C/015/015 Incoming
#3898 R

CONSOL ENERGY™

Consolidation Coal Company
P.O. Box 566
Sesser, IL 62884
(618) 625-2041

September 15, 2011

Daron Haddock
Utah Division of Oil, Gas and Mining
Coal Program
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Re: Emery Deep Mine Permit C/015/015
Amendment to MRP (Groundwater monitoring revision to abate NOV 10088)

Dear Mr. Haddock:

Please consider this a minor revision to abate your NOV # 10088, dated 6/30/2011. Enclosed please find three (3) copies of the submittal, and two (2) CD's with the submittal in pdf format. Also attached please find executed C1 and C-2 forms.

After a field review of the condition of the existing approved monitoring wells and a review of wells that can be removed from the program, Consol is proposing a revised Ground Water Monitoring Plan. A detailed discussion of the reasoning can be found in Appendix VI-17.

We have retained the wells we are proposing to drop on Plate VI-4 (Ground Water Monitoring Well & Surface Water Monitoring Site Location Map) for historic purposes. We have also kept the hydraulic discussion referring to these wells in the body of the permit for historic purposes. The wells that we are proposing to keep in the plan were chosen based on their geographic and geologic location and represent a reasonable coverage of the hydrologic area.

When approved the wells proposed to be dropped will be researched for ownership and reclaimed as required per Chapter VI, Section VI .6.5, page VI-41.

Also enclosed is a current Power of Attorney for Mark Stanley, General Manager Environmental Permitting.

If you have any questions concerning this request, please call me at (618) 625-6850.

Sincerely,

John Gefferth

John Gefferth
Director of Permitting-Coal Operations

CC: Karl Houskeeper – DOGM-Price Field Office
Attachments
JAG/jag emNOV10088.abate.docx

RECEIVED
SEP 15 2011
DIV. OF OIL, GAS & MINING

File in:
☐ Confidential
☐ Shelf
☒ Expandable
Date Folder 091511 C/0150015
Incoming

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Consolidation Coal Company
Mine: Emery Mine **Permit Number:** 015/015
Title: Groundwater Monitor revision
Description, Include reason for application and timing required to implement:
Revision to Groundwater monitoring plan NOV 10088 abatement 9/11

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☒ Yes ☐ No 9. Is the application submitted as a result of a Violation? NOV # 10088
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☒ Yes ☐ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes ☒ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations herein.

MARK T. STANLEY
Print Name

Sign Name, Position, Date

Subscribed and sworn to before me this 13th day of September, 2011

Janice L Davis
Notary Public

My commission Expires: October 19, 2013 }
Attest: State of Pennsylvania } } ss:
County of Washington

NOTARIAL SEAL
JANICE L DAVIS
Notary Public
CECIL TWP., WASHINGTON COUNTY
My Commission Expires Oct 19, 2013

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
		RECEIVED SEP 15 2011 DIV. OF OIL, GAS & MINING

Form DOGM- C1 (Revised March 12, 2002)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Consolidation Coal Company
Mine: Emery Mine **Permit Number:** 015/015
Title: Revision to Ground water monitoring plan NOV 10088 abatement 9/11

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	CH VI Appendix
☐ Add	☒ Replace	☐ Remove	CH VI, page VI-28
☐ Add	☒ Replace	☐ Remove	CH VI, page VI-56 Table VI-17
☒ Add	☐ Replace	☐ Remove	CH VI, Appendix VI-17
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☒ Replace	☐ Remove	CH VI, Plate VI-4, Ground Water Monitoring Well & Surface Water Monnitoring Site Map
☐ Add	☐ Replace	☐ Remove	
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☐ Add	☐ Replace	☐ Remove	

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	Received by Oil, Gas & Mining RECEIVED SEP 15 2011 DIV. OF OIL, GAS & MINING

POWER OF ATTORNEY

Consolidation Coal Company, a Delaware corporation, of 1000 Consol Energy Drive, Canonsburg, Pennsylvania 15317, hereby nominates, constitutes and appoints Mark T. Stanley as its Attorney-in-Fact, to act in its place and stead and on its behalf in any and all matters relating in any way to the filing of documents and reports to various state agencies, including applications for permits and licenses, consents, changes or modifications to permits and licenses, and related forms as may be necessary or convenient for the businesses of the Company related to the mining, re-mining, abandonment and reclamation of coal lands and facilities of the Company, including the power to negotiate, sign, execute and deliver on behalf of it any and all filings, agreements, transfers, assignments, confirmations, or other related documents as may be necessary or convenient to complete any of the above-described purposes.

This Power of Attorney shall remain in full force and effect until revoked in writing.

Given under the signature and seal of Consolidation Coal Company this 14th day of July, 2011.

By: _____
Robert M. Belesky
Vice President

Commonwealth of Pennsylvania
County of Washington

On this 14th day of July, 2011, the undersigned, Robert M. Belesky, appeared before me and acknowledged himself to be the Vice President of Consolidation Coal Company and that as such officer, being authorized to do so, executed the foregoing Power of Attorney for the purposes therein contained, by signing the name of the corporation by himself as Vice President.

In witness whereof, I hereunto set my hand and seal.

Janice L. Davis
Notary Public

My Commission Expires: October 19, 2013

Seal

NOTARIAL SEAL
JANICE L DAVIS
Notary Public
CECIL TWP., WASHINGTON COUNTY
My Commission Expires Oct 19, 2013

C:\Documents and Settings\ljd0val\My Documents\Consolidation Coal Company POA.doc

LIST OF APPENDICES

VI-1: Groundwater Monitoring – Water Quality Data

VI-2: Lithologic and Geophysical Data for Monitoring Wells

VI-3: Pump Test Reports and Plots

VI-4: Water Rights

VI-5: Surface Water Monitoring – Flow and Water Quality Data

VI-6: Drainage Ditch Designs

VI-7: Sedimentation Pond Designs

VI-8: Alternate Sediment Control Designs

VI-9: HEC-1 Computer Routings

VI-10: Groundwater Monitoring – Water Level Data

VI-11: USGS Streamflow Data

VI-12: UPDES Monitoring Data

VI-13: Data from Miscellaneous Surface Water Quality Studies

VI-14: Mass-Balance Estimates of Future Mine-Water Discharges

VI-15: MODFLOW Report

VI-16: Selected Text from Miller Canyon Tract EA

VI-17: Evaluation/Revision of Groundwater Monitoring Plan (08/2011)

Surface Water Protection. To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic or toxic drainage, prevents, to the extent possible, additional contributions of suspended solids to streamflow outside the permit area, and otherwise prevents water pollution. Additionally, Consol will maintain adequate runoff- and sediment-control facilities to protect local surface waters.

VI.3.1.2 Water Monitoring

Groundwater Monitoring. Groundwater monitoring is conducted in the permit and adjacent areas according to the water monitoring plans presented in Table VI-17. The locations of the monitoring points are presented on Plate VI-4. The monitoring plans were developed based on information presented in the PHC determination, the baseline hydrologic data, the 2011 re-evaluation presented in Appendix VI-17, and the geology chapter of this document.

