



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

November 20, 2002
Wailuku, Maui

Maui Meadows Homeowners Association
c/o James Williamson, Vice President
Petition to Designate Ground Water Management Areas Action
Iao & Waihee Aquifer Systems (60102 & 60103)
Wailuku, Maui

PETITIONER:

Maui Meadows Homeowners Association
C/o James Williamson, Vice-President
P.O. Box 1935
Kihei, HI 96753

DESCRIPTION: Location of aquifers: Exhibit 1; see also November 14, 2002 Final Findings of Fact

BACKGROUND:

From February 1986 to August 1997, various Board of Land and Natural Resources and Commission initiated designation proceedings, investigations, findings of fact (FOF), reports, and various milestone actions before the latest Commission action on August 13, 1997 to not designate the Iao Aquifer System as a ground water management area. Although not designated, the Commission added the condition that if the 12-month moving average of pumpage from the aquifer ever exceeded 20 million gallons per day (mgd) in the future, the aquifer would automatically be designated.

On July 12, 2001 Maui Meadows Homeowners Association (MMA) submitted a petition to the Commission requesting designation of the Iao and North Waihee Aquifer Systems as ground water management areas. This marked the first time a petition from the public concerning the designation these two (2) aquifer systems.

On August 6, 2001 staff mailed letters to the Mayor, County Council, and the Department of Water Supply for the County of Maui requesting comments to the MMA petition.

On August 15, 2001, the Commission extended the 60-day chairperson recommendation deadline (September 10, 2001) under designation proceedings to the November 14, 2001 Commission meeting to

Approved by Commission on
Water Resource Management
at the meeting held on
NOV 20 2002 (*amended*)

give the various agencies of the County of Maui more time to review and offer comments on the MMA petition.

On September 10, 2001, the Maui County Council Member, Charmaine Tavares, submitted a letter requesting more information about the Iao Aquifer System. On the same day, Maui County Council Member, Michael Molina, faxed a letter requesting more information about the Iao Aquifer System.

On September 11, 2001, the Maui Department of Water Supply (MDWS) faxed their MMA petition comments to the Commission.

On November 14, 2001, the CWRM accepted the chairperson's recommendation for designation by approving the continuance of the designation process. This was done to further investigate the hydrologic conditions and notify the County of the seriousness of the situation.

Notices for the public hearing were published in the Honolulu Star Bulletin and Maui News issues of December 10, 17, 24, 2001. On January 9, 2002, the CWRM held the public hearing on the island of Maui at the Wailuku Community Center to receive public testimony concerning designation of the Iao and Waihee Aquifer Systems. After the close of the public hearing, testimony was accepted until February 8, 2002. Public testimony is included in the Final FOF in Appendix D.

September 17, 2002, staff finished and posted a draft FOF on the Commission's website. The CWRM requested comments to the draft FOF from the County of Maui and accepted any other public comment up to November 4, 2002.

On October 16 & 18, 2002, staff attended the Maui County Council meetings to answer questions concerning the draft FOF.

On October 28, 2002, the CWRM received a request from the County of Maui County Council to defer the matter pending outcome of the election and ballot initiatives concerning the Department of Water Supply and stated it could not assess the results of the general election and take action as a council until sometime after the November 20, 2002 meeting.

On November 14, 2002, staff finalized the FOF by incorporating County of Maui and public comments received on or before the November 4, 2002 deadline on the draft FOF and updating the FOF where factual information was warranted.

In brief, the process for taking action on a petition to designate a water management is outlined under §174C- 41 through §174C-46 and is summarized as follows:

Summary of Water Management Area Designation Process

- (1) Petition filed with the Commission.
- (2) Consultation with Mayor, County Council, and County Water Board.
- (3) Comments received from Mayor, County Council, and County Water Board.
- (4) Chairperson makes a recommendation to the Commission to accept or reject petition within 60 days of receipt of the petition to continue the designation process.
- (5) Commission accepts or rejects petition. Commission shall render final decision within 90-days.
- (6) Publication notice of public hearing.
- (7) Public hearing held.
- (8) Completion of staff investigation and FOF in cooperation with county and federal agencies.
- (9) Consultation with Mayor, County Council, and County Water Board.
- (10) Chairperson recommendation to Commission action for or against designation.

- (11) Commission renders final decision within 90 days of the Chairperson's recommendation in step 10.

The current MMA petition procedural status is at step (10). The chairperson must make a recommendation on designation for the Iao and Waihee Aquifer Systems to the Commission for final action (step 11) within 90 days. Technically, the Commission could act on the chairperson's recommendation immediately; therefore, the current status is also at step 11.

County of Maui & Public Comments on the September 17, 2002 Draft FOF

Comments on the FOF received before the November 4, 2002 deadline are included in the Final FOF and found in its Appendix E. Factual corrections based on these comments were noted and made in the Final FOF. A listing of the significant changes from the Draft FOF is attached as Exhibit 2. No official comments were submitted after the November 4, 2002 deadline.

Final Findings of Fact (FOF) November 14, 2002

The Final FOF is the completion of the staff's investigations and consultations outlined in steps 8 & 9 of the designation process. The Final FOF attempts to present the most up to date and comprehensive set of data, facts, and comments on both the Iao and Waihee Aquifer Systems for the Commission's information in its consideration for designation. Staff also presents their professional opinions about these facts in regards to the designation criteria listed under §174C- 44 – ground water criteria for designation, which the Commission shall consider in its discretionary role on designation.

