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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

January 22, 2009
Honolulu, Oahu

Oasis Water Systems, Inc.
REQUEST TO EXCEED MAXIMUM PERMITTED WELL DEPTH
Lanikai Condominium Irrigation Well, "Welly 1" (Well No. 0319-01)
TMK (4) 4-3-002:003, Wailua, Kauai

APPLICANT:

Barry Simmons
Oasis Water Systems, Inc.
P.O. Box 507
Hanalei, HI 96714

LANDOWNER:

Dick Rentz
Lanikai Condominium AOA
390 Papaloa Road, #211
Kapaa, HI 96746

DESCRIPTION:

Location: See Exhibit I.

BACKGROUND:

August 9, 2007

Staff received a complete well construction/pump installation permit application from Oasis Water Systems, Inc., for a proposed irrigation well on TMK (4) 4-3-002:003, located near Papaloa, Wailua, Kauai. (Exhibit 2)

The well depth proposed on the application was 150 feet below ground surface (ft bgs), the ground elevation estimated to be 23 ft above mean sea level (ft msl), and the ground water elevation at the proposed well location estimated to be 10 ft msl (see Exhibit 2). Assuming that freshwater would be present in a typical basal aquifer beneath this property and by applying the Ghyben-Herzberg principle, the estimated theoretical basal aquifer thickness is 410 ft and the theoretical $\frac{1}{4}$ thickness estimated to be 102.5 ft.

A transmittal letter from Oasis Water Systems, submitted with the permit application (included with Exhibit 2) (letter received with the incomplete application on May 30, 2007), requested a variance from the Commission's standard allowed depth for basal aquifer wells (i.e., the theoretical ¼ basal aquifer thickness). The letter stated:

“We are requesting a variance to drill past the ¼ thickness of the theoretical basal lens for Welly #1.”

September 28, 2007

The well construction/pump installation permit application was approved.

October 9, 2007

A Well Construction Permit and a Pump Installation Permit were issued to Oasis Water Systems for the subject well, subject to the Commission's standard conditions and certain special conditions. Staff did not approve the variance request, and instead asked Oasis Water Systems to proceed under the approved permit conditions and make the variance request again when they reached the estimated ¼ theoretical basal aquifer thickness.

December 9, 2008

Elisabeth Lis, of Oasis Water Systems, called to report that the borehole was drilled to 120 ft bgs and that the water had a high salinity level. Ms. Lis again requested approval of their request to drill deeper than the ¼ theoretical basal aquifer thickness.

December 9, 2008

Since the borehole interfaced with a saltwater zone, and the presence and likely configuration of a basal lens was uncertain, staff granted a variance allowing Oasis to advance the borehole to a depth of 150 ft bgs – the depth proposed on the application. This approval included the condition that if Oasis felt it was necessary to drill deeper than 150 ft to reach a suitable ground water supply, it must make another variance request prior to drilling below 150 ft.

As a basis for this approval, staff tentatively concurred with a consultant's interpretation that, based on assessment of other wells within the Kapaa and Wailua areas and near Kauai's east shore, that suitable ground water with lower chloride concentrations could potentially be present below 150 ft bgs. The rationale for staff's approval of this request, which is generally consistent with Lanikai's consultant's interpretation, stated:

“...it is reasonably possible that the borehole for Well No. 0319-01 could produce water with lower chloride concentrations if the hole is drilled deeper than the theoretical ¼ thickness of the basal aquifer.”

December 15, 2008 Barry Simmons called to report that the borehole had been drilled to a depth of 150 ft, and requested approval to drill deeper than 150 ft because the water in the hole was too saline to be used for irrigation.

Staff also spoke to Lanikai's consultant, Tom Nance, who verified that the water being produced in the borehole at 150 ft bgs was saltwater. Mr. Nance asserted that less saline water could be present at some depth below 150 ft and may be confined by caprock-like strata. He said that water with chloride levels less than 1,000 milligrams per liter would be suitable for the proposed irrigation use.

December 15, 2008 Staff approved the second variance request and surmised that, absent any other documentation or data, Oasis "...may already be drilling in the salt water portion of the basal aquifer system in the area." The approval was stated as follows:

"By this letter, we are notifying you that you are allowed to drill to a maximum depth of 181 ft bgs, which we estimate to be ½ the theoretical thickness of the basal aquifer in this area. If water from the final approved depth is not suitable for the proposed irrigation use, you must request in writing approval to drill the borehole deeper than 181 ft prior to advancing the hole beyond that depth." (original emphasis)

This letter also advised that Commission approval would be required if the owner chooses to drill the well deeper than the estimated ½ theoretical thickness. The rationale for granting this approval was stated as follows:

"Our decision for allowing the two variances requested to date is based in part on the location of Well No. 0319-01 relative to other wells within the Wailua River Valley, which are all located hydraulically upgradient and at least a mile from the subject well."

January 10, 2009 Staff received an e-mail message from Tom Nance summarizing salinity and temperature profile data for the borehole, which was drilled to 188 ft bgs by January 7, 2009. (Exhibit 3) According to Mr. Nance's analysis, a thin brackish basal lens is situated over salt water "with an abrupt salinity decrease at depth."

Mr. Nance, on behalf of the Lanikai Condominium Association of Apartment Owners and Oasis Water Systems (the permittee), requests approval to continue drilling the hole to 250 ft bgs, followed by re-evaluation of the situation at the well site.