The monitoring programs provide data that are reviewed and compared to the baseline data. Any significant changes are evaluated to determine their impact on the hydrologic balance. Results of these evaluations are submitted periodically to the Division.

Sampling for the Emery Mine area is accomplished in accordance with the schedule outlined in Table VI-17. Monitoring at locations that are inaccessible during winter months are sampled three times per year. All other sites are monitored quarterly. Groundwater monitoring data are submitted to the Division by the end of the quarter following sampling. Monitoring data are submitted in an annual summary by March 31 of the subsequent year.

Groundwater monitoring will continue through the mining and post-mining periods until bond release. The monitoring requirements, including the analytical parameters and the sampling frequency may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified.

Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of groundwater in the permit and adjacent areas have been installed, maintained, and operated in accordance with accepted procedures. Where feasible, this equipment will be removed or properly abandoned by Consol when no longer needed.

Surface Water Monitoring. Surface water monitoring is conducted in the permit and adjacent areas based upon the monitoring plans contained in Table VI-17. Surface water monitoring locations are identified on Plate VI-4. The parameters monitored meet the requirements of R614-301-731.222.1, 40 CFR 122 and 123, R614-301-751, and the applicable UPDES permits.

Surface water monitoring data are submitted to the Division by the end of the quarter following sampling. Monitoring data are submitted in an annual summary by March 31 of the subsequent year. UPDES reporting requirements will be met for the UPDES discharge sites at the mine.

Surface water monitoring will continue through the mining and post-mining periods until bond release. The monitoring requirements (except those required by UPDES) may be modified in the future in consultation with the Division if the data demonstrate that such a modification is justified.

TABLE VI-17

Emery Mine Hydrologic Monitoring Program

Parameter	Surface Water Monitoring Stations	Sampled Wells	Other Wells	Springs/Seeps	UPDES Outfalls
Monitoring Site Names	SWMS-1A, SWMS-2, SWMS-3, SWMS-4, SWMS-5, SWMS-8, SWMS-9, SWMS-10	~~Bryant,~~ Emery Town[a], ~~I2, Lewis,~~ Kemmerer, ~~RDA-1,~~ RDA-2, ~~RDA-3,~~ RDA-4, ~~RDA-5,~~ RDA-6, ~~SM1-2,~~ SM1-3, ~~SM1-4,~~ T1, ~~TP, USGS1-2, USGS3-1,~~ USGS4-1	~~AA, EMRIA #1, EMRIA #2, FC346WW,~~ H-U, ~~I,~~ MUDDY #1, ~~MUDDY #2, MUDDY #4,~~ R-1, R-2, ~~SM1-1, T2, WW1~~	SP-10, SP-11, SP-13, SP-14, SP-15	001, 002, 003, 004, 005, 006, 007, 009
Monitoring Frequency	Quarterly	Quarterly, except RDA wells (annual)	Quarterly	Quarterly flows. Samples in 2nd and 3rd quarters	Per permit
Field Measurements					
Flow	X			X	X
Water Level		X	X		
pH (field)	X	X		X	X
Sp. Cond. (field)	X	X		X	
Water Temp. (field)	X	X		X	
Laboratory Measurements					
Total Settleable Solids	X				
Total Suspended Solids	X				X
Total Dissolved Solids	X	X		X	X
Total Hardness (as $CaCO_3$)	X	X		X	
Oil and Grease	X				X
Acidity (as $CaCO_3$)	X				
Carbonate	X	X		X	
Bicarbonate	X	X		X	
Alkalinity (as $CaCO_3$)					
Calcium, Total	X				
Calcium, Dissolved	X	X		X	
Chloride	X	X		X	
Iron, Total	X				X
Iron, Dissolved		X		X	
Magnesium, Total	X				
Magnesium, Dissolved		X		X	
Manganese, Total	X				
Manganese, Dissolved		X		X	
Potassium, Total	X				
Potassium, Dissolved		X		X	
Sodium, Total	X				
Sodium, Dissolved		X		X	
Sulfate		X		X	

[a] Due to physical limitations in the Emery town wells (see text), water-quality samples will be collected from Well #1 and water-level data will be collected from Well #2. Consol will evaluate data collected from the Emery town wells, using hydrographs and other appropriate means, and submit a report of findings to DOGM ~~on a semiannual basis~~with the annual report.

APPENDIX VI-17

Evaluation/Revision of
Groundwater Monitoring Plan (08/2011)

Inserted 09/15/2011

August 22, 2011

EarthFax

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Engineering, Inc.
Engineers/Scientists
7324 So. Union Park Ave.
Suite100
Midvale, Utah 84047
Telephone 801-561-1555
Fax 801-561-1861
www.earthfax.com

Mr. John Gefferth
Director, Coal Permitting
Consolidation Coal Company
P.O. Box 566
Sesser, IL 62884-0566

Subject: Recommended revisions to the Emery Mine Groundwater monitoring plan

Dear John:

Pursuant to your request, I have reviewed the data collected from the Emery Mine groundwater monitoring network to determine if changes to the monitoring plan are appropriate. The results of my review are summarized in the following documents attached to this letter:

- Table 1 – presents a summary of the trends observed at each monitoring well, the condition of each well (as appropriate), and recommendations regarding whether each well should be retained or eliminated from the monitoring network.
- Attachment A – presents graphs showing water levels in the existing monitoring wells, grouped by the zones that they monitor.
- Attachment B – presents graphs comparing water levels in wells completed in Quaternary Alluvium with the Palmer Hydrologic Drought Index (used as a general indication of climatic trends during the period of data collection).

Of the 46 wells that are currently part of the Emery Mine groundwater monitoring network, I have recommended that 15 be retained for future monitoring and 31 be eliminated from the plan. By zone of completion, I recommend that wells be retained as follows:

- Quaternary Alluvium – 4 wells
- Bluegate Shale – 3 wells
- Upper Ferron Sandstone – 4 wells
- Middle Ferron Sandstone – 1 wells
- Lower Ferron Sandstone – 2 wells
- Wells completed in multiple zones – 1 well (Emery Town well)

I have appreciated the opportunity to provide this review. Please contact me if you have any questions.

Sincerely,

Richard B. White, P.E.
President
EarthFax Engineering, Inc.