ISSUES/ANALYSIS:

The designation process and the criteria to be considered by the CWRM for designation of a ground water management area are set forth in Part IV of the State Water Code, Chapter 174C, Hawaii Revised Statutes. §174C- 41(a), HRS, states:

“When it can be reasonably determined, after conducting scientific investigations and research, that the water resources in an area may be threatened by existing or proposed withdrawals or diversions of water, the commission shall designate the area for the purpose of establishing administrative control over the withdrawals and diversions of ground and surface waters in the area to ensure reasonable-beneficial use of the water resources in the public interest.”

Additionally, §174C-44, HRS, sets forth eight criteria that the CWRM shall consider in designation of an area as a ground water management area. As discussed later in this section, the Final FOF found that Iao aquifer met two of the criteria and Waihee aquifer met one of the eight criteria for ground water designation.

The agency and public comments received since issuance of the FOF in September raised two principle issues:

1. What are the 'water resources' in the Iao and Waihee Aquifer System areas;
2. Whether these 'water resources' may reasonably be determined to be threatened by existing or proposed withdrawals from these areas.

Issue 1: What are the water resources in the Iao and Waihee Aquifer System areas?

Several comments received from the public advocated that the CWRM should define water resources as the individual wells contained in the aquifers rather than the aquifers themselves. There were also comments asserting that the sustainable yield exceed the amount of water that could be pumped from the existing infrastructure in Iao and Waihee Aquifer Systems. This again implies that the water resource is the existing infrastructure versus the aquifers themselves.

Water Resources in this context and sustainable yields are set in the Hawaii Water Plan.¹ Section 174C-31(h), HRS, requires the Commission to establish hydrological units on each county. Section 174C-31(i), HRS, requires the Commission to establish a sustainable yield for each hydrological unit. In 1990, the Water Resource Protection Plan established Iao aquifer and Waihee Aquifer Systems as two of the hydrological units for the Maui and established a sustainable yield of 20 mgd for Iao Aquifer System and 8 mgd for Waihee Aquifer System. Section 174C-31, HRS, also sets forth a detailed process for amendments to the plan or adoption of a revised plan. To date, no amendments or adoption of an updated water resource protection plan has been approved by the CWRM for Iao and Waihee Aquifer Systems. Therefore, based on the water code, it is clear that the water resources referred to in section 174C-41(a), HRS, are the aquifers themselves and not the existing infrastructure.²

Several commentators also felt that given the existing infrastructure, the CWRM's sustainable yield of 20 mgd for Iao aquifer was too high and should be revised. Sustainable yield in the Code is defined as:

§174C-3 "Sustainable yield" means the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the commission.

Section §174C-3 defines water source broadly as:

"a place within or from which water is or may be developed including but not limited to: (1) generally, an area such as a watershed defined by topographical boundaries, or a definitive ground water body; and (2) specifically, a particular stream, other surface water body, spring, tunnel, or well or related combination thereof."

As discussed earlier, the CWRM established hydrological units as the aquifers themselves and their sustainable yields through the Hawaii Water Plan, Water Resources Protection Plan (WRPP). Therefore, the code defines the maximum rate of withdrawal from the aquifer, rather than infrastructure, determines sustainable yield.

Not only does the code provide sufficient guidance for the determination of sustainable yield, but professional hydrologists recognize the distinctions between aquifers and infrastructure and maximum rates of withdrawal from these two perspectives. During the process of this designation proceeding, much attention has been given to the man-made limitations imposed on developing the potential sustainable yields through less than optimal well infrastructure construction. Staff concurs with the conclusions of

¹ Some of the comments criticizing the September FOF center more on the water code requirements of the Hawaii Water Plan or the legal definitions of authorized planned use, sustainable yields and water sources. Your staff offers no comments or recommendations for water code amendments, as that is irrelevant to the designation process. Your staff's analysis is based on the water code as it is currently enacted.

² This interpretation is also supported by §174C-44(1), HRS, where the Commission must determine whether authorized planned use exceeds 90% of the sustainable yield of the proposed ground water management area. The petition filed by Maui Meadows proposes to designate Iao and Waihee aquifers as ground water management areas.

the U.S. Geological Survey (USGS) reports and public comments that distribution of pumping in Iao, or any other aquifer system for that matter, is important in determining the sustainability of a given configuration of pumpage. Staff internally uses the term "safe infrastructure yield" to define what a given pumpage configuration can produce from a given aquifer. However, safe infrastructure yield is not sustainable yield. As defined in the water code and established in the WRPP, sustainable yield is the maximum rate of withdrawal from a given hydrological unit or in this case, Iao and Waihee Aquifer Systems. To obtain the maximum rate of withdrawal without impairing the utility or quality of the aquifer requires an optimal spacing of wells, well depths and pumping regimes. Staff concurs that poorly spaced wells, wells that are too deep, and poor pumping regimes would obviously not produce the maximum rate at which water can be withdrawn from any given aquifer. The estimated sustainable yield as determined in the Commission's Water Resource Protection Plan (WRPP) is the maximum rate at which water can be withdrawn based upon an optimal spacing of wells, which is a critical assumption of the analytical RAM model used for all sustainable yields in the WRPP.