ISSUES/ANALYSIS:

The *Hawaii Well Construction & Pump Installation Standards, February 2004* (HWCPIS 2004) do not allow drilling deeper than the theoretical ¼ basal aquifer thickness without prior approval. To address this requirement, Standard Condition 4 of the Commission's well construction permit reads:

“In basal ground water, the depth of the well may not exceed on-fourth ($\frac{1}{4}$) of the theoretical thickness (41 times initial head) of the basal ground water unless otherwise authorized by the Chairperson.”

In response to requests from staff for additional information from the well site, Ms. Lis has provided a lithologic log and water level data from the borehole. These data show that the actual ground water elevation is generally in the range of 2 to 4 ft msl, which is 8 to 6 feet lower than estimated on the well construction/pump installation permit application. This information can be used to refine the estimate of the theoretical basal aquifer thickness (using the Ghyben-Herzberg formula). Using the updated water level data, staff recalculated the theoretical basal aquifer thickness and $\frac{1}{4}$ thickness estimates; these refined estimates were 123 ft and approximately 31 ft, respectively. Given that salt water was present in the borehole at the 120-foot depth, when the initial variance request was made, it appears that the borehole had already been advanced into the saltwater portion of the basal lens.

Staff's experience with other wells constructed in certain areas on Kauai (e.g., the Lihue, Kapaa, Wailua, and Princeville areas), suggest that local hydrogeologic conditions could cause fresh water, brackish water, and salt water portions of local aquifer systems to depart from the theorized Ghyben-Herzberg basal lens configuration. Data provided for other wells in the Kapaa and Princeville areas, for example, show a similar decrease in salinity with depth, rather than an increase in salinity that would be found in a 'typical' basal lens configuration. Mr. Nance has presented similar findings for other wells on Kauai that suggest alternate theories and models should be considered for areas where the basal lens theory doesn't easily explain observed conditions.

The salinity profiles presented by Mr. Nance (Exhibit 3) show that the salinity declines with depth below approximately 120 feet. This is another departure from the conceptual basal model, which sets the $\frac{1}{2}$ depth limit, so it probably doesn't apply here.

The salinity data shows that ground water to approximately 120 ft bgs is too saline for domestic and most irrigation uses and is therefore not likely to be developed for these purposes. Further, because the well site is located hydraulically downgradient and at least a mile from other wells within Wailua Stream watershed, even if Well No. 0319-01 is constructed at a depth where ground water will be drawn from the transition zone and/or pumping causes an increase of chloride concentrations in the immediate vicinity, it is unlikely that this well design would adversely impact other wells or water users in the area.

As suggested by Mr. Nance in his January 12, 2009, e-mail message, the risks associated with a decision to drill this well deeper rest with the owner, the driller, and their consultant, with the risk largely being associated with time and money. It seems unlikely that drilling deeper will cause detrimental impacts to the local ground water quality.

RECOMMENDATION:

That the Commission:

- A. Approve the request to drill Well No. 0319-01 to a depth of 250 ft. All other conditions of the well construction permit remain the same.

- B. Add a special condition that the permittee submit a contingency plan in the event the borehole does not produce acceptable water at depth. The plan should specify whether the well bore will be permanently sealed or left in place with a cap at the surface.

Respectfully submitted,



KEN C. KAWAHARA, P.E.
Deputy Director

Exhibit(s):

1. (Location Map)
2. (Well Construction/Pump Installation Permit Application, completed on August 9, 2007)
3. (E-mail Message from Tom Nance, dated January 12, 2009)

APPROVED FOR SUBMITTAL:



LAURA H. THIELEN
Chairperson

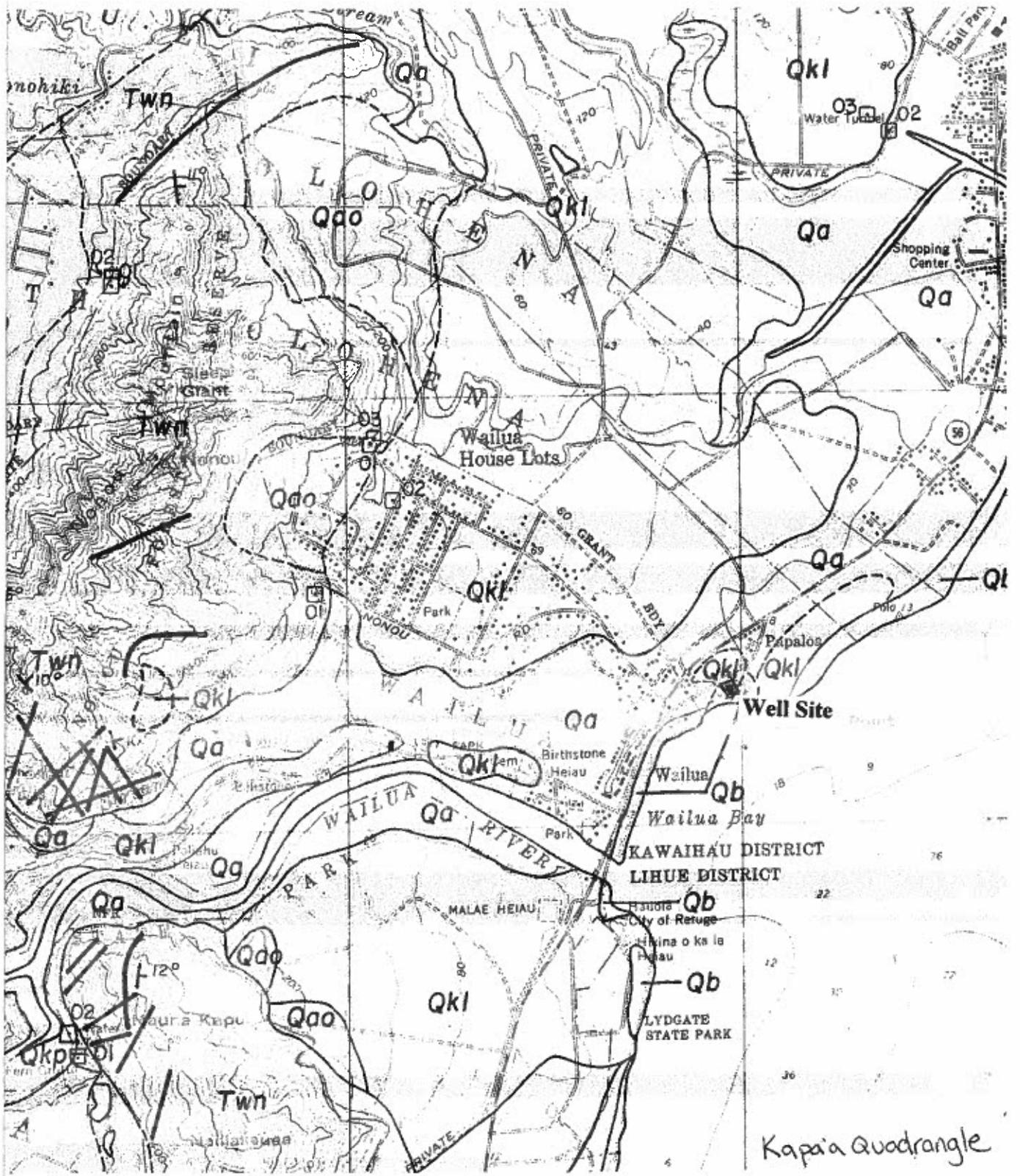


EXHIBIT 1



RECEIVED

07 MAY 30 A 9:33

COMMISSION ON WATER
SERVICE 5/22/2007

To: State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, HI 96809

From: Oasis Water Systems, Inc.
P.O. Box 507
Hanalei, HI 96714

Subject: Variance Request – Welly #1

We are requesting a variance to drill past the $\frac{1}{4}$ thickness of the theoretical basal lens for Welly #1. Please refer to nearby Wells No. 0419-01, 0120-01 & 0120-02, all of these wells had to be drilled over 200' to encounter a sustainable yield. Thank you for your assistance in this endeavor.

Barry Simmons
Oasis Water Systems, Inc.



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
APPLICATION FOR A WELL CONSTRUCTION /
PUMP INSTALLATION PERMIT

For Official Use Only:

RECEIVED

MAY 30 9:33

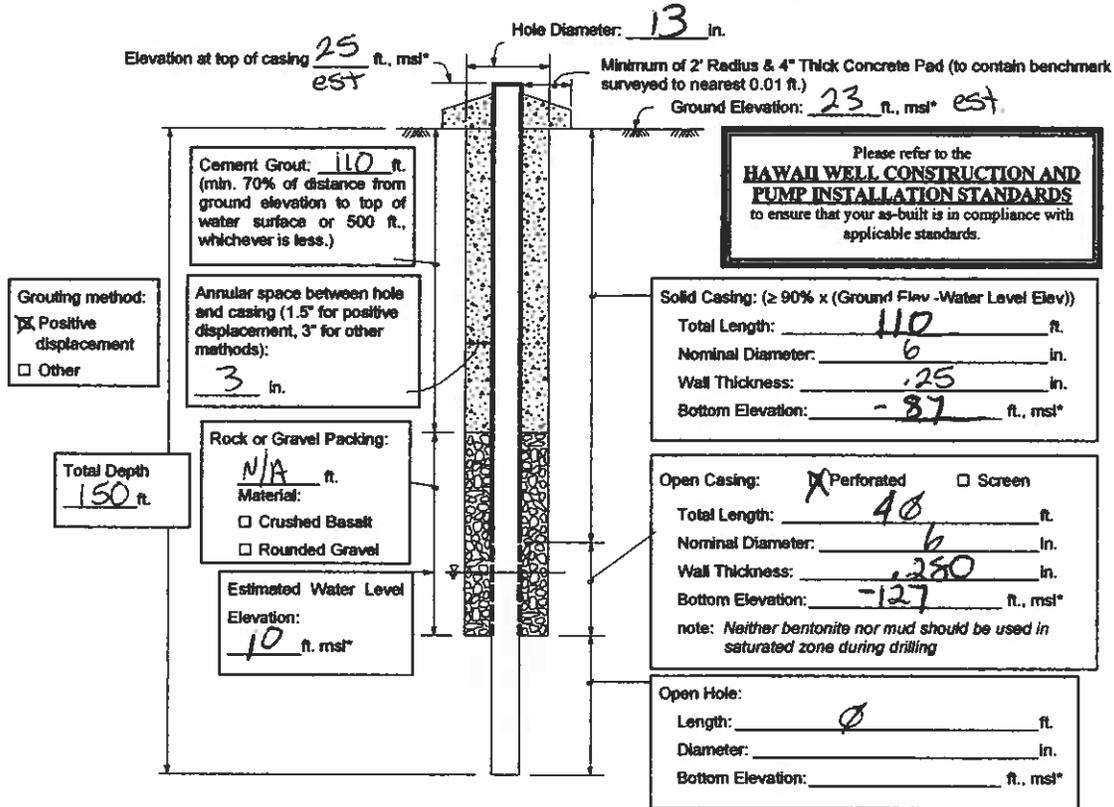
Instructions: Please print in ink or type and send completed application with attachments to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. Application must be accompanied by 16 copies and a non-refundable filing fee of \$25.00 payable to the Dept. of Land and Natural Resources. The Commission may not accept incomplete applications. For assistance, call the Regulation Branch at 587-0225. For further information and updates to this application form, visit <http://www.hawaii.gov/dlnr/cwrm>.