Attachments

TABLE 1

Recommended Revisions to the
Emery Mine Groundwater Monitoring Plan

Well	Data Summary	Proposed Plan	
		Retain	Eliminate
Wells Monitoring Quaternary Alluvium (Qal)			
RDA 1	These wells are located in a relatively small area south of Quitchupah Creek overlying a section of the mine that has not been active for over 30 years. Water levels are relatively stable, but correlate generally with climatic trends (as evidenced by comparison with the Palmer Hydrologic Drought Index). Water quality data exhibit wide variation over relatively short distances. Well RDA 6 may be influenced by the nearby mine-water discharge pond. Given their close proximity to each other, it is not necessary to collect data from all of these wells.		X
RDA 2		X	
RDA 3			X
RDA 4		X	
RDA 5			X
RDA 6		X	
SM1-1	Water level data collected from these two wells correlate generally with climatic trends. Salinity levels are higher at SM1-1 than SM1-2. SM1-1 is located in an area that receives significant irrigation return flow and is, therefore, difficult to access. SM1-2 has been buried in a road and is no longer accessible.		X
SM1-2			X
SM1-3	Water levels in these wells show no substantial climatic trends, but fluctuate seasonally due to nearby irrigation. SM1-3 is in an area of recent mining. SM1-4 is located in an area where mining has not been active for over 40 years.	X	
SM1-4			X
Wells Monitoring the Bluegate Shale (Kmb)			
AA	Water levels have been relatively stable since the mid 1980s. No water quality data. Area has been mined out for approximately 30 years.		X
H	Water levels were initially stable for 27 years, but have been erratic since 2007. The cause of the water-level fluctuations is unknown. However, oil was recently discovered in this well, probably due to communication with one of the deeper "H" wells. No water quality data.		X
I	Water levels have been relatively stable for several years. Oil has existed in this well for several years, rendering it unfit for data collection. No water quality data.		X
R2	A very gradual decline in water levels has occurred during the past 20 years. One data point (Sep 2008) is an obvious outlier. This well is located near a mine dewatering pump and Pond 06. Should be retained to monitor potential impacts from these operations. No water quality data.	X	
T1	Water levels have been relatively stable for the 30-year period of record. Occasional water quality data exist. Located near the center of the mine area. Should be retained as an indicator of potential impacts in the general area.	X	
T2	Water levels have been relatively stable for the 30-year period of record. No water quality data. Essentially duplicates well T1 and is, therefore, not needed.		X

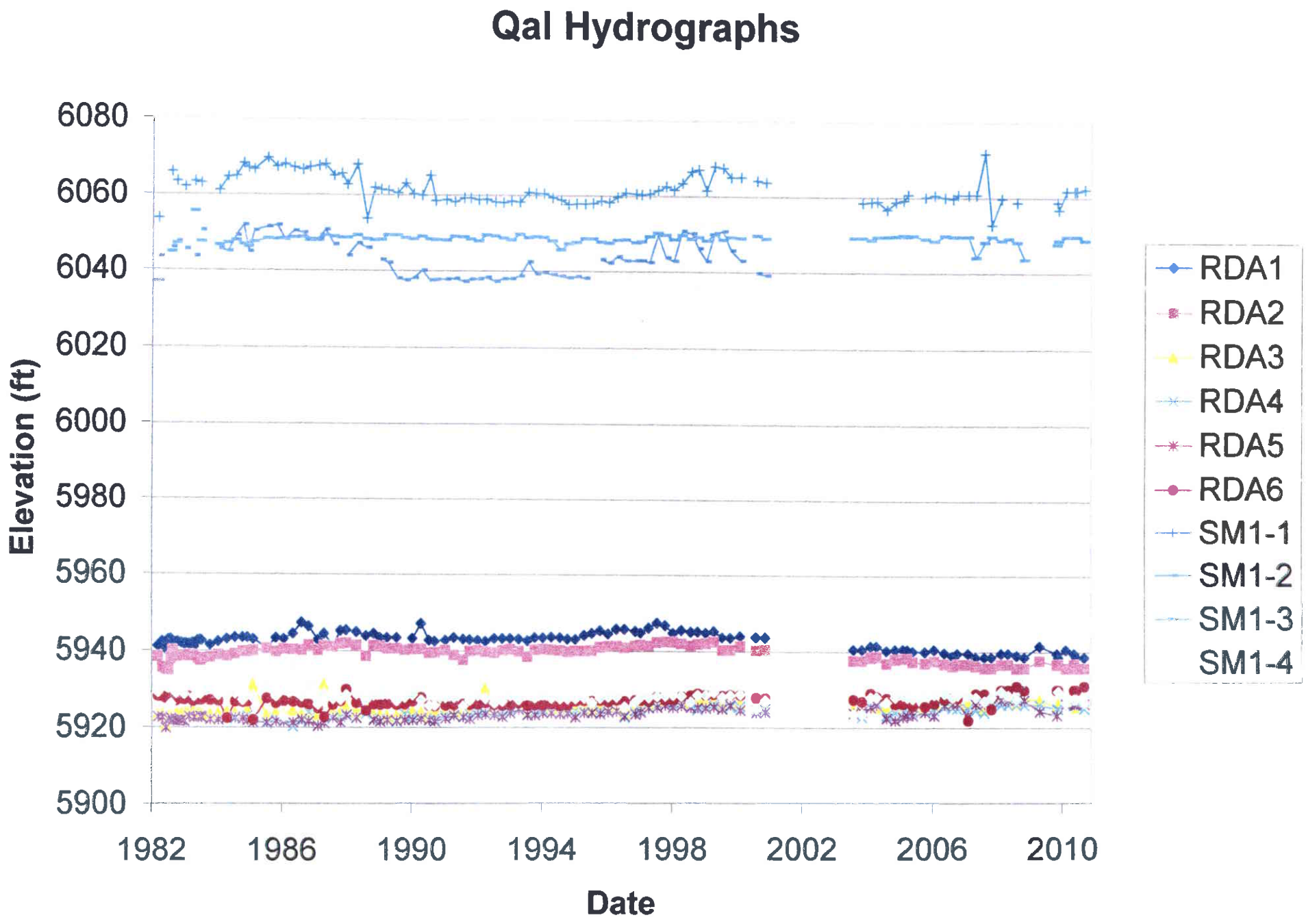
Well	Data Summary	Proposed Plan	
		Retain	Eliminate
USGS 3-1	Water levels have been relatively stable except for data collected in 2007 and 2008. Some water level data are reported as being deeper than the completed well, indicating reporting errors. Adjacent to other wells with more reliable data.		X
USGS 4-1	Adjacent to well USGS 3-1, but with more reliable data. Water levels declined in 2006, then rebounded. Mostly dry, but in an area of recent mining. Water quality data have been collected here.	X	
Wells Monitoring the Upper Ferron Sandstone (Kmf[u])			
Bryant	Relatively stable water levels since an initial decline in the mid 1980s. Consol provided a pump and ancillary facilities to the well owner several years ago. However, this pump is no longer functioning and the owner has not required that it be repaired. This makes data collection difficult.		X
AA	Water levels have been relatively stable since the early 1980s. No water quality data. Area has been mined out for approximately 30 years.		X
H	Water levels have been relatively stable for the period of record. No water quality data. Located between the mine and the town of Emery. Should be retained as an indicator of potential impacts in adjacent areas.	X	
I2	Water levels have fluctuated over a range of about 30 feet during the 25-year period of record, with no consistent trends. No water quality data. Therefore, well is of limited value.		X
Lewis	Relatively stable water levels since an initial decline in the mid 1980s. This well has been sealed and abandoned by its owner and is no longer accessible.		X
Muddy #1	Relatively stable water levels during the 30+-year period of record. No water quality data. Some future mining activity may occur in the general area.	X	
Muddy #2	With the exception of a few obvious outliers, water levels have fluctuated over a range of about 40 feet during the 25-year period of record, with no consistent trends. No water quality data. There appears to be an obstruction in the well. Therefore, the well is of limited value.		X
R2	This well is located adjacent to a mine dewatering pump and has shown substantial changes in water levels through time. Good long-term indication of potential groundwater impacts adjacent to the mine.	X	
T1	Except for a few data points that appear to be erroneous, water levels have shown a gradual decline for the 30-year period of record. Limited water quality data exist. Located near the center of the mine area. Should be retained as an indicator of potential impacts in the general area.	X	
T2	Except for a few data points that appear to be erroneous, water levels have been relatively stable for about 20 years. Limited water quality data exist. Data unnecessary due to the nearby location of T1.		X
TP	Except for a few data points that appear to be erroneous, water levels have been relatively stable for about 20 years. Limited water quality data exist. Data unnecessary due to the nearby location of T1.		X
USGS1-2	Good water level data prior to 2003. However, since that time, it appears that the well is obstructed, since the probe cannot consistently extend below a depth of 30 feet.		X

