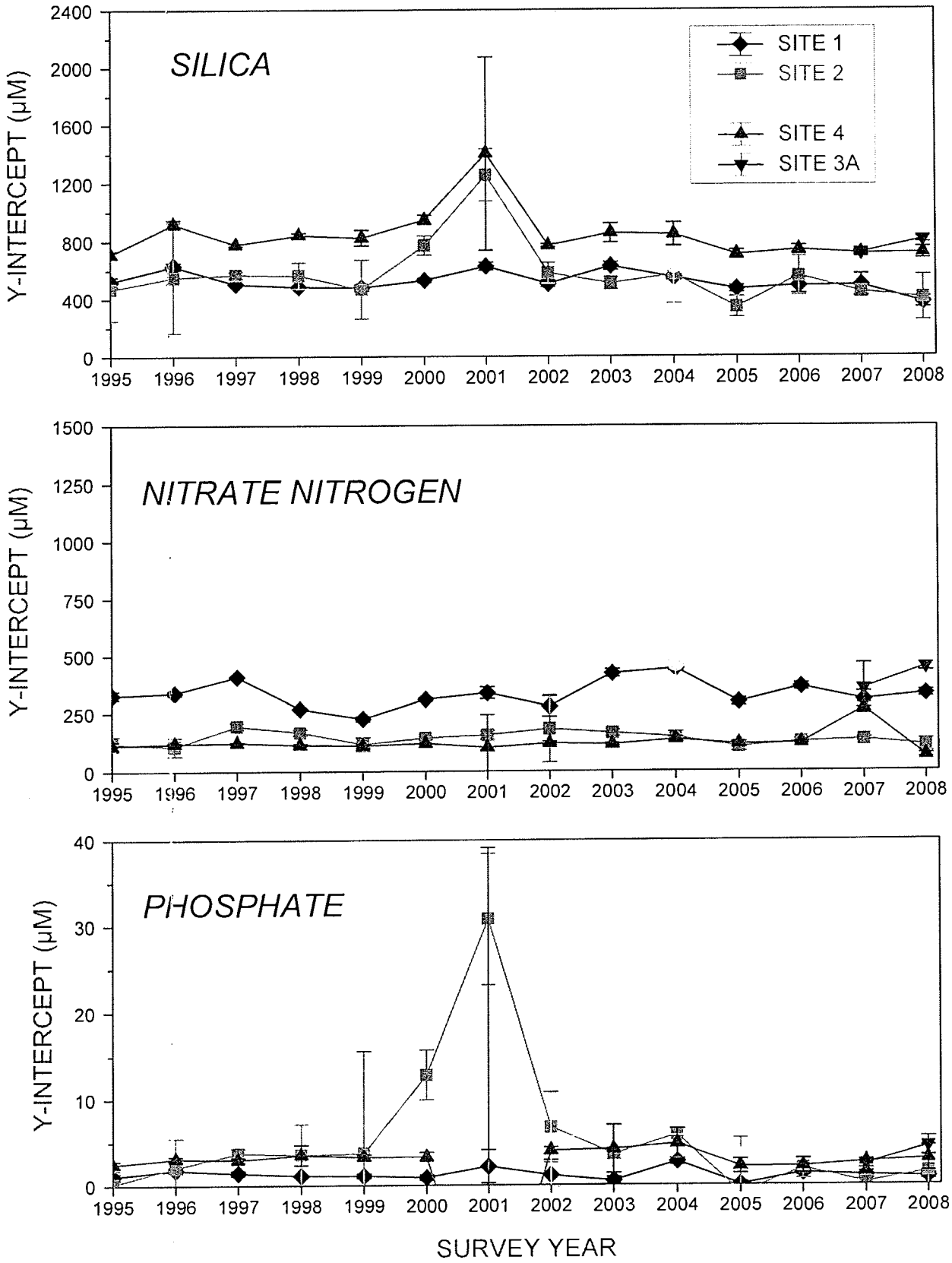

FIGURE 22. Time-course plots of Y-intercepts of linear regressions of concentrations of silca, nitrate and phosphorus as functions of salinity collected annually at each of the transect monitoring stations off the Makena Resort (Site 3A began in June 2007). Error bars are 95% confidence limits. For locations of sampling transect sites, see Figure 1.