Even assuming for argument sake only that the sustainable yield for Iao should be revised downward, the designation process is not the appropriate vehicle under the water code to revise Iao's sustainable yield. Sustainable yields are established through the Hawaii Water Plan and can be revised or amended through the process set forth in section 174C-31, HRS. No amendments or revisions for Iao's sustainable yield have been established through that process making any debate over sustainable yield revisions at this time somewhat academic and part of this designation process. Furthermore, none of the groundwork and analysis that the CWRM used in its sustainable yield revisions for the Pearl Harbor Aquifer Sector has been done here. Changing sustainable yield at this time without any new credible analysis (i.e. numerical model) that exists for the Iao and Waihee Aquifer Systems to better predict future pumpage distribution impacts to set a new sustainable yield estimate may be politically expedient but would be scientifically imprudent and ultimately unsupportable. We concur with the USGS that to better predict impacts from existing or future pumpage distributions for these aquifers a numerical model would be required. Fortunately, a four (4) year one million dollar (\$1M) numerical modeling effort is now being planned according to the County of Maui and the USGS. Staff supports this furtherance of scientific analysis and knowledge.

Issue 2 – Reasonable determination of threat to 'water resource' from existing and proposed withdrawals

Regarding the second issue for the Commission, staff starts with the minimum designation ground water criteria the Commission must consider. After all the scientific investigations and public comment, the FOF finds that that two (2) criteria are clearly met for the natural aquifer water resource called the Iao Aquifer System and one (1) for the natural aquifer water resource called the Waihee Aquifer System. These are as follows:

Iao Aquifer System

1. §174C- 44(1) - *Whether an increase in water use or authorized planned use may cause the maximum rate of withdrawal from the ground water source to reach ninety per cent of the sustainable yield of the proposed ground water management area;*
2. §174C- 44(4) - *Whether the rates, times, spatial patterns, or depths of existing withdrawals of ground water are endangering the stability or optimum development of the ground water body due to upconing or encroachment of salt water.*

Waihee Aquifer System

1. §174C- 44(1) - *Whether an increase in water use or authorized planned use may cause the maximum rate of withdrawal from the ground water source to reach ninety per cent of the sustainable yield of the proposed ground water management area;*

In addition to these minimum criteria that are met in its consideration of reasonable threat from **existing withdrawals** to the natural aquifer water resource, staff suggests that the Commission also consider the most recent Commission action on the Iao Aquifer System designation proceedings on August 13, 1997. The very same ground water criteria were met in January 1996 and a mixture of staff recommendations to designate and of milestones to avoid designation culminated in the Commission's August 13, 1997 decision to stop micromanaging the safe infrastructure yield alternatives and instead set designation as automatic if the 12 month moving average (12-MAV) pumpage exceeded the 20 mgd sustainable yield limit. This effectively affirmed the Commission's opinion in the reasonableness of the 20 mgd estimate, in light of existing data at the time, for the natural aquifer sustainable yield. This left achieving the goal of developing alternative sources outside Iao in the hands of the County of Maui.

Since setting this designation trigger of 20 mgd, the pumpage patterns for the Iao Aquifer System has arguably improved. The total 12-MAV pumpage has been reduced from 20+ mgd in 1996 to near 16 mgd, due in large part to the development of Waihee sources. Also, Wailuku Shaft 33 has been activated, Mokuhaui 2 has been deactivated, and the new, and yet to be pumped, Waikapu Mauka well have spread out the lowered pumpage. The rise in the midpoint of the transition zone has been markedly reduced and pumping well water levels have been stable over the past three (3) years despite the moderately to severely dry weather over the same period. Therefore, the designation pumpage trigger appears to be working in a positive direction towards addressing infrastructure concerns for Iao. Whatever the reasonableness of the threat from existing withdrawals to the water resource of the natural Iao Aquifer System back in 1997, it is arguably less today.

In the Waihee Aquifer System there is concern about the existing concentration of pumpage, which has dramatically increased since 1997. Although over half of the aquifer sustainable yield is pumped mostly in the southern portion of Waihee, current data does not demonstrate an immediate threat to the aquifer nor the infrastructure. The reasonableness of the threat from existing and future pumpage to Waihee would best be answered through a collaborative effort in designing a numerical model in conjunction with data from a deep monitor well in the Waihee Aquifer System. In the meantime, there is no automatic designation pumpage trigger like that existing for the Iao Aquifer System.

In terms of **proposed withdrawals**, both the Iao and Waihee aquifers face the same threat, however reasonable that threat may be, since it is part of the Central Maui Service Area. Proposed total use from the CMSA has reduced from 31.1 mgd in 1990 to 29.2 in 2002. Therefore, similar to existing threats, whatever the reasonableness of the threat from proposed withdrawals to the water resources of the natural Iao Aquifer System back in 1997, it is arguably less today. Nevertheless, the projected demand from the CMSA is larger than what are the combined reasonable sustainable yields from the Iao and Waihee Aquifer Systems and without clear alternatives this would constitute a reasonable threat. We remain concerned that despite the 1997 CWRM action, the County has continued to allow developments to tap Iao aquifer and the CMSA for their potable water supply. Over the last three years, your staff, and at times, the County's own DWS, have advised the County on numerous proposed projects that Iao should not be used as a water source given the historic problems with the aquifer. We continue to receive requests for comments for development projects that propose to tap water from Iao.

The disposition of the East Maui Water Development Plan (EMWDP) to supply an additional 9.3 mgd from eight wells from proposed sources should also be considered. The EIS for this plan has recently been accepted by the MBWS, but it may still be challenged in court. Therefore, the implementation of the EMWDP to bring additional alternative sources online is important in the Commission's consideration of the reasonableness of the threat from proposed withdrawals to the Iao and Waihee Aquifer Systems.

Finally, since there really is only one major water user in Iao, competition for water will not be like that experienced on Molokai or Oahu. Competition for Iao and Waihee water is more similar to Lanai where there is only one major user of ground water, in this case the MDWS. Infrastructure concerns for Lanai resulted in some special non-designation conditions based on water level behavior and total pumpage limits.