WELL LOCATION INFORMATION			
1. STATE WELL NO. (if already assigned) 0319-01	2. WELL NAME Welly #1	3. ISLAND Kauai	4. TMK 4-3-2-3 <small>zone sec dist perc</small>
The following must be attached before this application is accepted as complete: • Portion of 7.5-Minute Series USGS topographic map (scale 1:24,000) with well location labeled and include the name of the quad map • Property tax map, showing well location referenced to established property boundaries • Photograph of the proposed well site • A schematic diagram showing the well site, access road and proposed well infrastructure • For dug wells, attach a grading plan with cross section profiles showing existing and finish grades			
5. WELL OPERATOR'S NAME/COMPANY Lanikai AOAD		6. LANDOWNER'S NAME/COMPANY LK Development Assoc	
Well Operator's Contact Dick Rentz		Landowner's Contact Dick Rentz	
Well Operator's Mailing Address 390 Papaloa Rd #211 Kapaa, HI 96746		Landowner's Mailing Address same LANIKAI AOAD *	
Well Operator's Phone 822-4152	Well Operator's Fax 822-7456	Well Operator's E-mail	Landowner's Phone
			Landowner's Fax
			Landowner's E-mail
PROPOSED WELL CONSTRUCTION		PROPOSED PUMP INSTALLATION	
7. Proposed Work <input checked="" type="checkbox"/> Construct New Well <input type="checkbox"/> Modify Existing Well <input type="checkbox"/> Abandon/Seal Well	8. Construction Type <input checked="" type="checkbox"/> Drilled <input type="checkbox"/> Dug <input type="checkbox"/> Shaft <input type="checkbox"/> Tunnel	10. Proposed Work <input checked="" type="checkbox"/> Install New Pump <input type="checkbox"/> Replace Pump	11. Proposed Pumping Rate, gpm (gallons per minute) 85
9. Is this well part of a battery of wells? <input type="checkbox"/> Yes <input type="checkbox"/> No		12. Proposed Amount of Withdrawal, gpd (gallons per day) 26,000	13. Method of flow measurement <input checked="" type="checkbox"/> Flowmeter <input type="checkbox"/> Other (explain)
14. Proposed Surveyor name and license number (a surveyor is required for all Well Construction Permits and may be required for some Pump Installation Permits) Peter Taylor - 9149			
PROPOSED USE			
<input type="checkbox"/> 15. Municipal (water systems serving greater than 25 individuals or 15 service connections)			
16. Domestic Number of units to be served: _____			
<input type="checkbox"/> 17. Industrial (describe)			
<input checked="" type="checkbox"/> 18. Irrigation (describe crop and no. of acres) Landscaping 0.4 *			
<input type="checkbox"/> 19. Military (describe)			
<input type="checkbox"/> 20. Other (describe)			
OTHER LEGAL REQUIREMENTS <small>If required, items 21. and 22. must be obtained before the Commission can legally issue a permit:</small>			
21. Conservation District Use Permit (CDUP) <input type="checkbox"/> Well is in Conservation District <input type="checkbox"/> Required, CDUP # _____ date approved _____ <input type="checkbox"/> Not Required (attach documentation from OCCL) <input type="checkbox"/> I have not checked with OCCL about whether or not a CDUP is required. I understand that checking with OCCL prior to making this application will expedite my review. I further understand that issues raised by this agency may delay or result in denial of the permit issuance, or revocation of the permit after it is issued. <input checked="" type="checkbox"/> Well is not in Conservation District <input checked="" type="checkbox"/> I have not checked if well is in or out of Conservation District. I understand that checking if the well is in a Conservation District may expedite my review. I further understand that issues raised may delay or result in denial of the permit issuance, or revocation of the permit after it is issued.			
22. Special Management Area Permit (SMAP) <input type="checkbox"/> Required, SMA # _____ date approved _____ <input type="checkbox"/> Not Required (attach documentation from applicable County agency) <input checked="" type="checkbox"/> I have not checked with the county about whether or not an SMA Permit is required. I understand that checking with the County prior to making this application may expedite my review. I further understand that issues raised by this agency may delay or result in denial of the permit issuance, or revocation of the permit after it is issued.			
23. State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources <input type="checkbox"/> I have consulted with the HPD regarding potential impacts of well construction activities on historic sites. I have attached applicable documentation from the HPD. <input checked="" type="checkbox"/> I have not consulted with the HPD regarding potential impacts of well construction activities on historic sites. I understand that checking with the HPD prior to making this application may expedite my review. I further understand that issues raised by this agency may delay or result in denial of the permit issuance, or revocation of the permit after it is issued. Additionally, the history of past land use is attached.			
Additional remarks, explanations, etc. (attach additional sheet if more space is needed)			
NOTE: Signing below indicates that the signatories understand and swear that the information provided is accurate and true to the best of their knowledge. Further, the signatories understand that upon permit approval: 1) the proposed work is to be completed within two (2) years of the approval date; 2) the contractor shall submit to the Commission a well completion/abandonment report within 60 days after the completion date of the permitted work; 3) in the event that the application is not completed correctly, any permit may be suspended until the item is brought in to compliance, and any work done while the permit is in suspension may result in fines of up to \$5000/day.			
24. WELL DRILLER (Must be filled out if application is for Well Construction) Oasis Water Systems, Inc. 21457 Licensee business name C-57 License No. Elizabeth K. Lis 5/23/07 Signature Print Date		25. PUMP INSTALLER (Must be filled out if application is for Pump Installation) same Licensee business name C-57/C-57a/A License No. Signature Print Date	