TABLE 1. Water chemistry measurements from ocean water samples collected in the vicinity of the Makena Resort on December 13, 2008. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep; BDL=below detection limit. Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH 10% "dry" standards; boxed and shaded values exceed DOH 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	DEPTH (m)	PO_4^{3-} (μM)	NO_3^- (μM)	NH_4^+ (μM)	Si (μM)	TOP (μM)	TON (μM)	TP (μM)	TN (μM)	TURB (NTU)	SALINITY (ppt)	CHL a (μg/L)	TEMP (deg.C)	pH (std.units)	O2 % Sat
MAKENA 1	0 S	0.1	0.48	162.7	1.80	174.7	0.24	7.52	0.72	172.04	0.82	17.995	0.24	24.1	8.06	101.3
	2 S	0.1	0.28	43.80	0.44	77.28	0.24	14.44	0.52	58.68	0.37	30.489	0.22	25.0	8.16	100.2
	5 S	0.1	0.07	2.06	BDL	6.72	0.30	6.11	0.37	8.17	0.23	34.780	0.16	25.2	8.13	99.4
	5 D	1.0	0.05	0.98	0.08	4.21	0.30	7.31	0.35	8.37	0.15	34.925	0.24	25.1	8.12	100.4
	10 S	0.1	0.10	2.62	0.02	7.76	0.30	6.61	0.40	9.25	0.19	34.706	0.17	25.2	8.14	97.4
	10 D	1.7	0.10	1.25	0.50	4.37	0.31	5.44	0.41	7.19	0.16	34.890	0.18	25.3	8.13	94.2
	50 S	0.1	0.07	1.21	0.68	4.09	0.30	6.11	0.37	8.00	0.17	34.924	0.13	25.2	8.12	92.8
	50 D	4.4	0.11	0.59	0.58	3.35	0.31	5.96	0.42	7.13	0.21	34.983	0.25	25.2	8.10	103.2
	100 S	0.1	0.07	1.00	0.27	3.67	0.28	6.24	0.35	7.51	0.20	34.915	0.12	25.3	8.12	90.2
	100 D	6.2	0.07	0.20	0.04	2.81	0.29	6.82	0.36	7.06	0.13	34.958	0.13	25.2	8.12	100.0
	150 S	0.1	0.07	0.02	0.32	1.81	0.30	5.57	0.37	5.91	0.11	34.996	0.09	25.3	8.12	89.8
	150 D	11.7	0.12	0.27	0.55	2.10	0.30	5.87	0.42	6.69	0.18	34.983	0.10	25.2	8.10	100.0
MAKENA 2	0 S	0.1	0.20	3.07	0.50	21.58	0.30	5.36	0.50	8.93	1.04	34.164	0.43	25.4	8.12	89.3
	2 S	0.1	0.21	3.42	0.16	18.33	0.29	6.03	0.50	9.61	0.64	34.310	0.52	25.4	8.12	92.3
	5 S	0.1	0.19	1.70	0.36	10.90	0.30	5.89	0.49	7.95	0.72	34.765	0.68	25.3	8.10	92.0
	5 D	1.2	0.23	1.48	0.39	9.37	0.29	5.36	0.52	7.23	0.63	34.827	0.40	25.3	8.10	95.3
	10 S	0.1	0.20	0.94	0.55	6.73	0.29	6.20	0.49	7.69	0.38	34.887	0.39	25.4	8.10	89.3
	10 D	1.5	0.08	0.80	0.61	6.66	0.27	6.21	0.35	7.62	0.40	34.889	0.25	25.3	8.10	94.4
	50 S	0.1	0.12	0.65	0.21	4.96	0.30	6.75	0.42	7.61	0.26	34.914	0.14	25.4	8.10	90.2
	50 D	2.8	0.14	0.48	0.26	4.89	0.32	6.36	0.46	7.10	0.39	34.940	0.24	25.3	8.10	94.3
	100 S	0.1	0.12	0.20	0.47	2.27	0.30	4.87	0.42	5.54	0.15	34.994	0.12	25.3	8.11	89.8
	100 D	4.7	0.09	0.30	0.43	3.23	0.28	7.44	0.37	8.17	0.25	34.965	0.12	25.1	8.10	99.8
	150 S	0.1	0.09	0.06	0.24	2.04	0.30	6.61	0.39	6.91	0.12	34.991	0.40	25.3	8.13	91.6
	150 D	11.4	0.08	0.13	0.17	2.18	0.28	6.60	0.36	6.90	0.14	34.989	0.58	25.2	8.11	99.4
	200 S	0.1	0.09	0.03	0.09	1.79	0.32	6.17	0.41	6.29	0.09	34.967	0.42	25.3	8.13	90.9
	200 D	16.0	0.08	BDL	0.03	1.68	0.31	6.82	0.39	6.85	0.09	34.977	0.46	25.2	8.13	94.2
MAKENA 3-A	0 S	0.1	0.92	70.84	1.44	120.6	0.28	2.88	1.20	75.16	0.41	30.161	0.47	24.9	8.07	94.2
	2 S	0.1	0.64	48.80	0.92	84.12	0.20	4.64	0.84	54.36	0.19	31.564	0.48	25.0	8.11	100.2
	5 S	0.1	0.10	1.09	0.30	3.66	0.31	7.85	0.41	9.24	0.21	34.978	0.57	25.1	8.11	97.4
	5 D	1.0	0.08	0.92	0.27	3.06	0.28	7.58	0.36	8.77	0.16	34.981	0.44	25.0	8.12	98.4
	10 S	0.1	0.06	0.49	0.33	2.07	0.31	5.28	0.37	6.10	0.16	34.972	0.44	25.1	8.09	105.5
	10 D	1.8	0.07	0.37	0.16	1.62	0.30	5.77	0.37	6.30	0.11	34.982	0.29	25.1	8.11	95.2
	50 S	0.1	0.08	0.05	0.41	1.14	0.31	7.41	0.39	7.87	0.09	34.981	0.24	25.2	8.12	92.5
	50 D	4.3	0.06	0.04	0.42	1.26	0.31	6.13	0.37	6.59	0.10	34.979	0.25	25.1	8.12	100.4
	100 S	0.0	0.10	0.04	0.06	1.26	0.30	6.02	0.40	6.12	0.08	34.968	0.24	25.3	8.13	92.4
	100 D	5.0	0.10	0.07	0.25	1.14	0.34	5.98	0.44	6.30	0.09	34.969	0.26	25.1	8.13	101.4
	150 S	0.1	0.06	0.01	0.03	1.63	0.32	6.29	0.38	6.33	0.14	34.904	0.24	25.3	8.13	92.9
	150 D	11.5	0.06	BDL	0.64	1.02	0.32	6.31	0.38	6.95	0.11	34.990	0.36	25.1	8.13	99.4
MAKENA 3	0 S	0.1	0.30	11.29	0.42	23.07	0.22	5.99	0.52	17.70	0.73	34.397	0.34	25.1	8.18	100.4
	2 S	0.1	0.13	13.29	0.13	21.19	0.27	5.32	0.40	18.74	0.46	34.532	0.24	25.1	8.17	101.2
	5 S	0.1	0.06	3.03	0.49	6.91	0.30	6.28	0.36	9.80	0.14	34.798	0.25	25.1	8.11	98.4
	5 D	1.0	0.07	1.01	0.24	3.12	0.29	5.85	0.36	7.10	0.16	34.958	0.15	25.1	8.11	102.4
	10 S	0.1	0.09	1.29	0.17	3.67	0.31	6.14	0.40	7.60	0.16	34.929	0.17	25.1	8.10	94.6
	10 D	1.9	0.05	0.65	0.18	2.68	0.30	5.39	0.35	6.22	0.12	34.967	0.16	25.1	8.10	98.4
	50 S	0.1	0.06	0.32	0.44	1.88	0.31	5.91	0.37	6.67	0.15	34.994	0.14	25.2	8.11	94.2
	50 D	2.3	0.11	0.43	0.14	2.12	0.32	6.09	0.43	6.66	0.12	34.976	0.13	25.2	8.09	101.3
	100 S	0.1	0.05	0.32	0.63	2.16	0.32	6.02	0.37	6.97	0.16	34.974	0.13	25.2	8.11	96.4
	100 D	6.3	0.02	0.60	0.66	2.28	0.35	6.55	0.37	7.81	0.15	34.969	0.17	25.2	8.08	99.2
	150 S	0.1	0.08	0.03	0.07	1.64	0.31	6.50	0.39	6.60	0.11	34.960	0.29	25.2	8.13	95.2
	150 D	9.2	0.10	0.32	0.13	2.02	0.31	5.70	0.41	6.15	0.12	34.979	0.43	25.2	8.11	94.5
MAKENA 4	0 S	0.1	0.16	2.80	0.55	22.26	0.34	7.93	0.50	11.28	0.29	34.023	0.80	25.0	8.27	93.2
	2 S	0.1	0.15	0.92	0.06	13.48	0.34	6.51	0.49	7.49	0.21	34.595	0.64	25.0	8.20	97.3
	5 S	0.1	0.05	0.30	0.19	2.47	0.32	5.96	0.37	6.45	0.23	34.941	1.03	25.0	8.06	100.3
	5 D	1.0	0.06	0.28	0.14	2.35	0.31	5.86	0.37	6.28	0.16	34.942	0.47	25.1	8.07	98.3
	10 S	0.1	0.05	0.30	0.28	2.13	0.31	5.51	0.36	6.09	0.18	34.962	0.38	25.0	8.06	97.2
	10 D	2.0	0.05	0.17	0.14	2.39	0.32	6.58	0.37	6.89	0.19	34.964	0.48	24.1	8.07	98.2
	50 S	0.1	0.06	0.29	0.20	2.00	0.34	5.96	0.40	6.45	0.18	34.950	0.37	25.0	8.08	94.6
	50 D	4.4	0.05	0.21	0.22	2.19	0.32	8.22	0.37	8.65	0.17	34.941	0.38	25.0	8.07	109.4
	100 S	0.1	0.05	0.10	0.45	1.51	0.51	5.62	0.56	6.17	0.13	34.984	0.24	25.0	8.11	95.0
	100 D	6.4	0.05	0.03	0.36	1.50	0.33	5.89	0.38	6.28	0.10	34.992	0.33	25.1	8.12	99.4
	150 S	0.1	0.04	0.08	0.34	1.67	0.34	5.76	0.38	6.18	0.12	34.968	0.22	25.1	8.12	96.4
	150 D	7.7	0.03	0.01	0.50	1.45	0.33	5.80	0.36	6.31	0.10	34.963	0.25	25.1	8.12	92.4
DOH WQS		DRY	10%	0.71	0.36				0.96	12.86	0.50	*	0.50	**	***	****
			2%	1.43	0.64				1.45	17.86	1.00		1.00			
		WET	10%	1.00	0.61				1.29	17.85	1.25	*	0.90	**	***	****
			2%	1.78	1.07				1.93	25.00	2.00		1.75			

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by more than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