Possible Commission Actions

Given the responsibilities of the Commission and the facts as presented in the Final FOF, the Commission may act in one of the following three (3) ways within 90 days (deadline of February 18, 2003):

1. **Grant the County Council's request to defer action.** This would allow more time for the new Maui County Administration and the County Council to comment on designation and possibly provide firmer stances on proposed withdrawals, the numerical modeling commitment, and the implementation of the EMWDP in light of the charter amendments and new administration.

The merit of this option is since the major criteria for designation is based most heavily on the county's future development & water demand plans, infrastructure development, and the resulting use of Iao and Waihee aquifers, it is relevant to ascertain whether a change in administration on both the County administration and the charter amendment making the Department of Water Supply a county department directly under the Mayor would change any existing water related plans or any capitol improvement projects or both.

2. **Designated either one or both Iao and Waihee Aquifer Systems as ground water management areas.** If the Commission, after considering the met ground water criteria and other considerations met for the aquifer systems constitute a reasonable threat to the natural aquifer water resource then the Commission must designate them as ground water management areas. In staff's opinion, criteria §174C- 44(1) concerning authorized planned use is the strongest case for designation. Criteria §174C- 44(4) concerning the stabilization of optimization of the ground water body is a weaker argument at this time primarily due to the uncertainty of the optimization issue and current pumpage and data. Existing withdrawals, mainly from the sole user the County of Maui would be required to submit applications for water use permits within one year of the date of designation for existing uses only. Water use permits for future demands would be addressed after existing uses have been established through water use permits.

The merit of this option is for the CWRM to act now before reasonable threats to the aquifer(s) increase to avoid damage to the aquifer(s). Since the date of designation also establishes existing use amounts, the current 12-MAV of approximately 16 mgd would lock in this lower pumpage amount for Iao and 5 mgd for Waihee. Water use permits for future uses would be addressed separately and later under the water use permit process.

3. **Deny Designation for Iao and/or Waihee aquifers but institute triggers for automatic designation.** Like the non-designation decision for Lanai, the Iao and Waihee Aquifer systems have only one (1) major user of water, in this case the County of Maui, so the competition for ground water between well operators is not an issue that needs balancing. Therefore, the County

of Maui has almost total control over the pumpage patterns in the aquifer to address safe infrastructure yields, which it is in their own best interest to protect. In fact, if the MDWS enforces their own Iao Management Rule they should be able to manage their safe infrastructure yields adequately.

Since it appears to have been effective in the development of alternative well sources the case of Iao, automatic designation using the 12-MAV pumpage limit of 20 mgd for the Iao Aquifer System should remain in place under a non-designation decision. Additionally, staff would propose two (2) additional triggers of automatic designation that incorporate comments from the public on the uncertainty of natural aquifer sustainable yield, the counties apparent commitment to developing a numerical ground water model for both aquifers, the potential new information from the new deep monitor well in the southern portion of Iao, and the implementation of the EMWDP. These two new triggers are as follows:

- a. *Iao Aquifer System (60102)* – If the midpoint of the transition zone from the Waiehu Deep Monitor Well (5430-05) rises above the –680 ft. elevation (msl) at any time, the Iao Aquifer System shall be automatically designated as a ground water management area. See Exhibits 3 & 4.³
- b. *Waihee Aquifer System (60103)* – If the water level based on a 12-month moving average for the Kanoa Test Hole (5731-05?) under any non-pumping conditions from both Kanoa 1 & 2 (5731-02 & 04) conditions falls below +6 ft. elevation (msl) at any time, the Waihee Aquifer System shall be automatically designated as a ground water management area. See Exhibit 4.

³ Exhibits 3, 4, & 5 provide a graphical explanation for these triggers. Although the hydrologic behavior in the movement in the midpoint of the transition zone (Iao trigger) and the water table (Waihee) is not linear, staff used recreatable linear regression analysis on the actual data in both graphs to establish linear trends to facilitate setting trigger points based on water level elevations. The common time periods for linear regression analysis in both graphs are: 1) the complete long-term data set; 2) the period of 1996 to the present (public comments on present trend); and 3) the period of 2000 to the present (CWRM staff opinion of the present trend). Also common to both graphs is that these trends are projected four (4) years into the future to acknowledge the timeline of producing a numerical model and the potential implementation of the EMWDP.

Exhibits 3 & 4 explain the derivation of the Iao mid-point trigger. The data set for Iao is the Waiehu Deep Monitor well, which is the only source that can establish the mid-point elevation. The bottom of the deepest Iao production well, Waiehu Heights 1 (5430-01) at –338 ft msl, is included for reference purposes. Using the most recent and reasonable recharge estimates that range between 25 to 32 (Mink) and the RAM (CWRM), a zone of predicted mid-point elevation is shown between –501 ft and –686 ft msl. Additionally, the USGS (1997) provided a geographic information system based model analysis of recharge that resulted in a 29 mgd estimate that falls into this range. The most conservative trend to set a trigger would be the 2000 to present trend extrapolated the four (4) years for reasons described earlier. This results in a midpoint trigger point of –680 ft msl.

Exhibit 5 explains the derivation of the Waihee water table trigger. The data set for Waihee is a mixture of the North Waihee 1 (5631-02) and the Kanoa Test Hole (5731-05?) due to the scarcity of data from the Kanoa Test Hole and that the test hole is the better non-pumping observation well to establish a water table elevation for the aquifer. Since the most recent water levels are essentially flat since 2000 to the present this leaves no margin of error for a trigger projected four (4) years into the future. Therefore, staff proposes to use the petitioner's trend since 1996 extrapolated four (4) years into the future for reasons described earlier. This results in a water table trigger point of +6 msl.