15/Nov/07
email from
Betty Lis
(Oasis)

* revised per 8/19/07 email from Peter Taylor

PROPOSED WELL SECTION (Please attach schematic if different from diagram provided below)



* The approximate elevation must be referenced to mean sea level (msl) at the time of application filing. Final elevations of well components shall be submitted in the Well Completion/Well Abandonment reports and referenced to a benchmark which has been established by a surveyor licensed by the State.

For non-salt water Basal Wells - bottom elevation of well should not be deeper than 1/4 of aquifer thickness or,

$$\text{Bottom Elevation of Well Limit} = \left(\text{Water Elevation} - \frac{41 \times \text{Water Level Elevation}}{4} \right)$$

Example: Estimated + 2 ft. Water Level Elev. \rightarrow Bottom Elevation of Well Limit = $\left(2 - \frac{41 \times (2)}{4} \right) = -18.5$ ft.

Solid Casing Material:

Carbon Steel: compliant with (check one or more): ANSI/AWWA C200 API Spec. 5L ASTM A53 ASTM A139

And compliant with (check one or more): ASTM A242 (or A606) Type E Type S Grade B Other

Stainless Steel: (check one): ASTM A409 (production wells) ASTM A312 (monitor wells)

ABS Plastic conforming to ASTM F480 and ASTM D1527: (check one) Schedule 40 Schedule 80

PVC Plastic conforming to ASTM F480 and (ASTM D1785 or ASTM D2241): (check one): Schedule 40 Schedule 80 Schedule 120

Thermoset Plastic: (check one)

- Filament Wound Resin Pipe conforming to ASTM D2996
- Centrifugally Cast Resin Pipe conforming to ASTM D2997
- Reinforced Plastic Mortar Pressure Pipe conforming to ASTM D3517
- Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
- PTFE Fluorocarbon Tubing conforming to ASTM D3296
- FEP Fluorocarbon Tubing conforming to ASTM D3296

Open Casing Material:

Carbon Steel: compliant with (check one or more): ANSI/AWWA C200 API Spec. 5L ASTM A53 ASTM A139

And compliant with (check one or more): ASTM A242 (or A606) Type E Type S Grade B Other

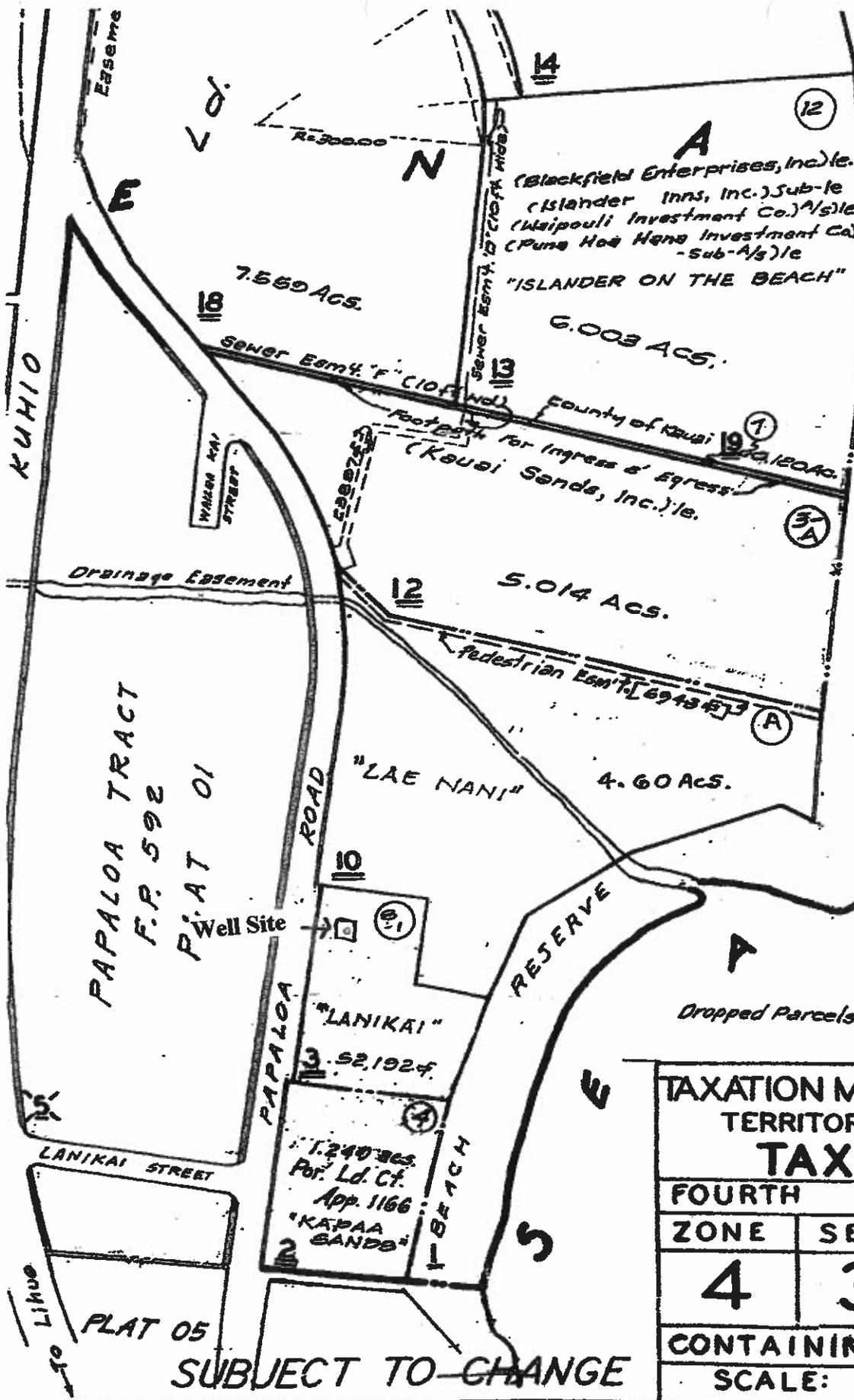
Stainless Steel: (check one): ASTM A409 (production wells) ASTM A312 (monitor wells)