Well	Data Summary	Proposed Plan	
		Retain	Eliminate
Wells Monitoring the Middle Ferron Sandstone (Kmf[m])			
AA	Water levels have been relatively stable since the early 1980s. No water quality data. Oil has existed in this well for several years, rendering it unfit for data collection.		X
H	Water levels have been relatively stable since the early 1990s. No water quality data. Oil has existed in this well for several years, rendering it unfit for data collection.		X
I	Data indicate that the water level dropped about 150 feet in mid 2005. However, oil has existed in this well for several years, rendering the data spurious and the well unfit for data collection. No water quality data.		X
R2	Water levels in this well dropped over 500 feet in the late 1980s and have since begun to recover. This well should be retained as an indicator of conditions in the aquifer immediately underlying the coal seam being mined.	X	
Wells Monitoring the Lower Ferron Sandstone (Kmf[l])			
AA	Relatively stable water levels during the 30+-year period of record. No water quality data. No future mining activity planned in the area.		X
H	Water levels have been relatively stable since the early 1990s. No water quality data. Oil has existed in this well for several years, rendering it unfit for data collection.		X
I	With the exception of one data point that appears to be erroneous, water levels in this well have been relatively table during the 30-year period of record. No water quality data.		X
Kemmerer	Water levels have gradually declined in this well during the nearly 40-year period of record. Water quality data have been collected from this well. Retain as an indicator of potential groundwater impacts in adjacent areas.	X	
R1	Water levels have been relatively stable since declining in the early 1990s (Note: data from this artesian well have been incorrectly reported as a depth to water rather than a water pressure since 2001). Retain this well as an indicator of groundwater conditions upgradient from the mine.	X	
WW1	Water levels have been relatively stable during the entire period of record. Located in an area where no future mining activities are planned.		X
ZZ	Water levels have been relatively stable during the entire period of record. This well has been damaged, rendering it unfit for data collection.		X
Wells Monitoring Multiple Zones			
Emery Town Wells	This monitoring location consists of two wells. Well #1 is completed in the lower Ferron Sandstone and has a functional pump. Water quality data are collected from this well. Well #2 is completed in the upper and middle Ferron Sandstone and can be accessed for the collection of water level data. Retain as an indicator of groundwater conditions in adjacent areas and as an indicator or potential impacts to public water supplies in the region.	X	

Well	Data Summary	Proposed Plan	
		Retain	Eliminate
EMRIA #1	Single well completed in both the upper and middle Ferron Sandstone. No water quality data. Relatively stable water levels during the entire 30-year period of record. Of limited value due to its completion in multiple zones.		X
EMRIA #2	Single well completed across all three zones of the Ferron Sandstone (upper, middle, and lower). Of limited value due to its completion in multiple zones.		X
EMRIA #3	Single well completed in the Bluegate Shale and the upper Ferron Sandstone. Of limited value due to its completion in multiple zones.		X
FC346WW	Single well completed in both the upper and middle Ferron Sandstone. No water quality data. Gradually declining water levels since the mid 1980s. Of limited value due to its completion in multiple zones.		X