****Dissolved Oxygen not to be below 75% saturation.

TABLE 2. Water chemistry measurements from ocean water samples (in µg/L) collected in the vicinity of the Makena Resort on December 13, 2008. Abbreviations os follows: DFS=distance from shore; S=surface; D=deep; BDL=below detection limit. Also shown are the State of Hawaii, Department of Health (DOH) "not to exceed more than 10% of the time" and "not to exceed more than 2% of the time" water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH 10% "dry" standards; boxed and shaded values exceed DOH 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	DEPTH (m)	PO_4^{3-} (µg/L)	NO_3^- (µg/L)	NH_4^+ (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	TURB (NTU)	SALINITY (ppt)	CHL a (µg/L)	TEMP (deg.C)	pH (std.units)	O2 % Sat
MAKENA 1	0 S	0.1	14.88	2278	25.21	4910	7.44	105.28	22.32	2409	0.82	17.995	0.24	24.1	8.06	101.3
	2 S	0.1	8.68	613.2	6.16	2172	7.44	202.16	16.12	821.5	0.37	30.489	0.22	25.0	8.16	100.2
	5 S	0.1	2.17	28.84	BDL	188.8	9.30	85.54	11.47	114.4	0.23	34.780	0.16	25.2	8.13	99.4
	5 D	1.0	1.55	13.72	1.12	118.3	9.30	102.34	10.85	117.2	0.15	34.925	0.24	25.1	8.12	100.4
	10 S	0.1	3.10	36.68	0.28	218.1	9.30	92.54	12.40	129.5	0.19	34.706	0.17	25.2	8.14	97.4
	10 D	1.7	3.10	17.50	7.00	122.8	9.61	76.16	12.71	100.7	0.16	34.890	0.18	25.3	8.13	94.2
	50 S	0.1	2.17	16.94	9.52	114.9	9.30	85.54	11.47	112.0	0.17	34.924	0.13	25.2	8.12	92.8
	50 D	4.4	3.41	8.26	8.12	94.14	9.61	83.44	13.02	99.82	0.21	34.983	0.25	25.2	8.10	103.2
	100 S	0.1	2.17	14.00	3.78	103.1	8.68	87.36	10.85	105.1	0.20	34.915	0.12	25.3	8.12	90.2
	100 D	6.2	2.17	2.80	0.56	78.96	8.99	95.48	11.16	98.84	0.13	34.958	0.13	25.2	8.12	100.0
	150 S	0.1	2.17	0.28	4.48	50.86	9.30	77.98	11.47	82.74	0.11	34.996	0.09	25.3	8.12	89.8
	150 D	11.7	3.72	3.78	7.70	59.01	9.30	82.18	13.02	93.66	0.18	34.983	0.10	25.2	8.10	100.0
MAKENA 2	0 S	0.1	6.20	42.98	7.00	606.4	9.30	75.04	15.50	125.0	1.04	34.164	0.43	25.4	8.12	89.3
	2 S	0.1	6.51	47.88	2.24	515.1	8.99	84.42	15.50	134.5	0.64	34.310	0.52	25.4	8.12	92.3
	5 S	0.1	5.89	23.80	5.04	306.3	9.30	82.46	15.19	111.3	0.72	34.765	0.68	25.3	8.10	92.0
	5 D	1.2	7.13	20.72	5.46	263.3	8.99	75.04	16.12	101.2	0.63	34.827	0.40	25.3	8.10	95.3
	10 S	0.1	6.20	13.16	7.70	189.1	8.99	86.80	15.19	107.7	0.38	34.887	0.39	25.4	8.10	89.3
	10 D	1.5	2.48	11.20	8.54	187.1	8.37	86.94	10.85	106.7	0.40	34.889	0.25	25.3	8.10	94.4
	50 S	0.1	3.72	9.10	2.94	139.4	9.30	94.50	13.02	106.5	0.26	34.914	0.14	25.4	8.10	90.2
	50 D	2.8	4.34	6.72	3.64	137.4	9.92	89.04	14.26	99.40	0.39	34.940	0.24	25.3	8.10	94.3
	100 S	0.1	3.72	2.80	6.58	63.79	9.30	68.18	13.02	77.56	0.15	34.994	0.12	25.3	8.11	89.8
	100 D	4.7	2.79	4.20	6.02	90.76	8.68	104.16	11.47	114.4	0.25	34.965	0.12	25.1	8.10	99.8
	150 S	0.1	2.79	0.84	3.36	57.32	9.30	92.54	12.09	96.74	0.12	34.991	0.40	25.3	8.13	91.6
	150 D	11.4	2.48	1.82	2.38	61.26	8.68	92.40	11.16	96.60	0.14	34.989	0.58	25.2	8.11	99.4
	200 S	0.1	2.79	0.42	1.26	50.30	9.92	86.38	12.71	88.06	0.09	34.967	0.42	25.3	8.13	90.9
	200 D	16.0	2.48	BDL	0.42	47.21	9.61	95.48	12.09	95.90	0.09	34.977	0.46	25.2	8.13	94.2
MAKENA 3-A	0 S	0.1	28.52	991.8	20.17	3388	8.68	40.32	37.20	1052	0.41	30.161	0.47	24.9	8.07	94.2
	2 S	0.1	19.84	683.2	12.89	2364	6.20	64.96	26.04	761.0	0.19	31.564	0.48	25.0	8.11	100.2
	5 S	0.1	3.10	15.26	4.20	102.8	9.61	109.90	12.71	129.4	0.21	34.978	0.57	25.1	8.11	97.4
	5 D	1.0	2.48	12.88	3.78	85.99	8.68	106.12	11.16	122.8	0.16	34.981	0.44	25.0	8.12	98.4
	10 S	0.1	1.86	6.86	4.62	58.17	9.61	73.92	11.47	85.40	0.16	34.972	0.44	25.1	8.09	105.5
	10 D	1.8	2.17	5.18	2.24	45.52	9.30	80.78	11.47	88.20	0.11	34.982	0.29	25.1	8.11	95.2
	50 S	0.1	2.48	0.70	5.74	32.03	9.61	103.74	12.09	110.2	0.09	34.981	0.24	25.2	8.12	92.5
	50 D	4.3	1.86	0.56	5.88	35.41	9.61	85.82	11.47	92.26	0.10	34.979	0.25	25.1	8.12	100.4
	100 S	0.0	3.10	0.56	0.84	35.41	9.30	84.28	12.40	85.68	0.08	34.968	0.24	25.3	8.13	92.4
	100 D	5.0	3.10	0.98	3.50	32.03	10.54	83.72	13.64	88.20	0.09	34.969	0.26	25.1	8.13	101.4
	150 S	0.1	1.86	0.14	0.42	45.80	9.92	88.06	11.78	88.62	0.14	34.904	0.24	25.3	8.13	92.9
	150 D	11.5	1.86	BDL	8.96	28.66	9.92	88.34	11.78	97.30	0.11	34.990	0.36	25.1	8.13	99.4
MAKENA 3	0 S	0.1	9.30	158.1	5.88	648.3	6.82	83.86	16.12	247.8	0.73	34.397	0.34	25.1	8.18	100.4
	2 S	0.1	4.03	186.1	1.82	595.4	8.37	74.48	12.40	262.4	0.46	34.532	0.24	25.1	8.17	101.2
	5 S	0.1	1.86	42.42	6.86	194.2	9.30	87.92	11.16	137.2	0.14	34.798	0.25	25.1	8.11	98.4
	5 D	1.0	2.17	14.14	3.36	87.67	8.99	81.90	11.16	99.40	0.16	34.958	0.15	25.1	8.11	102.4
	10 S	0.1	2.79	18.06	2.38	103.1	9.61	85.96	12.40	106.4	0.16	34.929	0.17	25.1	8.10	94.6
	10 D	1.9	1.55	9.10	2.52	75.31	9.30	75.46	10.85	87.08	0.12	34.967	0.16	25.1	8.10	98.4
	50 S	0.1	1.86	4.48	6.16	52.83	9.61	82.74	11.47	93.38	0.15	34.994	0.14	25.2	8.11	94.2
	50 D	2.3	3.41	6.02	1.96	59.57	9.92	85.26	13.33	93.24	0.12	34.976	0.13	25.2	8.09	101.3
	100 S	0.1	1.55	4.48	8.82	60.70	9.92	84.28	11.47	97.58	0.16	34.974	0.13	25.2	8.11	96.4
	100 D	6.3	0.62	8.40	9.24	64.07	10.85	91.70	11.47	109.3	0.15	34.969	0.17	25.2	8.08	99.2
	150 S	0.1	2.48	0.42	0.98	46.08	9.61	91.00	12.09	92.40	0.11	34.960	0.29	25.2	8.13	95.2
	150 D	9.2	3.10	4.48	1.82	56.76	9.61	79.80	12.71	86.10	0.12	34.979	0.43	25.2	8.11	94.5
MAKENA 4	0 S	0.1	4.96	39.20	7.70	625.5	10.54	111.02	15.50	157.9	0.29	34.023	0.80	25.0	8.27	93.2
	2 S	0.1	4.65	12.88	0.84	378.8	10.54	91.14	15.19	104.9	0.21	34.595	0.64	25.0	8.20	97.3
	5 S	0.1	1.55	4.20	2.66	69.41	9.92	83.44	11.47	90.30	0.23	34.941	1.03	25.0	8.06	100.3
	5 D	1.0	1.86	3.92	1.96	66.04	9.61	82.04	11.47	87.92	0.16	34.942	0.47	25.1	8.07	98.3
	10 S	0.1	1.55	4.20	3.92	59.85	9.61	77.14	11.16	85.26	0.18	34.962	0.38	25.0	8.06	97.2
	10 D	2.0	1.55	2.38	1.96	67.16	9.92	92.12	11.47	96.46	0.19	34.964	0.48	24.1	8.07	98.2
	50 S	0.1	1.86	4.06	2.80	56.20	10.54	83.44	12.40	90.30	0.18	34.950	0.37	25.0	8.08	94.6
	50 D	4.4	1.55	2.94	3.08	61.54	9.92	115.08	11.47	121.1	0.17	34.941	0.38	25.0	8.07	109.4
	100 S	0.1	1.55	1.40	6.30	42.43	15.81	78.68	17.36	86.38	0.13	34.984	0.24	25.0	8.11	95.0
	100 D	6.4	1.55	0.42	5.04	42.15	10.23	82.46	11.78	87.92	0.10	34.992	0.33	25.1	8.12	99.4
	150 S	0.1	1.24	1.12	4.76	46.93	10.54	80.64	11.78	86.52	0.12	34.968	0.22	25.1	8.12	96.4
	150 D	7.7	0.93	0.14	7.00	40.75	10.23	81.20	11.16	88.34	0.10	34.963	0.25	25.1	8.12	92.4
DOH WQS		DRY	10%	10.00	5.00				30.00	180.00	0.50	*	0.50	**	***	****
			2%	20.00	9.00				45.00	250.00	1.00		1.00			
		WET	10%	14.00	8.50				40.00	250.00	1.25	*	0.90	**	***	****
			2%	25.00	15.00				60.00	350.00	2.00		1.75			

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by more than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

****Dissolved Oxygen not to be below 75% saturation.

TRANSECT SITE	DFS (m)	DEPTH (m)	PO_4^{3-} (µg/L)	NO_3^- (µg/L)	NH_4^+ (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	TURB (NTU)	SALINITY (ppt)	CHL a (µg/L)	TEMP (deg.C)	pH (std.units)	O2 % Sat

Dissolved Oxygen not to be below 70% saturation.