ABS Plastic conforming to ASTM F480 and ASTM D1527: (check one) Schedule 40 Schedule 80

PVC Plastic conforming to ASTM F480 and (ASTM D1785 or ASTM D2241): (check one): Schedule 40 Schedule 80 Schedule 120

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- Glass Fiber Reinforced Resin Pressure Pipe conforming to AWWA C950
- PTFE Fluorocarbon Tubing conforming to ASTM D3296
- FEP Fluorocarbon Tubing conforming to ASTM D3296



State of Hawaii
6.36 acs

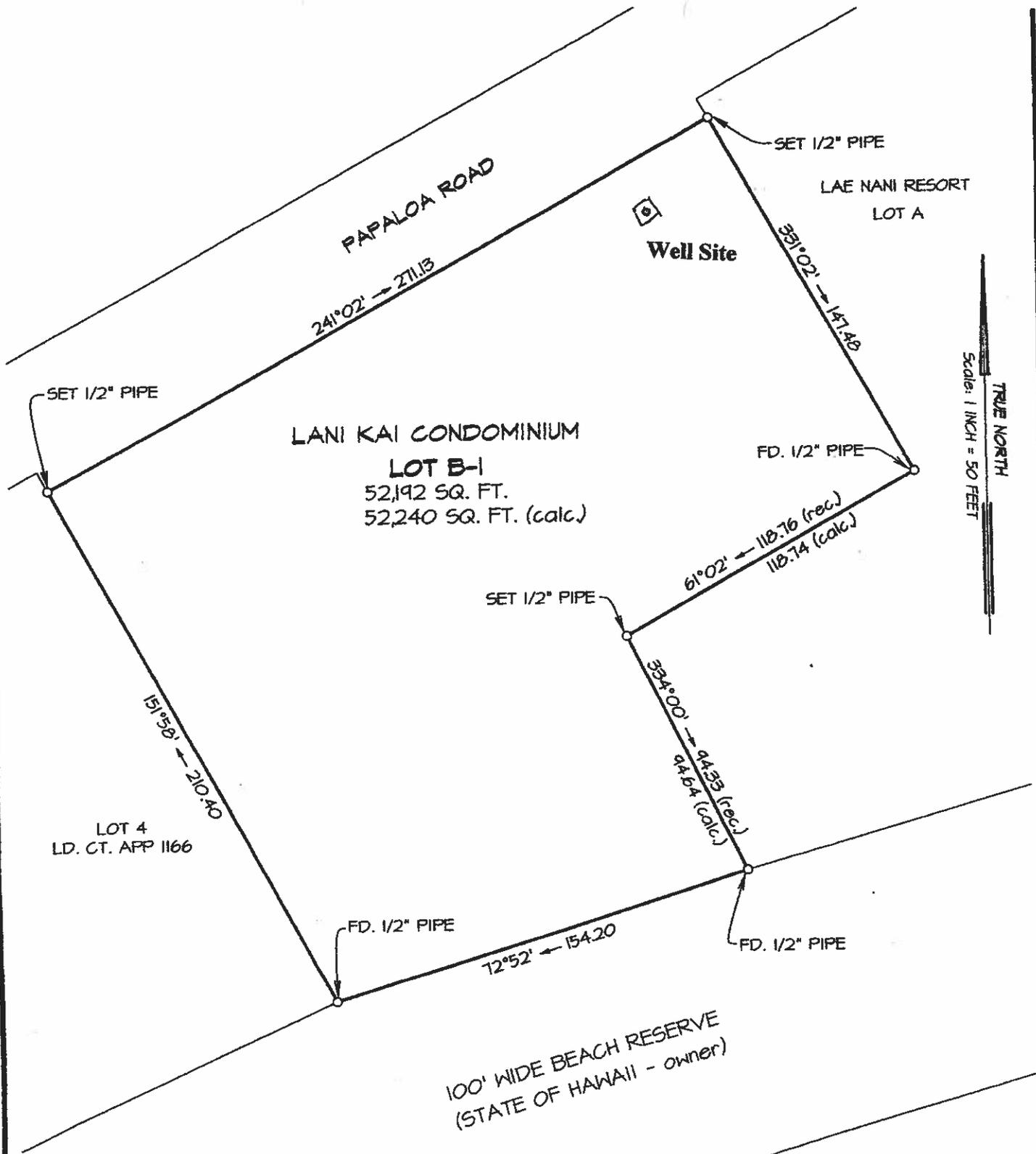
NOTE: Parcels 4, 13 thru 20 incl. owned by Niu Pia Farms, Ltd. unless otherwise noted.