ATTACHMENT A

Hydrographs of Emery Mine Monitoring Wells


Qal Hydrographs
Elevation (ft)
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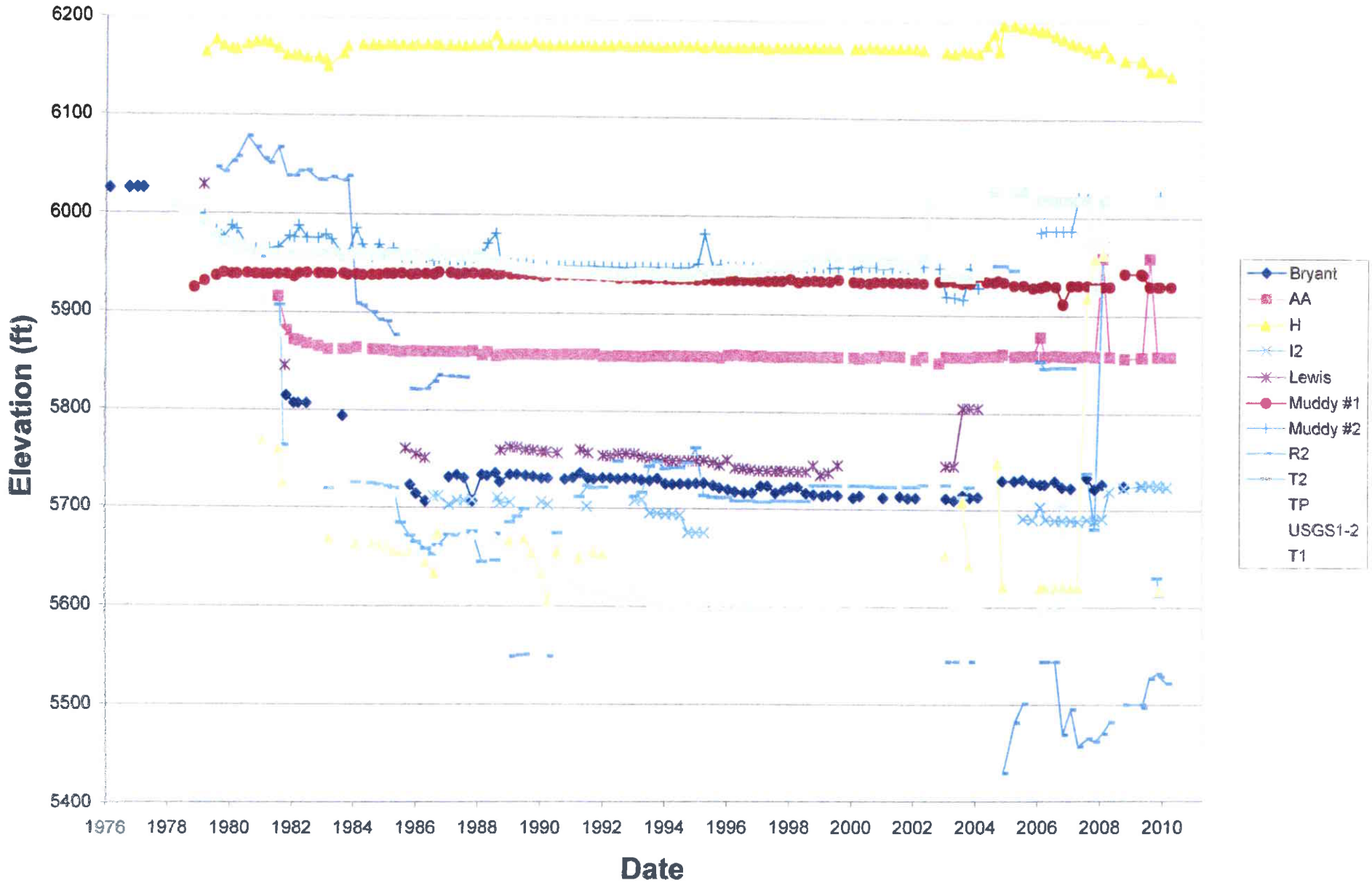
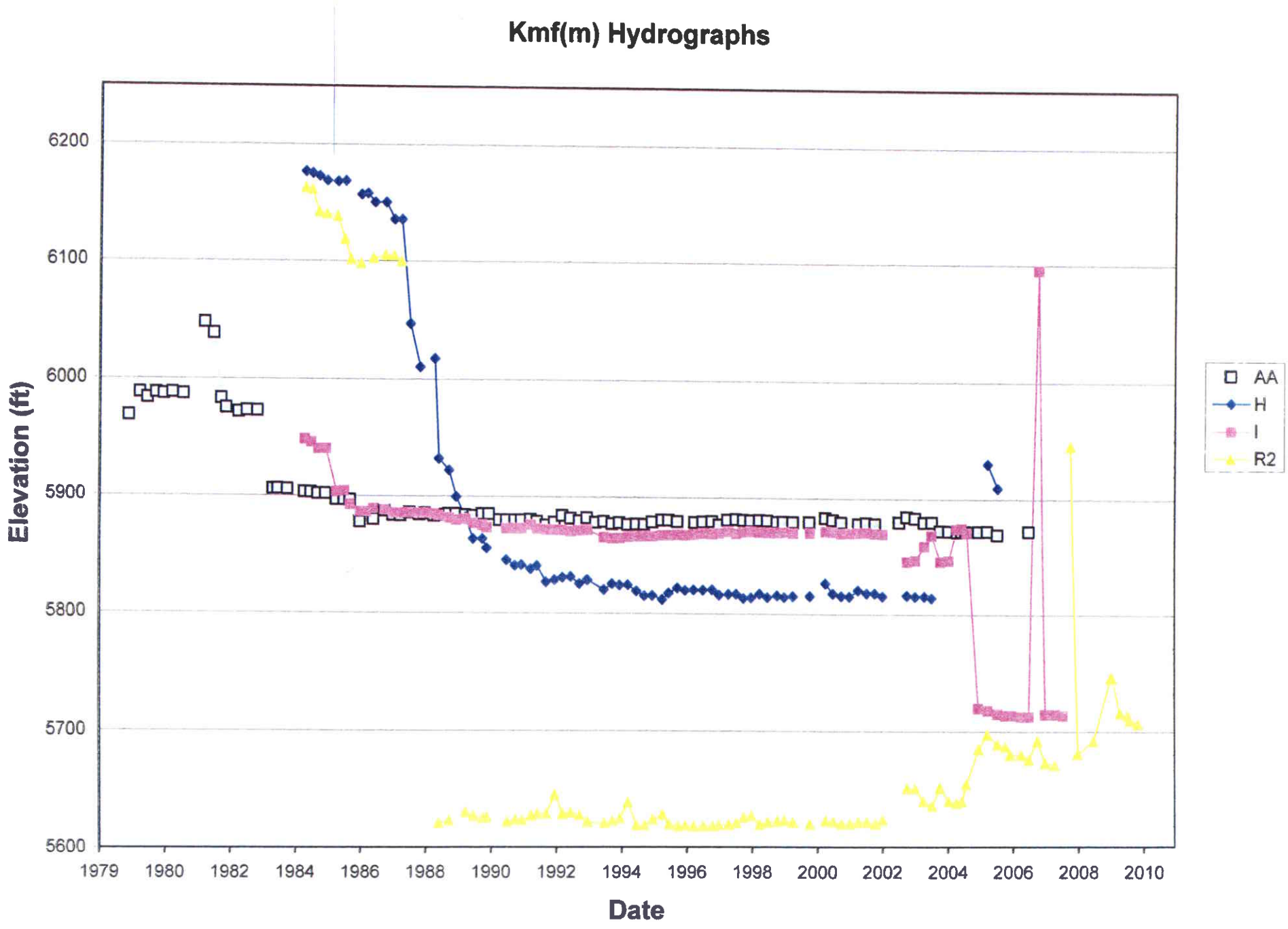
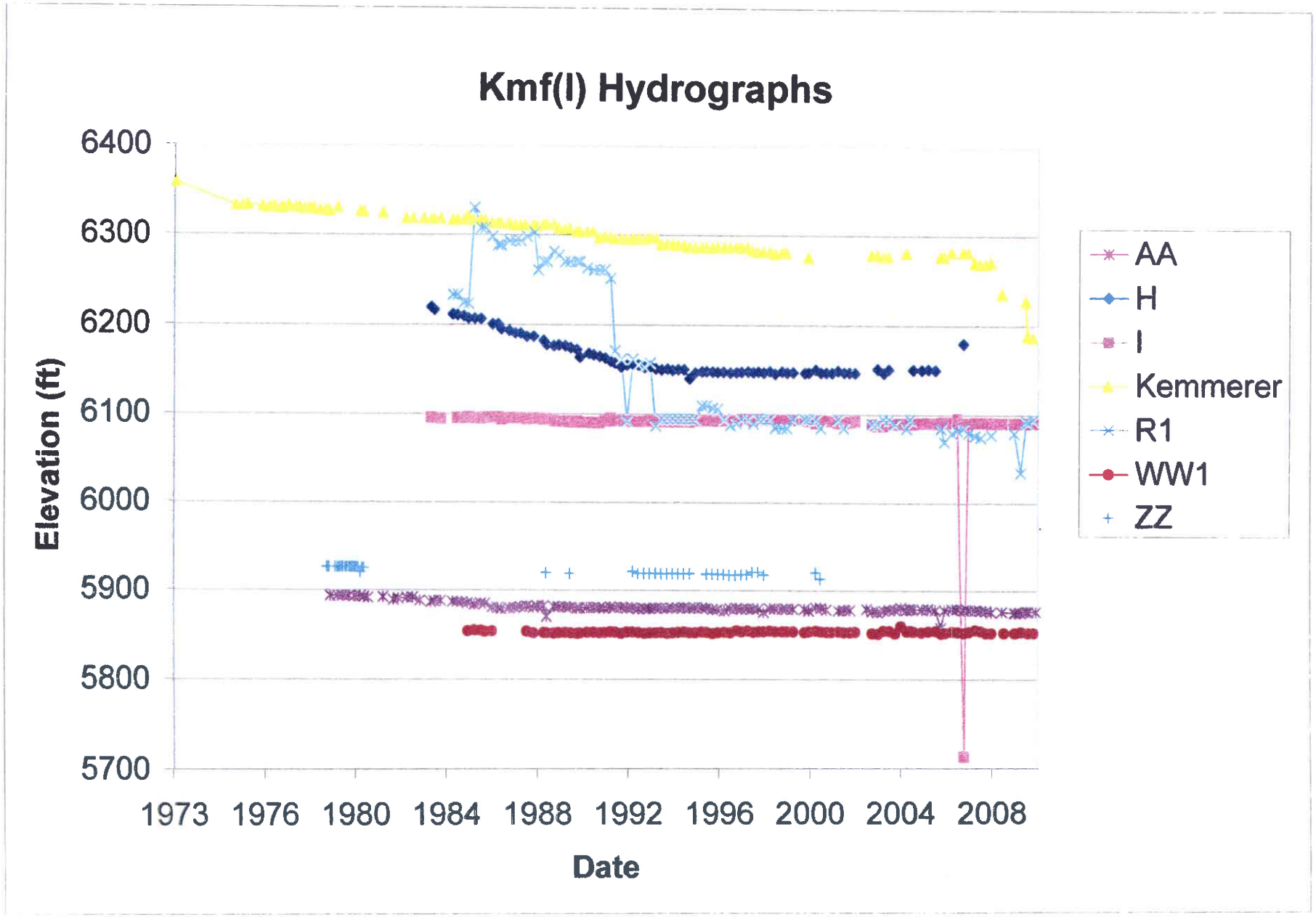
6060
6040
6020
6000
5980
5960
5940
5920
5900
1982
1986
1990
1994
1998
2002
2006
2010
Date
RDA1
RDA2
RDA3
RDA4
RDA5
RDA6
SM1-1
SM1-2
SM1-3
SM1-4