TABLE 3. Geometric mean data from water chemistry measurements (in μM) off the Makena Resort collected since August 1995 from Sites 1, 2, and 4 (N=22); since June 2002 from Site 3 (N=13) and since June 2007 from Site 3-A (N=4). For geometric mean calculations, detection limits were used in cases where sample was below detection limit. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep. Also shown are State of Hawaii, Department of Health (DOH) geometric mean water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH GM 10% "dry" standards; boxed and shaded values exceed DOH GM 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	PO_4^{3-} (μM)	NO_3^- (μM)	NH_4^+ (μM)	Si (μM)	TOP (μM)	TON (μM)	TP (μM)	TN (μM)	TURB (NTU)	SALINITY (ppt)	CHL a (μg/L)	TEMP (deg.C)	pH
MAKENA 1	0 S	0.20	36.59	0.32	59.67	0.23	7.06	0.49	51.04	0.33	28.591	0.92	25.5	8.13
	2 S	0.14	24.58	0.17	43.10	0.25	7.86	0.41	36.12	0.28	31.261	0.87	25.6	8.16
	5 S	0.11	9.55	0.14	20.79	0.26	8.03	0.39	21.58	0.23	32.756	0.62	25.6	8.16
	5 D	0.10	7.67	0.21	17.60	0.27	7.47	0.39	18.45	0.19	33.364	0.53	25.6	8.16
	10 S	0.09	3.55	0.16	9.59	0.26	7.48	0.36	12.54	0.17	34.211	0.40	25.6	8.16
	10 D	0.10	2.13	0.20	6.45	0.28	7.51	0.39	10.70	0.17	34.452	0.41	25.6	8.15
	50 S	0.09	2.58	0.21	7.16	0.26	7.35	0.37	11.34	0.15	34.393	0.32	25.7	8.14
	50 D	0.08	0.33	0.15	2.58	0.28	7.40	0.37	8.12	0.12	34.777	0.29	25.6	8.14
	100 S	0.08	1.04	0.16	4.69	0.27	6.76	0.37	9.71	0.12	34.530	0.27	25.7	8.14
	100 D	0.08	0.11	0.10	2.09	0.27	7.35	0.36	7.72	0.09	34.827	0.23	25.6	8.15
	150 S	0.09	0.30	0.16	3.00	0.27	7.29	0.37	8.60	0.12	34.715	0.21	25.8	8.14
	150 D	0.08	0.07	0.12	1.83	0.27	7.13	0.37	7.47	0.10	34.831	0.19	25.6	8.15
MAKENA 2	0 S	0.19	3.78	0.40	20.99	0.32	8.47	0.55	13.70	0.93	33.722	0.86	25.7	8.13
	2 S	0.19	3.71	0.29	19.23	0.32	8.03	0.54	13.09	0.67	33.590	0.87	25.8	8.13
	5 S	0.17	3.05	0.31	15.05	0.29	7.30	0.48	11.48	0.46	34.009	0.70	25.7	8.14
	5 D	0.17	2.82	0.37	14.38	0.31	7.50	0.51	11.72	0.45	34.071	0.89	25.7	8.14
	10 S	0.12	1.68	0.23	9.68	0.30	5.57	0.45	9.46	0.33	34.363	0.48	25.6	8.14
	10 D	0.12	1.05	0.27	7.94	0.31	7.28	0.45	9.31	0.27	34.484	0.56	25.7	8.14
	50 S	0.11	1.13	0.29	7.29	0.32	7.74	0.46	9.71	0.24	34.459	0.37	25.6	8.13
	50 D	0.10	0.28	0.23	3.32	0.31	7.75	0.44	8.48	0.19	34.769	0.43	25.6	8.14
	100 S	0.09	0.49	0.22	4.19	0.30	7.43	0.40	8.46	0.16	34.623	0.30	25.7	8.13
	100 D	0.08	0.17	0.23	2.36	0.29	7.30	0.39	7.92	0.13	34.802	0.29	25.6	8.15
	150 S	0.09	0.23	0.25	3.04	0.29	7.51	0.39	8.19	0.13	34.756	0.25	25.7	8.14
	150 D	0.07	0.11	0.16	2.00	0.30	7.67	0.39	8.09	0.10	34.824	0.25	25.6	8.16
	200 S	0.07	0.13	0.17	2.31	0.29	7.34	0.38	7.92	0.11	34.822	0.28	25.8	8.15
	200 D	0.08	0.05	0.20	1.69	0.29	7.90	0.38	8.26	0.10	34.853	0.28	25.7	8.16
MAKENA 3-A	0 S	1.11	167.05	0.99	268.45	0.31	11.83	1.47	182.72	0.19	18.579	0.33	25.1	7.85
	2 S	0.59	113.92	1.09	183.84	0.31	6.90	1.10	126.43	0.16	23.788	0.50	25.3	7.86
	5 S	0.22	29.88	0.31	57.52	0.37	13.38	0.69	66.89	0.19	29.029	0.51	25.4	7.93
	5 D	0.15	14.64	0.54	31.72	0.32	10.58	0.52	32.56	0.16	32.488	0.49	25.4	8.01
	10 S	0.07	4.04	0.39	11.78	0.31	9.76	0.42	17.10	0.10	34.101	0.25	25.6	8.06
	10 D	0.04	0.93	0.42	3.77	0.29	7.18	0.36	9.44	0.11	34.768	0.32	25.3	8.07
	50 S	0.05	1.12	0.54	5.52	0.29	9.12	0.38	12.66	0.10	34.640	0.17	26.0	8.11
	50 D	0.03	0.08	0.58	3.06	0.29	9.03	0.35	9.82	0.09	34.745	0.17	25.6	8.10
	100 S	0.07	0.76	0.11	4.70	0.28	7.81	0.39	9.86	0.08	34.729	0.18	26.0	8.09
	100 D	0.14	0.03	0.54	2.09	0.30	8.28	0.45	8.97	0.06	34.905	0.15	25.5	8.11
	150 S	0.04	0.19	0.15	3.58	0.31	8.73	0.36	10.82	0.10	34.732	0.17	25.8	8.10
	150 D	0.04	0.01	0.52	1.33	0.30	8.07	0.35	8.66	0.08	34.925	0.22	25.5	8.11
MAKENA 3	0 S	0.13	6.71	0.42	16.73	0.27	6.08	0.48	21.91	0.27	33.735	0.59	25.6	8.14
	2 S	0.16	12.31	0.30	23.56	0.27	6.71	0.50	27.45	0.29	33.723	0.61	25.8	8.12
	5 S	0.12	7.45	0.27	14.80	0.27	8.11	0.45	20.64	0.20	34.091	0.36	25.7	8.12
	5 D	0.12	4.79	0.31	11.31	0.28	7.08	0.44	16.53	0.18	34.337	0.44	25.7	8.12
	10 S	0.08	3.51	0.29	8.42	0.29	7.73	0.40	14.37	0.16	34.456	0.27	25.7	8.12
	10 D	0.08	1.83	0.23	5.90	0.30	7.77	0.40	11.88	0.13	34.660	0.28	25.6	8.13
	50 S	0.07	1.31	0.23	4.91	0.28	7.73	0.37	10.50	0.13	34.661	0.23	25.7	8.11
	50 D	0.08	0.32	0.19	2.69	0.29	7.94	0.38	8.83	0.09	34.804	0.23	25.6	8.13
	100 S	0.07	0.43	0.28	2.92	0.29	7.49	0.37	8.56	0.10	34.774	0.17	25.7	8.13
	100 D	0.05	0.10	0.27	1.87	0.29	7.05	0.36	7.67	0.08	34.821	0.18	25.6	8.13
	150 S	0.06	0.18	0.19	2.27	0.29	6.88	0.36	7.66	0.10	34.782	0.15	25.7	8.15
	150 D	0.06	0.08	0.13	1.77	0.29	6.83	0.36	7.22	0.09	34.847	0.18	25.6	8.16
MAKENA 4	0 S	0.20	36.59	0.32	59.67	0.23	7.06	0.49	51.04	0.33	28.591	0.92	25.5	8.13
	2 S	0.14	24.58	0.17	43.10	0.25	7.86	0.41	36.12	0.28	31.261	0.87	25.6	8.16
	5 S	0.11	9.55	0.14	20.79	0.26	8.03	0.39	21.58	0.23	32.756	0.62	25.6	8.16
	5 D	0.10	7.67	0.21	17.60	0.27	7.47	0.39	18.45	0.19	33.364	0.53	25.6	8.16
	10 S	0.09	3.55	0.16	9.59	0.26	7.48	0.36	12.54	0.17	34.211	0.40	25.6	8.16
	10 D	0.10	2.13	0.20	6.45	0.28	7.51	0.39	10.70	0.17	34.452	0.41	25.6	8.15
	50 S	0.09	2.58	0.21	7.16	0.26	7.35	0.37	11.34	0.15	34.393	0.32	25.7	8.14
	50 D	0.08	0.33	0.15	2.58	0.28	7.40	0.37	8.12	0.12	34.777	0.29	25.6	8.14
	100 S	0.08	1.04	0.16	4.69	0.27	6.76	0.37	9.71	0.12	34.530	0.27	25.7	8.14
	100 D	0.08	0.11	0.10	2.09	0.27	7.35	0.36	7.72	0.09	34.827	0.23	25.6	8.15
	150 S	0.09	0.30	0.16	3.00	0.27	7.29	0.37	8.60	0.12	34.715	0.21	25.8	8.14
	150 D	0.08	0.07	0.12	1.83	0.27	7.13	0.37	7.47	0.10	34.831	0.19	25.6	8.15
DOH WQS GEOMETRIC MEAN	DRY	0.25	0.14					0.52	7.86	0.20	*	0.15	**	***
	WET	0.36	0.25					0.64	10.71	0.50		0.30		