The merit of using non-designation to set triggers is evidenced by the last trigger set by the Commission and the reduced pumpage and significant development of alternative resources outside of Iao since then. The impending numerical ground water model project, implementation of the EMWDP, construction of the new deep monitor well in southern Iao, and implementation of the Iao Water Management Rule are potent water resource management tools and alternatives that may provide better management for the petitioned aquifers rather than designation at this time. The time and effort spent on implementing these tools may be hindered by the work generated by designation to both the county and staff. Staff would rather see increased efforts and reliance on these management tools prioritized by the county through this trigger technique than on the processing of water use permits and subsequent possible contested case hearings.

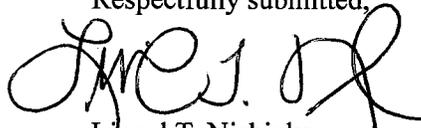
In summary, staff believes for the reasons discussed herein that the final FOF would support any of the three alternatives. However, to be consistent with staff's 1997 recommendation, staff believes that the finding that Iao aquifer and Waihee aquifer has met one or more of the criteria under section 174C-44, HRS, meets the standard under section 174C-41(a) for designation. The strongest argument for designation is the lack of proper planning that threatens the water resource through the CMSA future demands that exceed both the Iao and Waihee Aquifer Systems cumulative available amount of sustainable resource and the tentative nature of alternative sources.

RECOMMENDATION:

That the Chairperson recommend to the Commission that the Commission:

1. Accept the November 14, 2002 Findings of Fact as final.
2. Find that meeting criteria §174C- 44(1) constitutes a current reasonable threat to the Iao Aquifer System (60102).
3. Designate the Iao Aquifer System (60102) as a ground water management area.
4. Find that meeting criteria §174C- 44(1) constitutes a current reasonable threat to the Waihee Aquifer System (60103).
5. Designate the Waihee Aquifer System (60103) as a ground water management area.

Respectfully submitted,



Linnel T. Nishioka
Deputy Director

Exhibit 1	Iao and Waihee Aquifer System Map
Exhibit 2	Listing of significant changes to the Final FOF from the Draft FOF
Exhibit 3	Iao Transition Zone Mid-Point Trends and Proposed Trigger
Exhibit 4	Zoom-in of Iao Transition Zone Mid-Point Trends and Proposed Trigger
Exhibit 5	Waihee Water Level Trends and Proposed Trigger



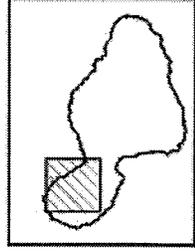
State of Hawaii
 Department of Land and Natural Resources
 Division of Water Resource Management