Kmb Hydrographs

Kmf(u) Hydrographs




Kmf(m) Hydrographs
Elevation (ft)
6200
6100
6000
5900
5800
5700
5600
1979
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
Date
AA
H
I
R2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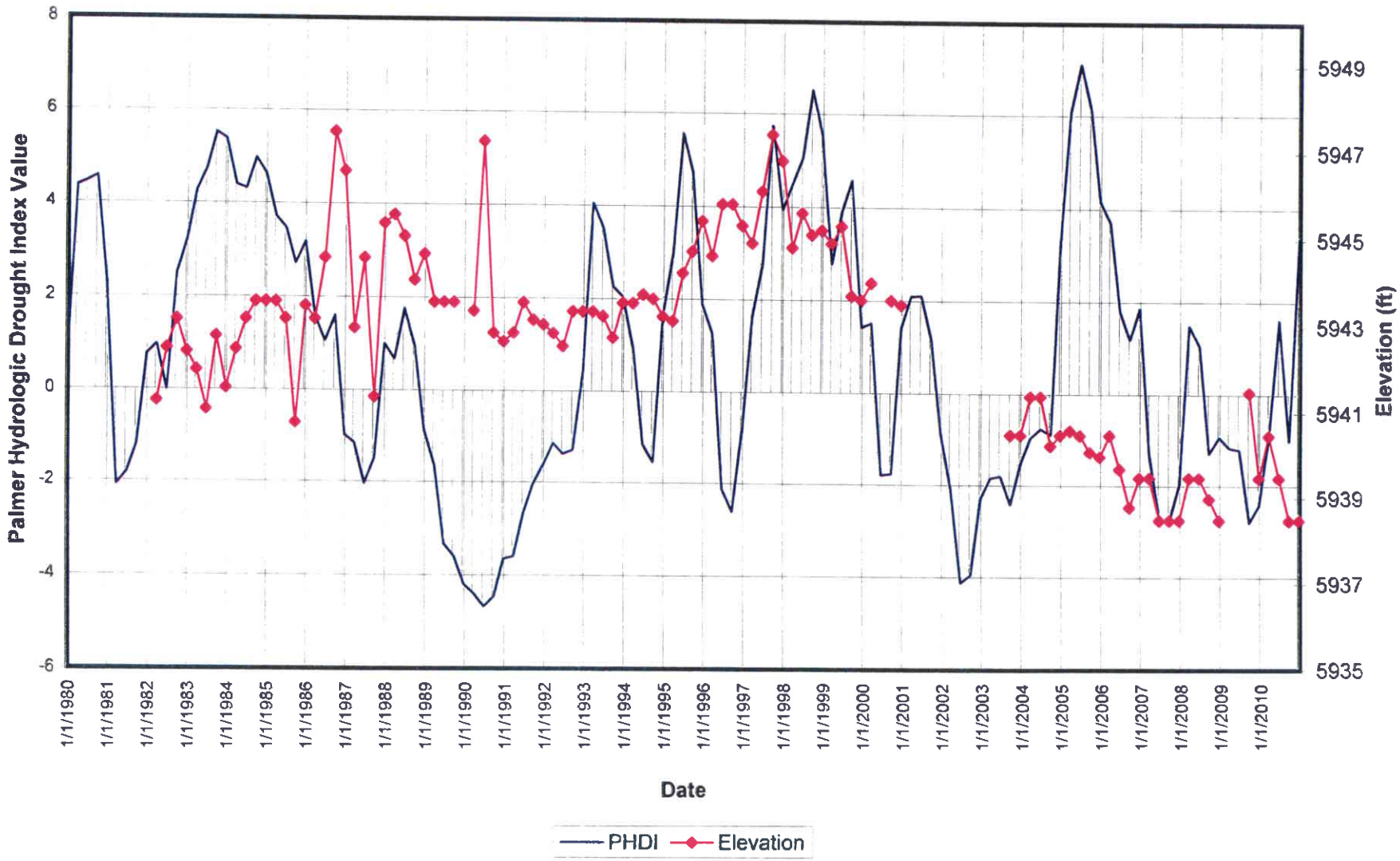
6400
6300
6200
6100
6000
5900
5800
5700
Elevation (ft)
1973
1976
1980
1984
1988
1992
1996
2000
2004
2008
Date
AA
H
I
Kemmerer
R1
WW1
ZZ