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by mare than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

TABLE 4. Geometric mean data (in µg/L) from water chemistry measurements (in µM) off the Makena Resort collected since August 1995 for Sites 1, 2, and 4 (N=22); since June 2002 from Site 3 (N=13) and since June 2007 from Site 3-A (N=4). For geometric mean calculations, detection limits were used in cases where sample was below detection limit. Abbreviations as follows: DFS=distance from shore; S=surface; D=deep. Also shown are State of Hawaii, Department of Health (DOH) geometric mean water quality standards for open coastal waters under "dry" and "wet" conditions. Boxed values exceed DOH GM 10% "dry" standards; boxed and shaded values exceed DOH GM 10% "wet" standards. For sampling site locations, see Figure 1.

TRANSECT SITE	DFS (m)	PO_4^{3-} (µg/L)	NO_3^- (µg/L)	NH_4^+ (µg/L)	Si (µg/L)	TOP (µg/L)	TON (µg/L)	TP (µg/L)	TN (µg/L)	TURB (NTU)	SALINITY (ppt)	CHL a (µg/L)	TEMP (deg.C)	pH
MAKENA 1	0 S	6.10	512.4	4.40	1676	7.10	98.80	15.10	714.8	0.33	28.591	0.92	25.5	8.13
	2 S	4.30	344.2	2.30	1211	7.70	110.00	12.60	505.8	0.28	31.261	0.87	25.6	8.16
	5 S	3.40	133.7	1.90	584.0	8.00	112.40	12.00	302.2	0.23	32.756	0.62	25.6	8.16
	5 D	3.00	107.4	2.90	494.4	8.30	104.60	12.00	258.4	0.19	33.364	0.53	25.6	8.16
	10 S	2.70	49.70	2.20	269.4	8.00	104.70	11.10	175.6	0.17	34.211	0.40	25.6	8.16
	10 D	3.00	29.80	2.80	181.2	8.60	105.10	12.00	149.8	0.17	34.452	0.41	25.6	8.15
	50 S	2.70	36.10	2.90	201.1	8.00	102.90	11.40	158.8	0.15	34.393	0.32	25.7	8.14
	50 D	2.40	4.60	2.10	72.47	8.60	103.60	11.40	113.7	0.12	34.777	0.29	25.6	8.14
	100 S	2.40	14.50	2.20	131.7	8.30	94.60	11.40	135.9	0.12	34.530	0.27	25.7	8.14
	100 D	2.40	1.50	1.40	58.71	8.30	102.90	11.10	108.1	0.09	34.827	0.23	25.6	8.15
	150 S	2.70	4.20	2.20	84.27	8.30	102.10	11.40	120.4	0.12	34.715	0.21	25.8	8.14
	150 D	2.40	0.90	1.60	51.40	8.30	99.80	11.40	104.6	0.10	34.831	0.19	25.6	8.15
MAKENA 2	0 S	5.80	52.90	5.60	589.6	9.90	118.60	17.00	191.8	0.93	33.722	0.86	25.7	8.13
	2 S	5.80	51.90	4.00	540.2	9.90	112.40	16.70	183.3	0.67	33.590	0.87	25.8	8.13
	5 S	5.20	42.70	4.30	422.8	8.90	102.20	14.80	160.7	0.46	34.009	0.70	25.7	8.14
	5 D	5.20	39.40	5.10	403.9	9.60	105.00	15.70	164.1	0.45	34.071	0.89	25.7	8.14
	10 S	3.70	23.50	3.20	271.9	9.20	78.00	13.90	132.4	0.33	34.363	0.48	25.6	8.14
	10 D	3.70	14.70	3.70	223.0	9.60	101.90	13.90	130.3	0.27	34.484	0.56	25.7	8.14
	50 S	3.40	15.80	4.00	204.8	9.90	108.40	14.20	135.9	0.24	34.459	0.37	25.6	8.13
	50 D	3.00	3.90	3.20	93.26	9.60	108.50	13.60	118.7	0.19	34.769	0.43	25.6	8.14
	100 S	2.70	6.80	3.00	117.7	9.20	104.00	12.30	118.4	0.16	34.623	0.30	25.7	8.13
	100 D	2.40	2.30	3.20	66.29	8.90	102.20	12.00	110.9	0.13	34.802	0.29	25.6	8.15
	150 S	2.70	3.20	3.50	85.39	8.90	105.10	12.00	114.7	0.13	34.756	0.25	25.7	8.14
	150 D	2.10	1.50	2.20	56.18	9.20	107.40	12.00	113.3	0.10	34.824	0.25	25.6	8.16
	200 S	2.10	1.80	2.30	64.89	8.90	102.80	11.70	110.9	0.11	34.822	0.28	25.8	8.15
	200 D	2.40	0.70	2.80	47.47	8.90	110.60	11.70	115.6	0.10	34.853	0.28	25.7	8.16
MAKENA 3-A	0 S	34.30	2340	13.80	7541	9.60	165.60	45.50	2559.1	0.19	18.579	0.33	25.1	7.85
	2 S	18.20	1596	15.20	5164	9.60	96.60	34.00	1770.7	0.16	23.788	0.50	25.3	7.86
	5 S	6.80	418.4	4.30	1616	11.40	187.40	21.30	936.8	0.19	29.029	0.51	25.4	7.93
	5 D	4.60	205.0	7.50	891.0	9.90	148.10	16.10	456.0	0.16	32.488	0.49	25.4	8.01
	10 S	2.10	56.50	5.40	330.9	9.60	136.60	13.00	239.5	0.10	34.101	0.25	25.6	8.06
	10 D	1.20	13.00	5.80	105.9	8.90	100.50	11.10	132.2	0.11	34.768	0.32	25.3	8.07
	50 S	1.50	15.60	7.50	155.1	8.90	127.70	11.70	177.3	0.10	34.640	0.17	26.0	8.11
	50 D	0.90	1.10	8.10	85.96	8.90	126.40	10.80	137.5	0.09	34.745	0.17	25.6	8.1
	100 S	2.10	10.60	1.50	132.0	8.60	109.30	12.00	138.0	0.08	34.729	0.18	26.0	8.09
	100 D	4.30	0.40	7.50	58.71	9.20	115.90	13.90	125.6	0.06	34.905	0.15	25.5	8.11
	150 S	1.20	2.60	2.10	100.6	9.60	122.20	11.10	151.5	0.10	34.732	0.17	25.8	8.1
	150 D	1.20	0.10	7.20	37.36	9.20	113.00	10.80	121.2	0.08	34.925	0.22	25.5	8.11
MAKENA 3	0 S	4.00	93.90	5.80	469.9	8.30	85.10	14.80	306.8	0.27	33.735	0.59	25.6	8.14
	2 S	4.90	172.4	4.20	661.8	8.30	93.90	15.40	384.4	0.29	33.723	0.61	25.8	8.12
	5 S	3.70	104.3	3.70	415.7	8.30	113.50	13.90	289.0	0.20	34.091	0.36	25.7	8.12
	5 D	3.70	67.00	4.30	317.7	8.60	99.10	13.60	231.5	0.18	34.337	0.44	25.7	8.12
	10 S	2.40	49.10	4.00	236.5	8.90	108.20	12.30	201.2	0.16	34.456	0.27	25.7	8.12
	10 D	2.40	25.60	3.20	165.7	9.20	108.80	12.30	166.3	0.13	34.660	0.28	25.6	8.13
	50 S	2.10	18.30	3.20	137.9	8.60	108.20	11.40	147.0	0.13	34.661	0.23	25.7	8.11
	50 D	2.40	4.40	2.60	75.56	8.90	111.20	11.70	123.6	0.09	34.804	0.23	25.6	8.13
	100 S	2.10	6.00	3.90	82.02	8.90	104.90	11.40	119.8	0.10	34.774	0.17	25.7	8.13
	100 D	1.50	1.40	3.70	52.53	8.90	98.70	11.10	107.4	0.08	34.821	0.18	25.6	8.13
	150 S	1.80	2.50	2.60	63.76	8.90	96.30	11.10	107.2	0.10	34.782	0.15	25.7	8.15
	150 D	1.80	1.10	1.80	49.72	8.90	95.60	11.10	101.1	0.09	34.847	0.18	25.6	8.16
MAKENA 4	0 S	6.10	512.4	4.40	1676	7.10	98.80	15.10	714.8	0.33	28.591	0.92	25.5	8.13
	2 S	4.30	344.2	2.30	1211	7.70	110.00	12.60	505.8	0.28	31.261	0.87	25.6	8.16
	5 S	3.40	133.7	1.90	584.0	8.00	112.40	12.00	302.2	0.23	32.756	0.62	25.6	8.16
	5 D	3.00	107.4	2.90	494.4	8.30	104.60	12.00	258.4	0.19	33.364	0.53	25.6	8.16
	10 S	2.70	49.70	2.20	269.4	8.00	104.70	11.10	175.6	0.17	34.211	0.40	25.6	8.16
	10 D	3.00	29.80	2.80	181.2	8.60	105.10	12.00	149.8	0.17	34.452	0.41	25.6	8.15
	50 S	2.70	36.10	2.90	201.1	8.00	102.90	11.40	158.8	0.15	34.393	0.32	25.7	8.14
	50 D	2.40	4.60	2.10	72.47	8.60	103.60	11.40	113.7	0.12	34.777	0.29	25.6	8.14
	100 S	2.40	14.50	2.20	131.7	8.30	94.60	11.40	135.9	0.12	34.530	0.27	25.7	8.14
	100 D	2.40	1.50	1.40	58.71	8.30	102.90	11.10	108.1	0.09	34.827	0.23	25.6	8.15
	150 S	2.70	4.20	2.20	84.27	8.30	102.10	11.40	120.4	0.12	34.715	0.21	25.8	8.14
	150 D	2.40	0.90	1.60	51.40	8.30	99.80	11.40	104.6	0.10	34.831	0.19	25.6	8.15
DOH WQS GEOMETRIC MEAN	DRY	3.50	2.00					16.00	110.00	0.20	*	0.15	**	***
	WET	5.00	3.50					20.00	150.00	0.50		0.30		