Dropped Parcels: 7, 5, 9,

TAXATION MAPS BUREAU		
TERRITORY OF HAWAII		
TAX MAP		
FOURTH		DIVISION
ZONE	SEC	PLAT
4	3	02
CONTAINING PARCELS		
SCALE: 1 in. = 200 ft.		

PRINTED _____

PRINTED _____



NOTE:

1. FEATURES SHOWN HEREON REFLECT CONDITIONS EXISTING ON MAY 6, 2004

MAY 20, 2004

PREPARED FOR:

LANIKAI CONDOMINIUM ASSOCIATION
390 PAPALOA ROAD
KAPAA, KAUAI, HI 96746

SURVEY OF
LOT B-1
being a portion of
GRANT 5264

to
RUFUS S. SPALDING

at SOUTH OLOHENA, FUNA, KAUAI, HAWAII



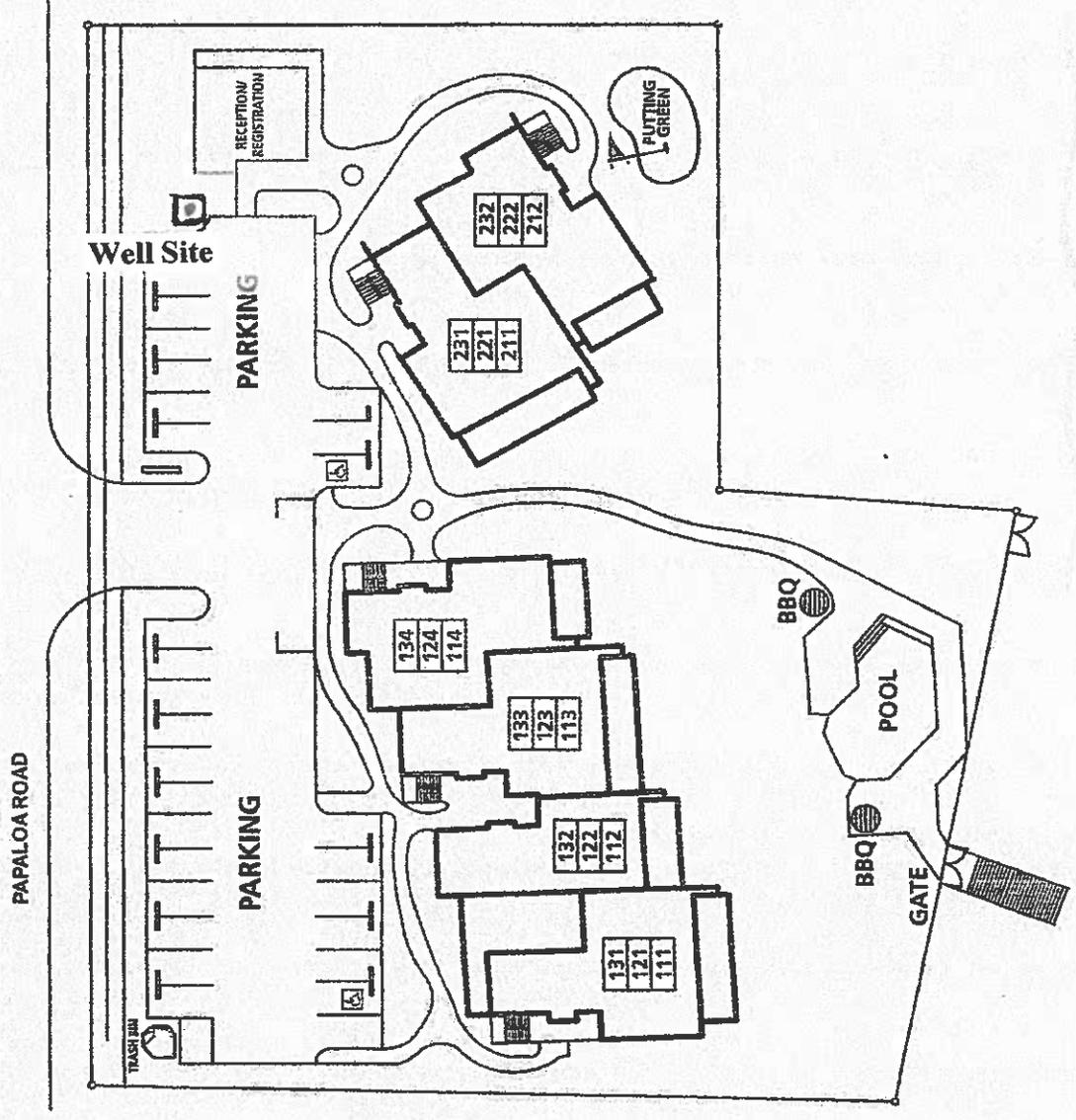
THIS MAP WAS PREPARED BY ME OR



Kauai, Hawaii
Lanikai
Resort

Room Number: _____
 Room Phone Number: _____

Office Hours: 11:00 a.m. - 3:00 p.m.
 Check-in: 3:00 p.m.
 Check-out: 12:00 p.m. (noon)
 Pool Hours: 8:00 a.m. - 10:00 p.m.