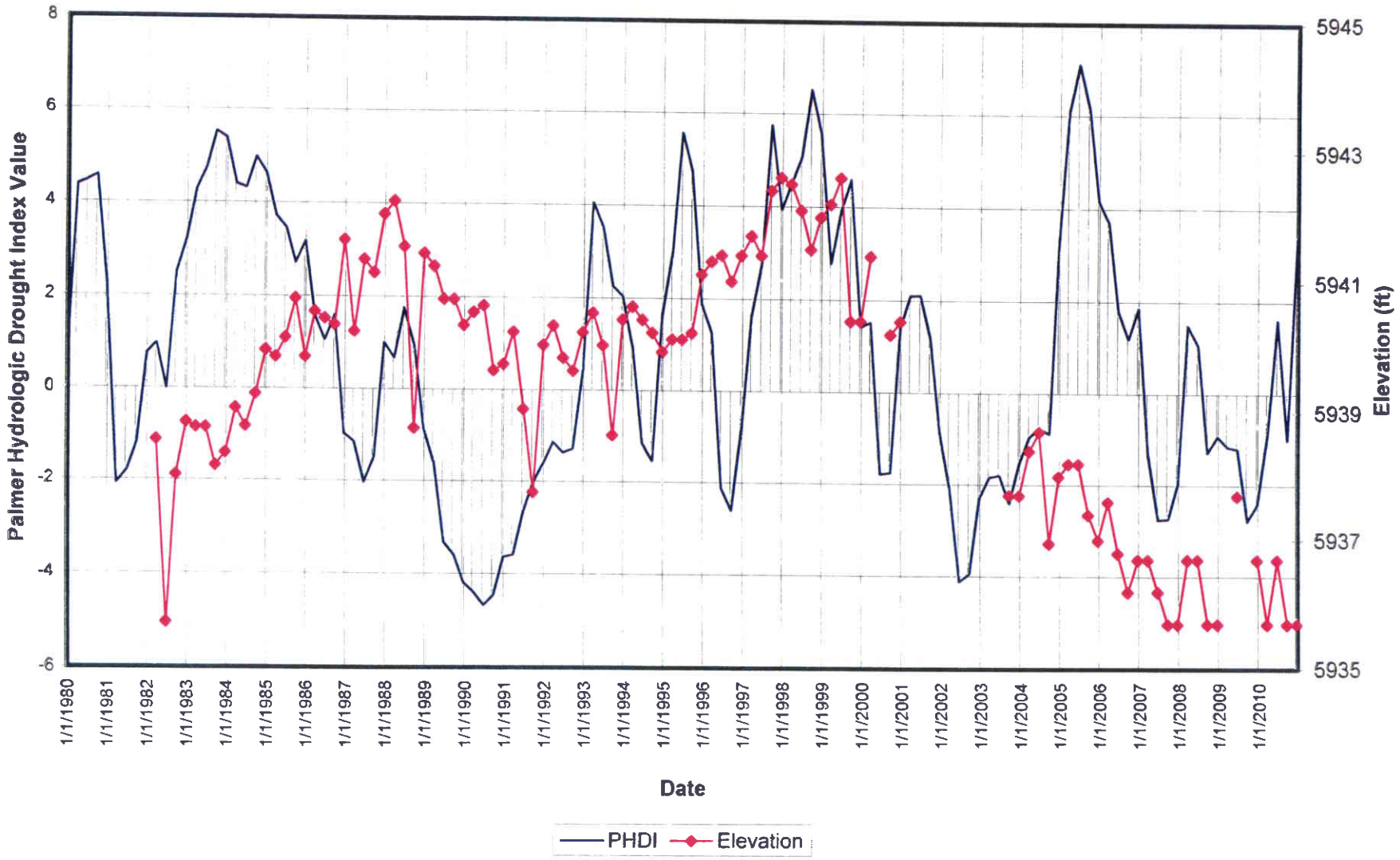
ATTACHMENT B

Comparison of Hydrographs in Wells
Monitoring Quaternary Alluvium with the
Palmer Hydrologic Drought Index

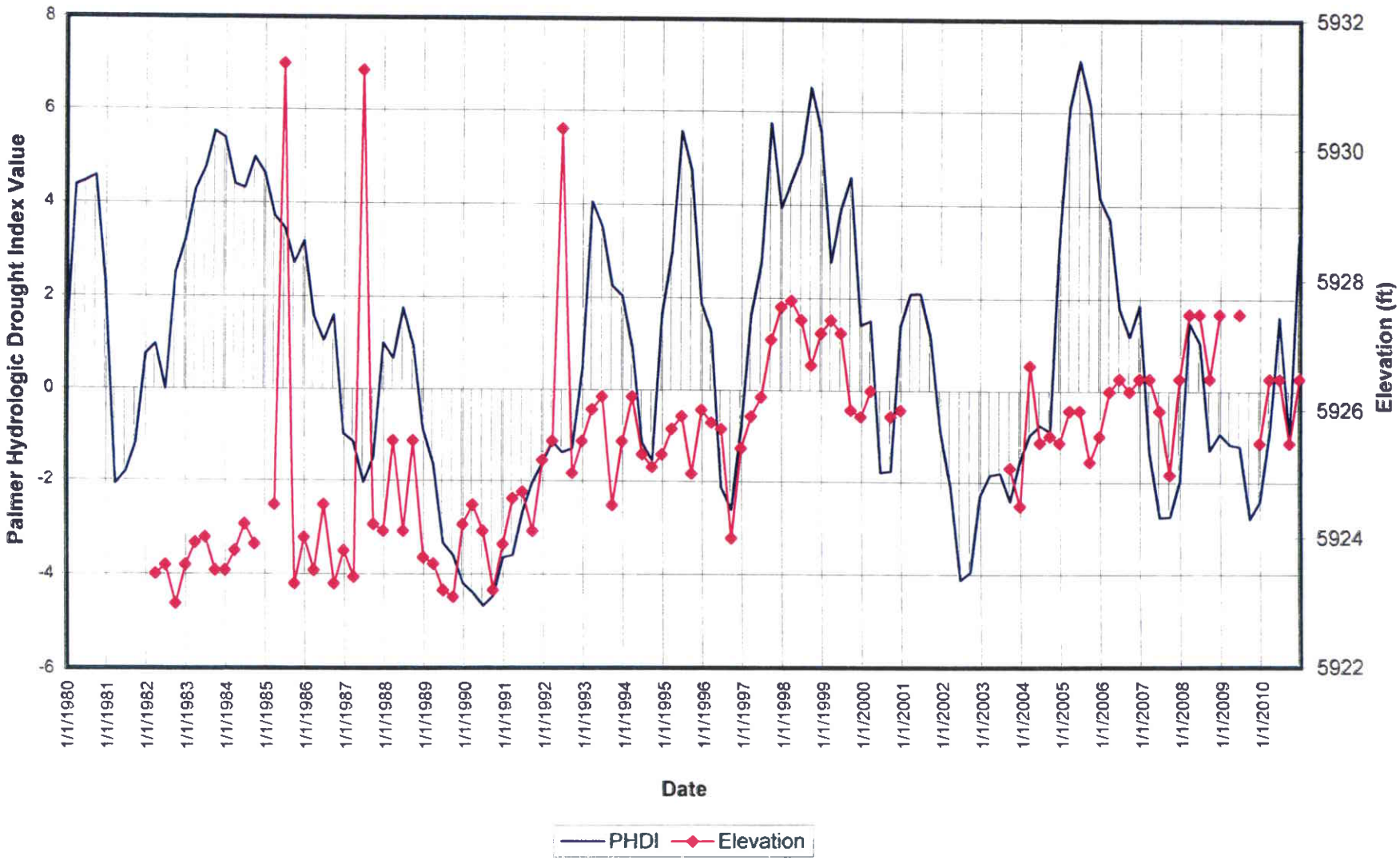
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL RDA1