* Salinity shall not vary more than ten percent form natural or seasonal changes considering hydrologic input and oceanographic conditions.

** Temperature shall not vary by more than one degree C. from ambient conditions.

***pH shall not deviate more than 0.5 units from a value of 8.1.

TABLE 5. Water chemistry measurements in μM and μg/L (shaded) from irrigation wells and two irrigation lakes collected in the vicinity of the Makena Resort on December 13, 2008. BDL=below detection limit. For sampling site locations, see Figure 1.

WELL	PO_4^{3-} (μM)	PO_4^{3-} (μg/L)	NO_3^- (μM)	NO_3^- (μg/L)	NH_4^+ (μM)	NH_4^+ (μg/L)	Si (μM)	Si (μg/L)	TOP (μM)	TOP (μg/L)	TON (μM)	TON (μg/L)	TP (μM)	TP (μg/L)	TN (μM)	TN (μg/L)	SALINITY (ppt)
1	1.95	60.45	123.0	1721	1.90	26.60	510.4	14341	0.20	6.20	1.70	23.80	2.15	66.65	126.6	1772	1.331
2	3.00	93.00	135.5	1896	1.25	17.50	682.4	19174	0.00	0.00	1.40	19.60	3.00	93.00	138.1	1933	1.752
3	3.00	93.00	133.2	1864	BDL	BDL	688.4	19344	0.05	1.55	1.90	26.60	3.05	94.55	135.1	1891	1.938
4	2.95	91.45	127.1	1779	1.85	25.90	647.2	18186	0.10	3.10	5.15	72.10	3.05	94.55	134.1	1877	1.762
5	2.60	80.60	200.8	2811	2.40	33.60	586.6	16482	0.15	4.65	3.45	48.30	2.75	85.25	206.6	2892	1.558
6	2.35	72.85	184.5	2583	4.20	58.80	548.5	15413	0.25	7.75	3.30	46.20	2.60	80.60	192.0	2688	1.515
8	2.70	83.70	112.4	1574	2.45	34.30	602.7	16934	0.15	4.65	11.75	164.5	2.85	88.35	126.6	1772	1.741
10	2.90	89.90	191.8	2685	2.30	32.20	629.0	17675	0.05	1.55	0.45	6.30	2.95	91.45	194.5	2723	1.853
11	2.85	88.35	114.7	1606	2.15	30.10	629.4	17685	0.03	0.93	13.80	193.2	2.88	89.28	130.7	1829	2.051
IL10	0.50	15.50	48.9	683.9	16.55	231.70	303.3	8521	1.45	44.95	44.10	617.4	1.95	60.45	109.5	1533	1.932

TABLE 6. Linear regression statistics (y-intercept and slope) of concentrations of silica as functions of salinity from four ocean transect sites off of the Makena Resort collected during monitoring surveys from 1995 to December 2008 (Transect Site 3 has been monitored since 2002; Trasect Site 3A since 2007). Also shown are standard errors and upper and lower 95% confidence limits around the y-intercepts and slopes."REGSLOPE" indicates regression statistics for slope of yearly coefficients as a function of time. For location of transect sites, see Figure 1.

SILICA -Y-INTERCEPT

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	522.34	12.18	491.03	553.66
1996	629.56	11.05	605.49	653.64
1997	504.17	2.83	496.89	511.46
1998	484.14	2.44	477.86	490.41
1999	479.11	9.89	457.55	500.66
2000	528.68	5.87	513.58	543.77
2001	625.85	10.91	597.82	653.88
2002	502.98	8.68	480.66	525.30
2003	625.85	10.91	597.82	653.88
2004	546.00	8.33	527.84	564.16
2005	466.59	11.09	442.42	490.75
2006	487.68	24.60	434.08	541.28
2007	491.19	34.99	414.95	567.42
2008	371.80	16.96	334.85	408.75
REGSLOPE	-7.14	4.44	-16.81	2.53
SITE 2				
1995	468.41	85.54	248.51	688.30
1996	549.09	177.83	164.91	933.28
1997	567.57	9.71	543.80	591.33
1998	563.20	37.23	472.10	654.30
1999	466.74	95.75	261.37	672.11
2000	770.15	27.32	703.31	837.00
2001	1254.31	74.17	1072.82	1435.81
2002	577.53	29.40	505.60	649.46
2003	505.05	20.10	461.94	548.15
2004	565.31	93.71	364.33	766.29
2005	339.08	33.78	266.64	411.52
2006	553.48	62.93	418.51	688.45
2007	443.05	17.15	406.27	479.84
2008	402.41	73.66	244.42	560.41
REGSLOPE	-10.33	14.92	-42.83	22.17
SITE 3				
2002	931.92	27.54	861.13	1002.71
2003	984.76	41.58	894.16	1075.35
2004	632.75	127.62	354.68	910.82
2005	704.38	52.31	590.40	818.35
2006	928.22	64.18	788.40	1068.05
2007	722.80	15.07	689.97	755.63
2008	1058.06	48.59	952.18	1163.94
REGSLOPE	5.36	33.60	-81.01	91.72
SITE 3A				
2007	714.10	5.58	701.94	726.27
2008	805.12	9.00	785.52	824.73
REGSLOPE	91.02	0.00	91.02	91.02
SITE 4				
1995	710.45	8.83	687.74	733.15
1996	917.33	13.38	888.18	946.47
1997	776.74	3.53	767.66	785.82
1998	841.35	6.75	824.00	858.70
1999	823.63	24.78	769.63	877.62
2000	946.97	12.51	914.80	979.14
2001	1403.91	260.13	735.22	2072.61
2002	767.85	4.37	756.63	779.08
2003	854.37	29.88	789.26	919.48
2004	843.49	37.55	761.67	925.31
2005	703.97	14.00	673.47	734.46
2006	735.05	14.01	704.53	765.57
2007	710.11	7.14	694.56	725.66
2008	712.32	18.22	672.63	752.01
REGSLOPE	-9.68	12.15	-36.16	16.80