IAO & WAIHEE AQUIFERS



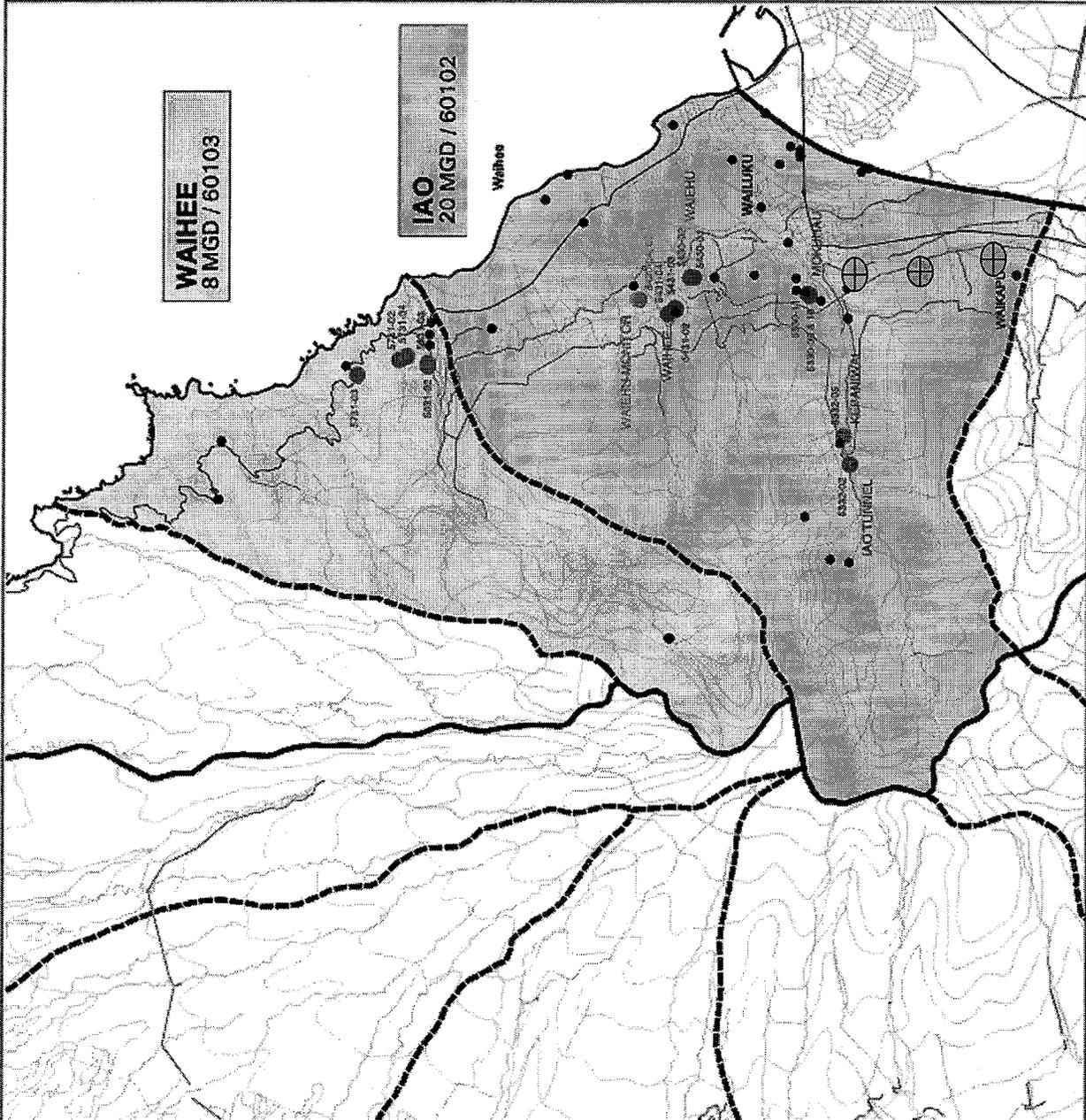
SCALE 1:70,000

- ACQUIFER SECTOR BOUNDARY
- - - ACQUIFER SYSTEM BOUNDARY
- OTHER WELLS
- MAUI DWS WELL
- MONITOR WELL
- PERENNIAL STREAM
- DITCH
- MAJOR ROAD
- ROAD
- CONTOUR (500 FT INT.)



LOCATION MAP

Map Projection: Universal Transverse Mercator



**Revisions to the September 17, 2002 Draft Finds of Fact
From CWRM Staff and Public Comments Received before November 14, 2002**

Tables and Figures Titles

Minor changes in titles for consistency throughout report and number changes due to inclusion of new figures – see listings.

Major Findings pg x.

Added that the Iao Management Rule was adopted on 3/15/99.

3.4.2 Rainfall

Table 2: Studies sorted by date. Also added a study by Mink and Yuen (2001). Updated some sustainable yield estimates based on data from those studies.

3.4.8 Ground-Water Pumpage

Table 4: CWRM staff updated information in Table 4 for clarifications. There is nothing significantly different other than some average pumpage from Maui Parks and Recreation and clarifications on types of use.

3.4.9 Water Levels

1st paragraph clarifies that regular collection of water-level data and most water-level data has been from non-pumping observation wells and occasional water-level data has been collected from some pumping wells.

4th paragraph describing what constitutes good water level data has been included.

New Figure 14 of all water-level data from Wailuku Shaft 33 and Mokuhaui 2 was added.

3.4.10(a) Chlorides

New Figure 20 showing a conceptual diagram of upconing perpendicular to the coast that shows a well can go bad but the aquifer remains undamaged.

New Figure 21 showing a conductivity profile of Waiehu Deep Monitor Well was added with an accompanying explanation.

Waihee Wells:

A sentence added stating that upconing has not been a problem at this Iao well field.

3.5.2 Rainfall

Figure 35 on the 12-month SPI for Waihee Valley Raingage was added.

Figure 36 of rainfall data for the Puu Kukui Raingage was added.

Table 8 title reworded and studies sorted by date.

3.5.8 Ground-Water Pumpage

Table 10:

CWRM staff updated information in Table 10. There is nothing significantly different.

3.5.9 Water Levels

5th paragraph, actual water-level measurement updated.

Figure 41 of final FOF was updated to include new Kanoa TH-1 data.

3.5.11 Sustainable Yield

3rd paragraph updated to provide more information and clarification regarding the southern portion of the Waihee Aquifer System and current pumpage patterns.

3.6.1(b) Projected Demands

Table 11, note 3, has been revised to show the Central Maui Hount Venture commitments are not currently disputed in court.

2nd paragraph has been revised to clarify that Table 11 projects have an unknown timeframe.

3.6.2 Growth of CMSA Supply

Outside Iao and Waihee:

First paragraph updated to show MBWS acceptance of the Supplemental EIS for the East Maui Water Development Plan.

3.7 County and Public Testimony

Table 12 minor updates on Sector information.

3.8.1 Iao Aquifer System Designation Criteria

Criterion 3, Note 2 has been revised to clarify well water-levels rather than aquifer water-levels.