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"Tom Nance"
<tom@tnwre.com>
01/10/2009 03:45 PM

To "Simmons, Barry (2-05)" <oasiskauai@yahoo.com>
cc denise.e.mills@hawaii.gov
bcc

Subject Lanikai Condo Well Profiles on Kauai

History: This message has been replied to and forwarded.

Barry and Denise:

Attached are two salinity and temperature profiles, the most recent on January 10th (170 feet into water, about 188 feet below ground) and the other previously on December 5th (about 110 feet into water). Both show a thin, brackish basal lens over saltwater with an abrupt salinity decrease at depth. When the December 5th profile was done, the well had only sit overnight and I attributed this to suspended silt that had not settled as the cause of the "apparent" salinity decrease. However, the January 10th profile was done after the well had been left alone since Wednesday, January 7th. Substantial silt had settled to the bottom (you could feel it). A sufficient amount still in the water column after three days to cause the salinity change in the profile would be unprecedented. Also, suspended silt would not cause the corresponding abrupt change in temperature at the exact same depth.

Having spent the time and clients money to get to this depth, it seems worth going further, say to 250 feet, and then re-evaluating. Certainly there is no "threat" to groundwater in doing so.

Tom

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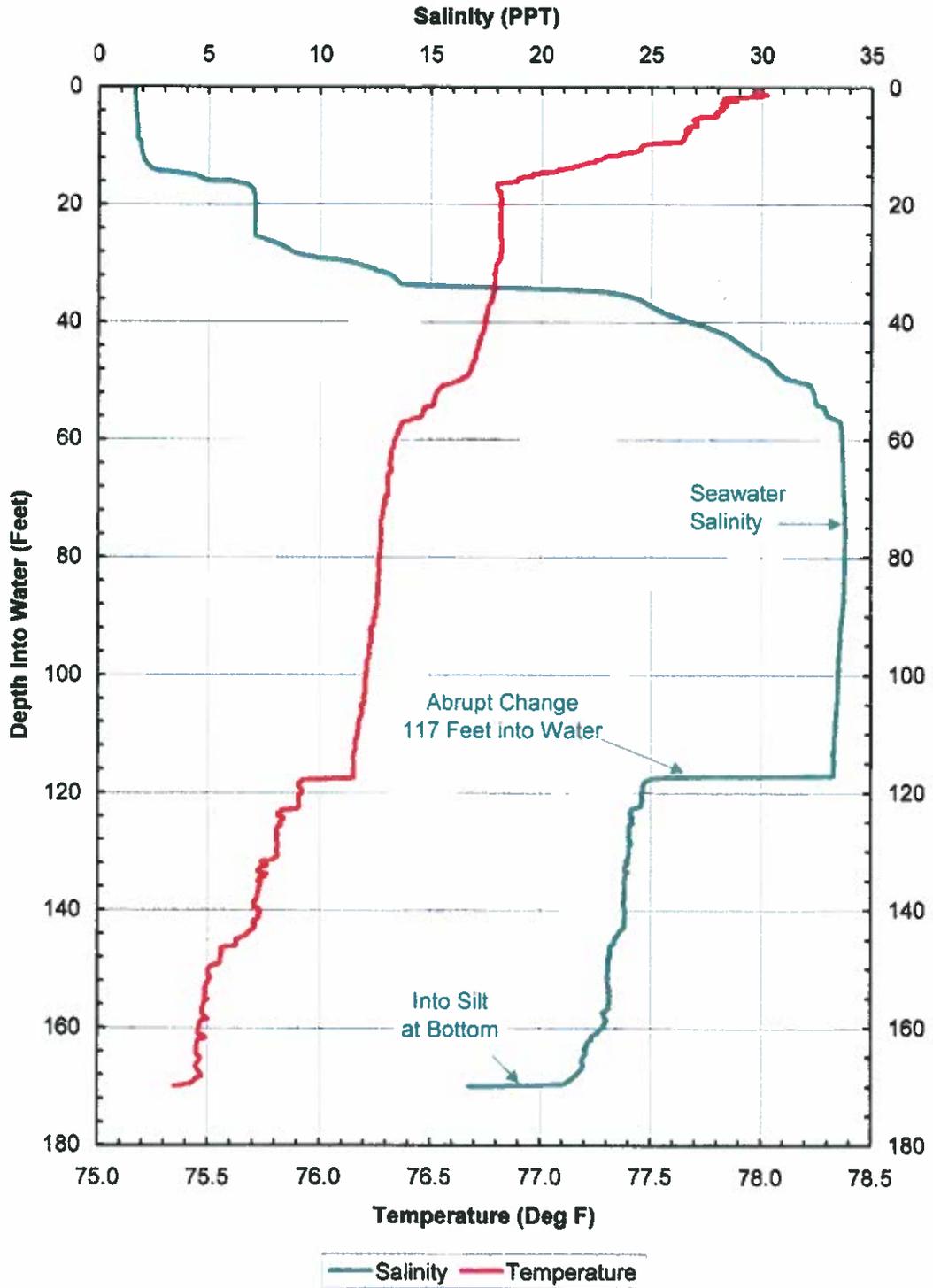
Tom Nance Water Resource Engineering
680 Ala Moana Boulevard - Suite 406
Honolulu, Hawaii 96813



Tel: 808-537-1141 / Fax: 808-538-7757 Lanikai Wel Profiles.pdf

EXHIBIT 3

**Salinity and Temperature Profile of the Lanikai Well
January 10, 2009**



**Salinity and Temperature Profile of the Lanikai Well
December 5, 2008**