SILICA - SLOPE

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	-15.08	0.38	-16.05	-14.12
1996	-18.05	0.32	-18.75	-17.34
1997	-14.43	0.08	-14.65	-14.21
1998	-13.83	0.07	-14.02	-13.64
1999	-13.63	0.29	-14.27	-12.99
2000	-15.08	0.18	-15.54	-14.62
2001	-17.76	0.32	-18.57	-16.94
2002	-14.38	0.26	-15.05	-13.72
2003	-17.76	0.32	-18.57	-16.94
2004	-15.68	0.25	-16.23	-15.14
2005	-13.31	0.33	-14.02	-12.61
2006	-13.88	0.76	-15.53	-12.23
2007	-14.11	1.14	-16.59	-11.62
2008	-10.46	0.52	-11.59	-9.33
REGSLOPE	0.21	0.13	-0.06	0.49
SITE 2				
1995	-13.47	2.51	-19.93	-7.00
1996	-15.62	5.15	-26.75	-4.49
1997	-16.26	0.29	-16.96	-15.56
1998	-16.11	1.08	-18.76	-13.45
1999	-13.21	2.78	-19.18	-7.23
2000	-22.06	0.80	-24.02	-20.11
2001	-35.68	2.12	-40.87	-30.49
2002	-16.54	0.86	-18.64	-14.44
2003	-14.37	0.59	-15.63	-13.11
2004	-16.23	2.73	-22.09	-10.38
2005	-9.61	0.98	-11.70	-7.52
2006	-15.82	1.83	-19.75	-11.89
2007	-12.54	0.51	-13.64	-11.45
2008	-11.41	2.14	-15.99	-6.83
REGSLOPE	0.30	0.42	-0.62	1.23
SITE 3				
2002	-26.75	0.81	-28.83	-24.68
2003	-28.10	1.21	-30.73	-25.47
2004	-18.19	3.69	-26.24	-10.14
2005	-20.11	1.51	-23.40	-16.83
2006	-26.56	1.89	-30.67	-22.46
2007	-20.60	0.44	-21.56	-19.63
2008	-30.22	1.41	-33.29	-27.14
REGSLOPE	-0.13	0.96	-2.60	2.33
SITE 3A				
2007	-20.35	0.19	-20.75	-19.94
2008	-22.96	0.28	-23.57	-22.36
REGSLOPE	-2.62	0.00	-2.62	-2.62
SITE 4				
1995	-20.55	0.27	-21.25	-19.85
1996	-26.23	0.40	-27.10	-25.37
1997	-22.27	0.11	-22.55	-21.99
1998	-24.07	0.20	-24.58	-23.56
1999	-23.50	0.73	-25.10	-21.90
2000	-27.12	0.37	-28.08	-26.16
2001	-39.92	7.42	-58.99	-20.86
2002	-21.99	0.13	-22.34	-21.65
2003	-24.36	0.91	-26.34	-22.39
2004	-24.27	1.10	-26.66	-21.88
2005	-20.11	0.41	-21.00	-19.22
2006	-20.96	0.41	-21.86	-20.06
2007	-20.27	0.23	-20.77	-19.78
2008	-20.33	0.53	-21.49	-19.17
REGSLOPE	0.29	0.34	-0.46	1.03

TABLE 7. Linear regression statistics (y-intercept and slope) of concentrations of nitrate as functions of salinity from four ocean transect sites off of the Makena Resort collected during monitoring surveys from 1995 to December 2008 (Transect Site 3 has been monitored since 2002; Trasect Site 3A since 2007). Also shown are standard errors and upper and lower 95% confidence limits around the y-intercepts and slopes. "REGSLOPE" indicates regression statistics for slope of yearly coefficients as a function of time. For location of transect sites, see Figure 1.

NITRATE -Y-INTERCEPT

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	326.50	7.10	308.25	344.75
1996	336.49	4.62	326.41	346.56
1997	406.96	1.93	402.00	411.93
1998	268.90	1.55	264.91	272.89
1999	225.24	5.32	213.66	236.83
2000	309.77	3.36	301.14	318.41
2001	336.53	9.69	311.61	361.44
2002	278.21	17.43	233.40	323.03
2003	421.29	7.81	404.28	438.30
2004	442.33	4.89	431.68	452.99
2005	296.36	7.44	280.16	312.56
2006	361.76	7.20	346.08	377.45
2007	305.06	15.88	270.45	339.67
2008	330.95	7.18	315.29	346.60
REGSLOPE	1.89	4.13	-7.12	10.90
SITE 2				
1995	119.87	12.03	88.95	150.79
1996	106.36	18.44	66.53	146.19
1997	193.75	5.64	179.95	207.55
1998	166.93	5.33	153.89	179.97
1999	116.21	14.04	86.10	146.32
2000	142.07	2.83	135.13	149.01
2001	154.93	7.65	136.21	173.64
2002	180.82	58.78	36.98	324.66
2003	163.36	6.31	149.82	176.91
2004	145.36	10.55	122.74	167.99
2005	102.66	9.11	83.13	122.19
2006	124.74	4.89	114.26	135.22
2007	134.27	3.25	127.30	141.24
2008	108.01	12.87	80.41	135.61
REGSLOPE	-1.50	1.95	-5.74	2.74
SITE 3				
2002	847.45	52.35	712.88	982.01
2003	693.24	39.54	607.10	779.38
2004	463.72	90.73	266.04	661.40
2005	535.53	47.19	432.72	638.34
2006	856.96	48.22	751.91	962.02
2007	1233.34	18.23	1193.63	1273.06
2008	899.91	41.92	808.57	991.25
REGSLOPE	58.24	46.45	-61.15	177.64
SITE 3A				
2007	354.33	49.92	245.56	463.11
2008	448.07	7.75	431.19	464.95
REGSLOPE	93.74	0.00	93.74	93.74
SITE 4				
1995	111.38	6.47	94.74	128.02
1996	118.34	1.63	114.79	121.89
1997	122.56	1.29	119.25	125.88
1998	112.77	1.87	107.97	117.57
1999	109.13	3.30	101.94	116.33
2000	118.51	0.75	116.58	120.43
2001	100.93	54.85	-40.08	241.94
2002	118.91	3.25	110.56	127.25
2003	113.78	2.76	107.77	119.79
2004	134.97	4.64	124.86	145.07
2005	114.59	4.47	104.85	124.33
2006	119.85	1.76	116.03	123.68
2007	269.24	10.13	247.16	291.32
2008	62.93	4.05	54.11	71.74
REGSLOPE	2.53	3.02	-4.04	9.10