References

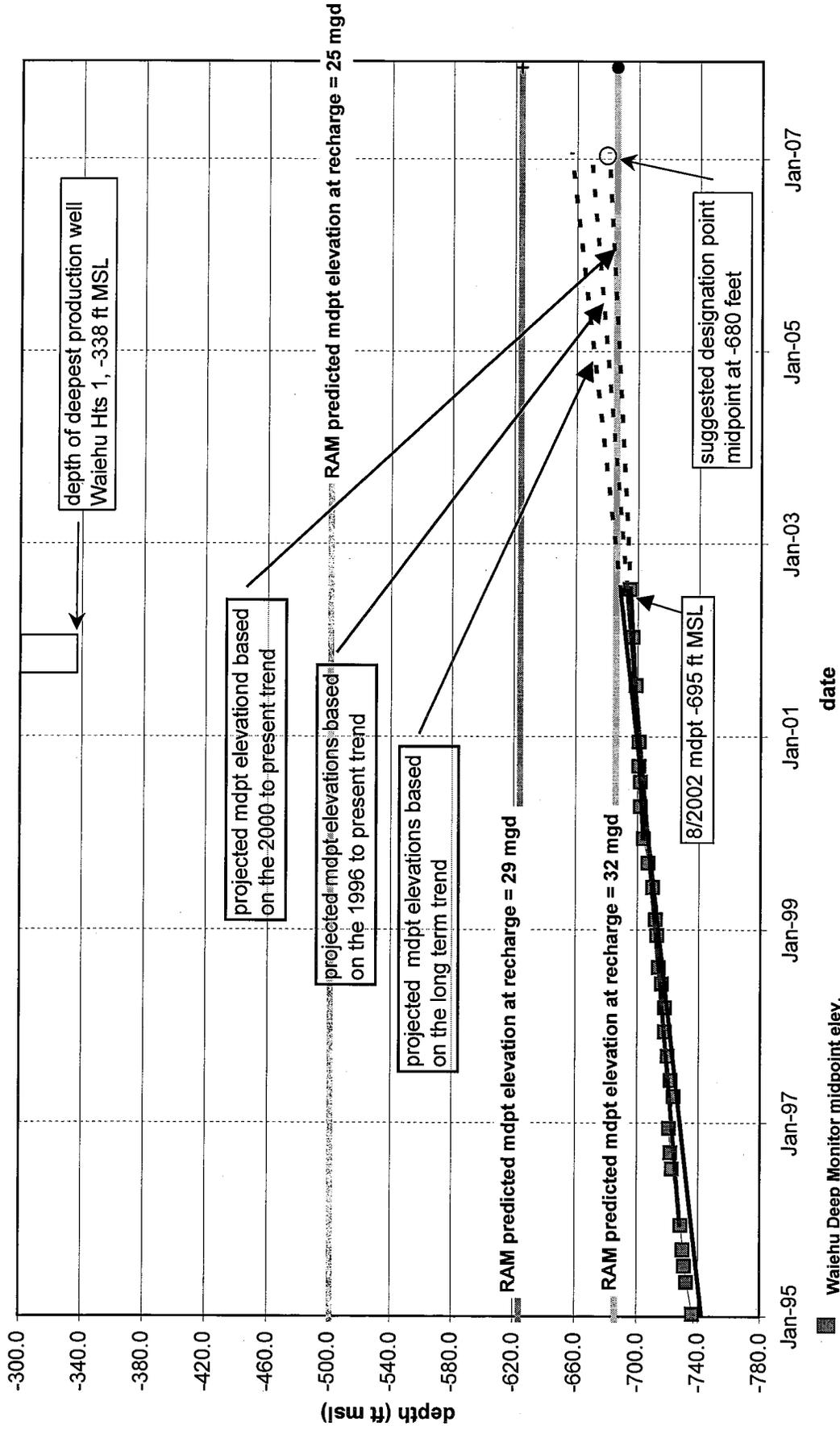
Include reference to the Draft Supplemental EIS for the East Maui Water Development Plan.

Include reference to Taylor and Alley (2001) publication on ground-water level monitoring.

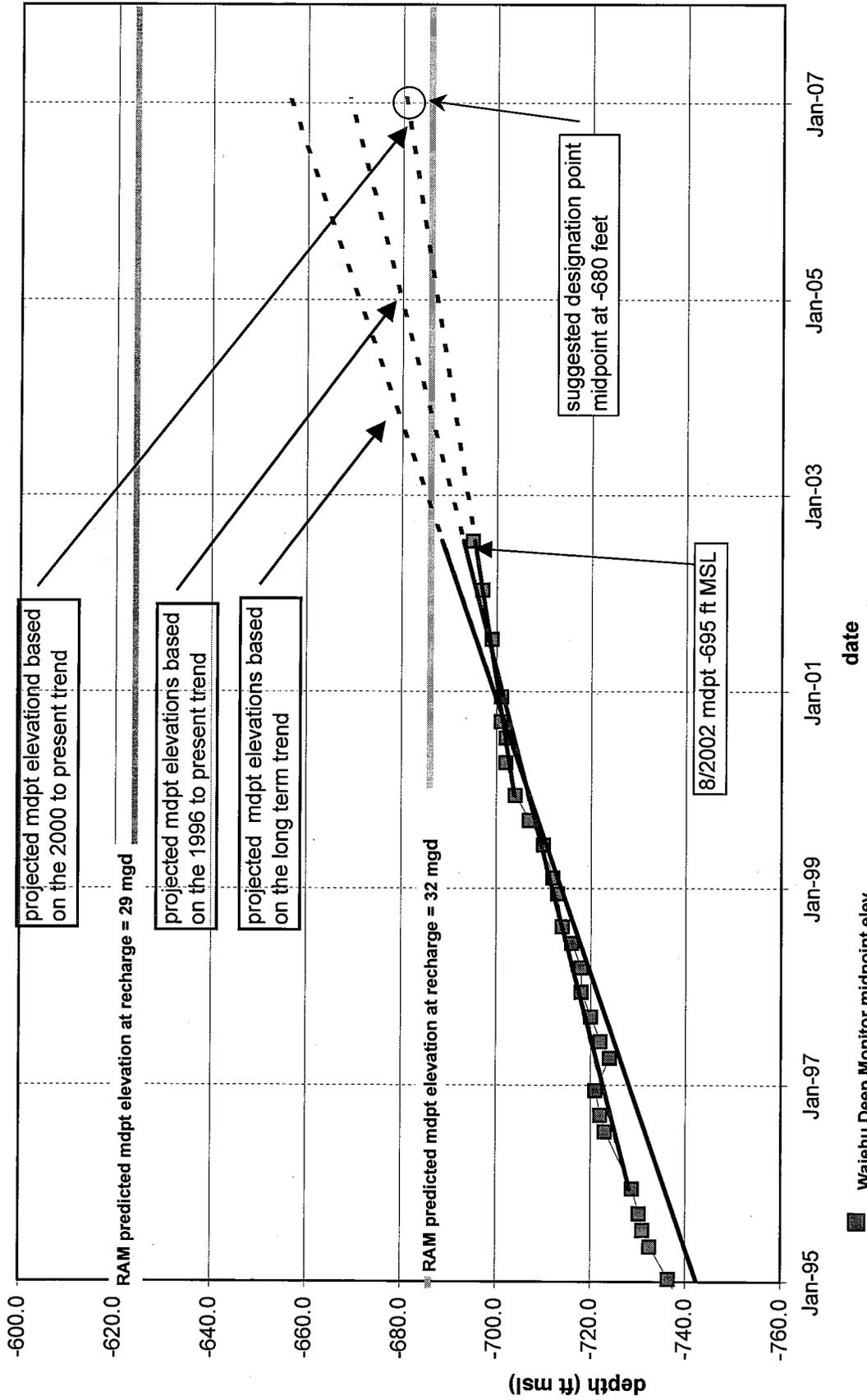
Appendix E

Included comments on the 9/17/2002 draft FOF.

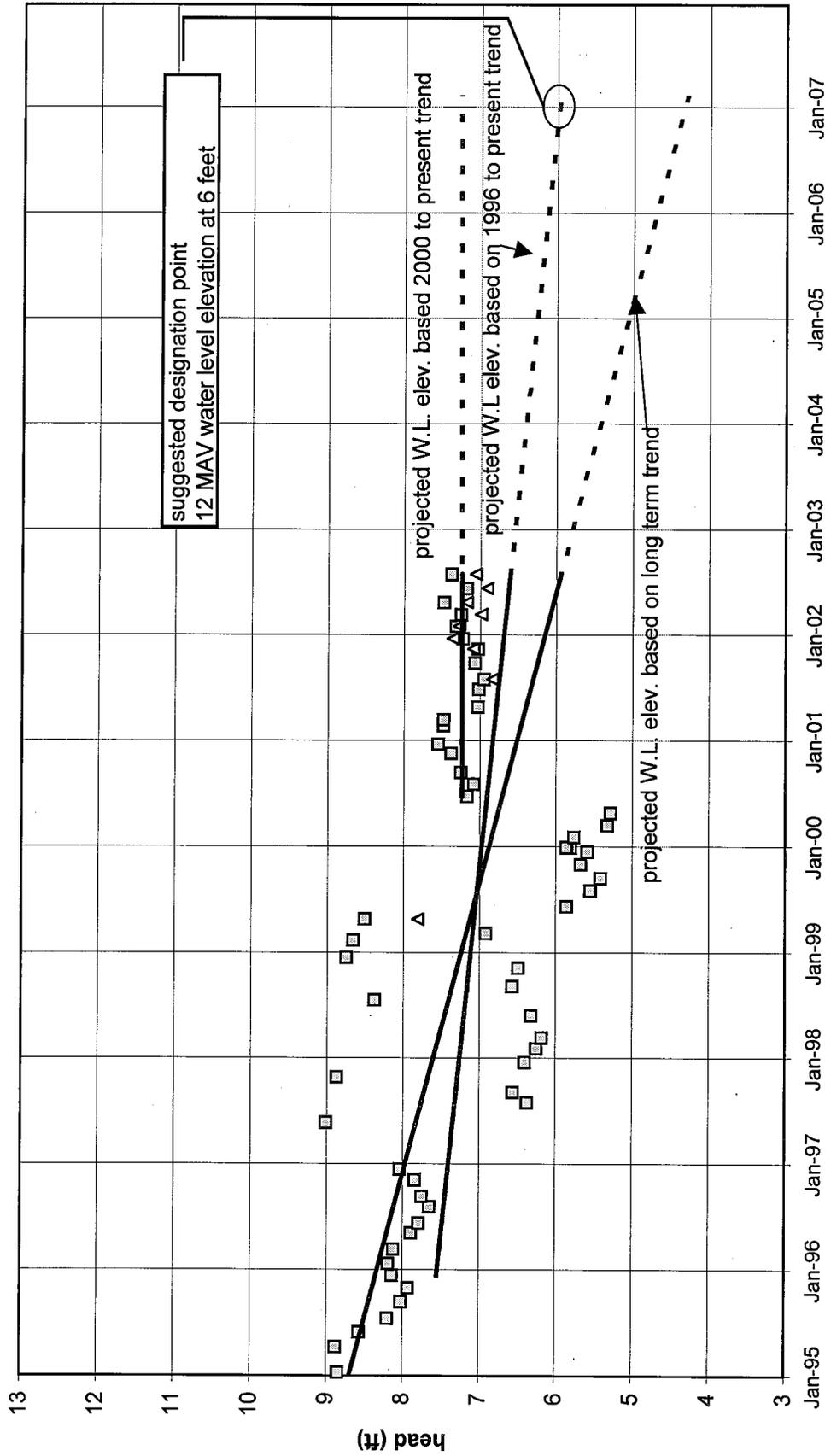
Iao Aquifer System Projected Midpoint Elevation Trends and Proposed Designation Trigger



Iao Aquifer System Projected Midpoint Elevation Trends and Proposed Designation Trigger



Waihee Aquifer System Projected Water Level Trends and Proposed Designation Trigger



△ Kanoa Test Hole
 □ North Waihee 1
 date
 Most of the available water-level data is from North Waihee 1. Since 12/2001 the USGS has been taking regular measurements from the Kanoa Test Hole. The designation trigger should be based on the Kanoa Test Hole data because it is not a production well.