NITRATE - SLOPE

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	-9.49	0.22	-10.05	-8.92
1996	-9.67	0.14	-9.97	-9.38
1997	-11.70	0.06	-11.85	-11.55
1998	-7.72	0.05	-7.84	-7.60
1999	-6.44	0.16	-6.79	-6.10
2000	-8.91	0.10	-9.17	-8.65
2001	-9.60	0.28	-10.32	-8.88
2002	-7.99	0.52	-9.31	-6.66
2003	-12.09	0.23	-12.60	-11.58
2004	-12.74	0.15	-13.06	-12.42
2005	-8.48	0.22	-8.96	-8.01
2006	-10.40	0.22	-10.89	-9.92
2007	-8.73	0.52	-9.86	-7.60
2008	-9.52	0.22	-10.00	-9.05
REGSLOPE	-0.05	0.12	-0.31	0.21
SITE 2				
1995	-3.47	0.35	-4.38	-2.56
1996	-3.05	0.53	-4.20	-1.89
1997	-5.57	0.17	-5.97	-5.16
1998	-4.79	0.16	-5.17	-4.41
1999	-3.31	0.41	-4.19	-2.43
2000	-4.08	0.08	-4.29	-3.88
2001	-4.41	0.22	-4.95	-3.88
2002	-5.19	1.72	-9.40	-0.99
2003	-4.68	0.18	-5.07	-4.28
2004	-4.19	0.31	-4.84	-3.53
2005	-2.94	0.26	-3.50	-2.37
2006	-3.57	0.14	-3.88	-3.27
2007	-3.85	0.10	-4.06	-3.64
2008	-3.09	0.37	-3.89	-2.29
REGSLOPE	0.04	0.06	-0.08	0.17
SITE 3				
2002	-24.49	1.53	-28.43	-20.56
2003	-19.86	1.15	-22.36	-17.35
2004	-13.37	2.63	-19.09	-7.64
2005	-15.33	1.36	-18.29	-12.37
2006	-24.61	1.42	-27.70	-21.52
2007	-35.51	0.54	-36.68	-34.34
2008	-25.78	1.22	-28.43	-23.12
REGSLOPE	-1.66	1.34	-5.11	1.80
SITE 3A				
2007	-9.57	1.67	-13.20	-5.93
2008	-12.81	0.24	-13.33	-12.29
REGSLOPE	-3.24	0.00	-3.24	-3.24
SITE 4				
1995	-3.26	0.20	-3.77	-2.75
1996	-3.40	0.05	-3.50	-3.29
1997	-3.53	0.04	-3.63	-3.43
1998	-3.24	0.05	-3.38	-3.10
1999	-3.13	0.10	-3.34	-2.92
2000	-3.40	0.02	-3.46	-3.34
2001	-2.87	1.56	-6.89	1.15
2002	-3.44	0.10	-3.70	-3.19
2003	-3.28	0.08	-3.46	-3.09
2004	-3.89	0.14	-4.18	-3.59
2005	-3.29	0.13	-3.57	-3.00
2006	-3.43	0.05	-3.54	-3.31
2007	-7.87	0.32	-8.58	-7.17
2008	-1.79	0.12	-2.05	-1.54
REGSLOPE	-0.07	0.09	-0.27	0.12

TABLE 8. Linear regression statistics (y-intercept and slope) of concentrations of orthophosphate phosphorus as functions of salinity from four ocean transect sites off of the Makena Resort collected during monitoring surveys from 1995 to December 2008 (Transect site 3 has been monitored since 2002; Trasect Site 3A since 2007). Also shown are standard errors and upper and lower 95% confidence limits around the y-intercepts and slopes. For location of transect sites, see Figure 1.

PHOSPHATE -Y-INTERCEPT

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	1.04	0.14	0.68	1.39
1996	1.78	0.12	1.52	2.03
1997	1.40	0.12	1.10	1.69
1998	1.10	0.06	0.95	1.25
1999	1.07	0.12	0.80	1.34
2000	0.89	0.12	0.59	1.19
2001	2.16	0.76	0.22	4.11
2002	1.12	0.68	-0.64	2.88
2003	0.48	0.19	0.06	0.90
2004	2.71	0.17	2.33	3.08
2005	-0.02	0.14	-0.34	0.29
2006	1.36	0.13	1.08	1.65
2007	1.07	0.20	0.64	1.50
2008	0.89	0.13	0.61	1.16
REGSLOPE	-0.03	0.05	-0.13	0.07
SITE 2				
1995	0.15	0.63	-1.46	1.76
1996	2.03	1.59	-1.41	5.48
1997	3.70	0.25	3.10	4.31
1998	3.55	1.44	0.03	7.07
1999	3.68	5.55	-8.22	15.58
2000	12.78	1.18	9.89	15.66
2001	30.73	3.12	23.09	38.37
2002	6.67	1.68	2.57	10.77
2003	3.57	0.31	2.90	4.24
2004	5.76	0.53	4.62	6.91
2005	-0.95	2.96	-7.31	5.40
2006	1.88	0.57	0.67	3.10
2007	0.22	0.26	-0.34	0.78
2008	1.50	1.14	-0.95	3.95
REGSLOPE	-0.20	0.55	-1.41	1.00
SITE 3				
2002	4.62	2.31	-1.31	10.55
2003	7.38	0.99	5.24	9.53
2004	7.40	0.78	5.70	9.10
2005	3.17	0.53	2.03	4.32
2006	7.32	1.16	4.80	9.84
2007	4.46	0.46	3.47	5.45
2008	4.01	1.13	1.56	6.47
REGSLOPE	-0.28	0.36	-1.19	0.64
SITE 3A				
2007	2.39	0.24	1.86	2.93
2008	4.43	0.49	3.36	5.50
REGSLOPE	2.04	0.00	2.04	2.04
SITE 4				
1995	2.44	0.15	2.04	2.84
1996	3.08	0.13	2.79	3.37
1997	2.95	0.09	2.71	3.19
1998	3.50	0.46	2.32	4.67
1999	3.26	0.14	2.96	3.55
2000	3.29	0.20	2.77	3.82
2001	-19.16	22.66	-77.41	39.09
2002	3.98	0.15	3.60	4.35
2003	4.13	1.29	1.33	6.93
2004	4.75	0.79	3.04	6.47
2005	2.12	0.38	1.28	2.95
2006	2.15	0.40	1.28	3.02
2007	2.65	0.09	2.46	2.83
2008	2.98	0.67	1.52	4.44
REGSLOPE	0.04	0.41	-0.86	0.94

PHOSPHATE - SLOPE

YEAR	Coefficients	Std Err	Lower 95%	Upper 95%
SITE 1				
1995	-0.03	0.00	-0.04	-0.02
1996	-0.05	0.00	-0.06	-0.04
1997	-0.04	0.00	-0.05	-0.03
1998	-0.03	0.00	-0.03	-0.02
1999	-0.03	0.00	-0.03	-0.02
2000	-0.02	0.00	-0.03	-0.01
2001	-0.06	0.02	-0.12	0.00
2002	-0.03	0.02	-0.08	0.02
2003	-0.01	0.01	-0.02	0.00
2004	-0.08	0.01	-0.09	-0.06
2005	0.00	0.00	-0.01	0.01
2006	-0.04	0.00	-0.04	-0.03
2007	-0.03	0.01	-0.04	-0.02
2008	-0.02	0.00	-0.03	-0.02
REGSLOPE	0.00	0.00	0.00	0.00
SITE 2				
1995	0.00	0.02	-0.05	0.04
1996	-0.06	0.05	-0.16	0.04
1997	-0.10	0.01	-0.12	-0.09
1998	-0.10	0.04	-0.20	0.00
1999	-0.10	0.16	-0.44	0.25
2000	-0.36	0.03	-0.45	-0.28
2001	-0.87	0.09	-1.09	-0.65
2002	-0.19	0.05	-0.31	-0.07
2003	-0.10	0.01	-0.12	-0.08
2004	-0.16	0.02	-0.20	-0.13
2005	0.03	0.09	-0.15	0.21
2006	-0.05	0.02	-0.09	-0.02
2007	0.00	0.01	-0.02	0.01
2008	-0.04	0.03	-0.11	0.03
REGSLOPE	0.01	0.02	-0.03	0.04
SITE 3				
2002	-0.13	0.07	-0.30	0.04
2003	-0.21	0.03	-0.27	-0.15
2004	-0.21	0.02	-0.26	-0.16
2005	-0.09	0.02	-0.12	-0.06
2006	-0.21	0.03	-0.28	-0.13
2007	-0.13	0.01	-0.16	-0.10
2008	-0.11	0.03	-0.18	-0.04
REGSLOPE	0.01	0.01	-0.02	0.03
SITE 3A				
2007	-0.07	0.01	-0.09	-0.05
2008	-0.13	0.02	-0.16	-0.09
REGSLOPE	-0.06	0.00	-0.06	-0.06
SITE 4				
1995	-0.07	0.00	-0.08	-0.06
1996	-0.09	0.00	-0.09	-0.08
1997	-0.08	0.00	-0.09	-0.07
1998	-0.10	0.01	-0.13	-0.06
1999	-0.09	0.00	-0.10	-0.08
2000	-0.09	0.01	-0.10	-0.07
2001	0.55	0.65	-1.11	2.21
2002	-0.11	0.00	-0.12	-0.10
2003	-0.11	0.04	-0.19	-0.02
2004	-0.13	0.02	-0.18	-0.08
2005	-0.06	0.01	-0.08	-0.03
2006	-0.06	0.01	-0.08	-0.03
2007	-0.07	0.00	-0.08	-0.07
2008	-0.08	0.02	-0.13	-0.04
REGSLOPE	0.00	0.01	-0.03	0.02