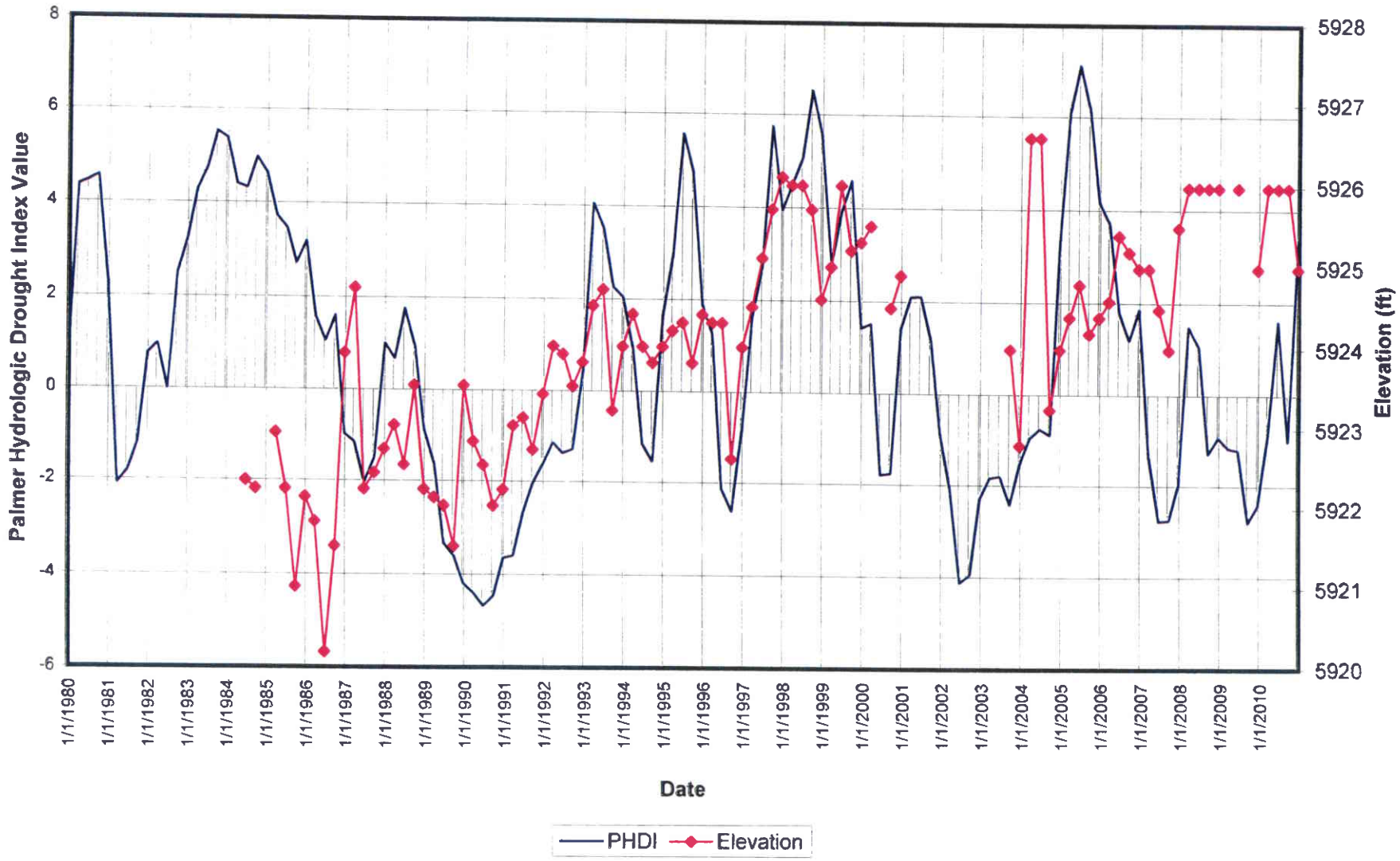
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL RDA2



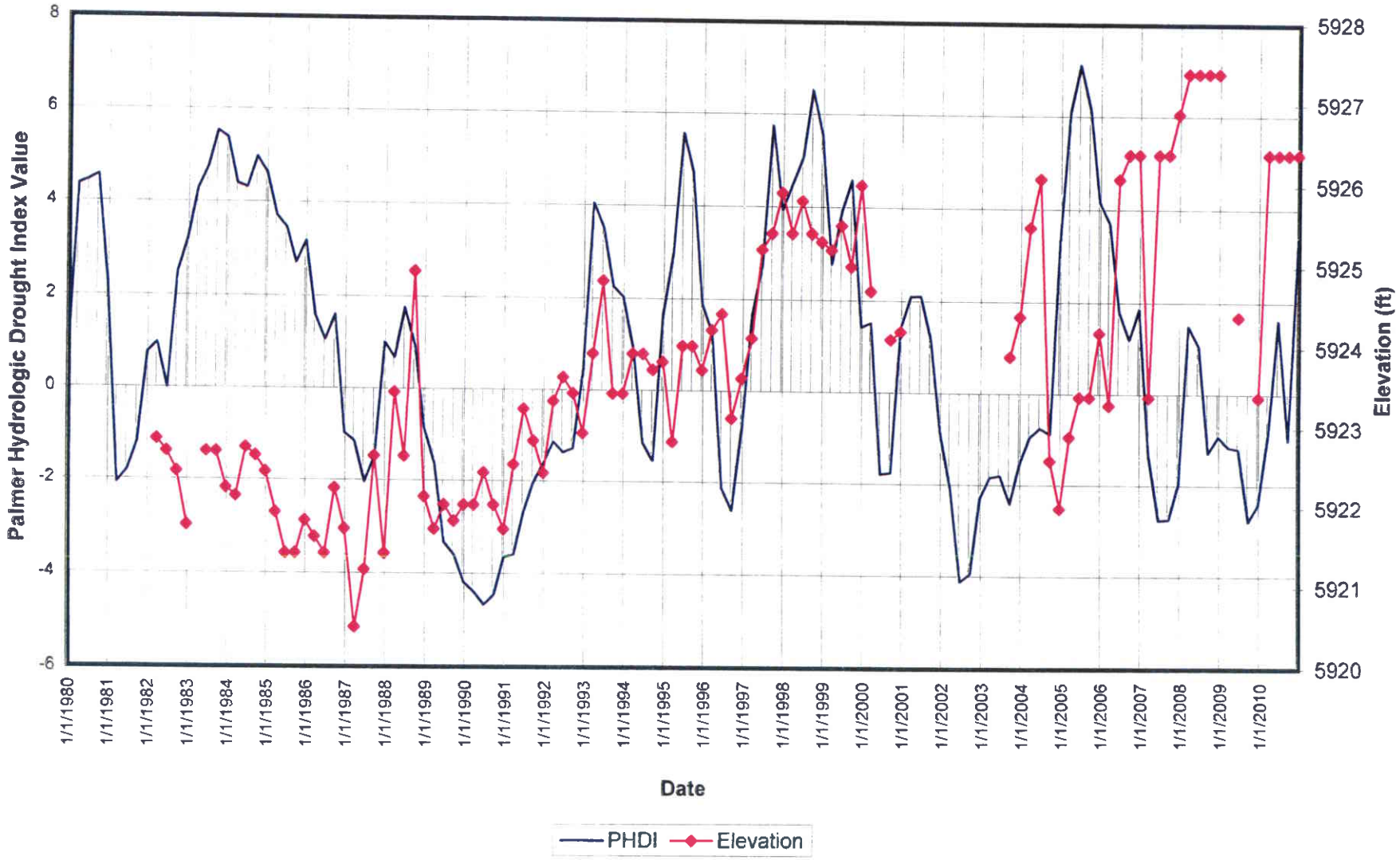
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL RDA3



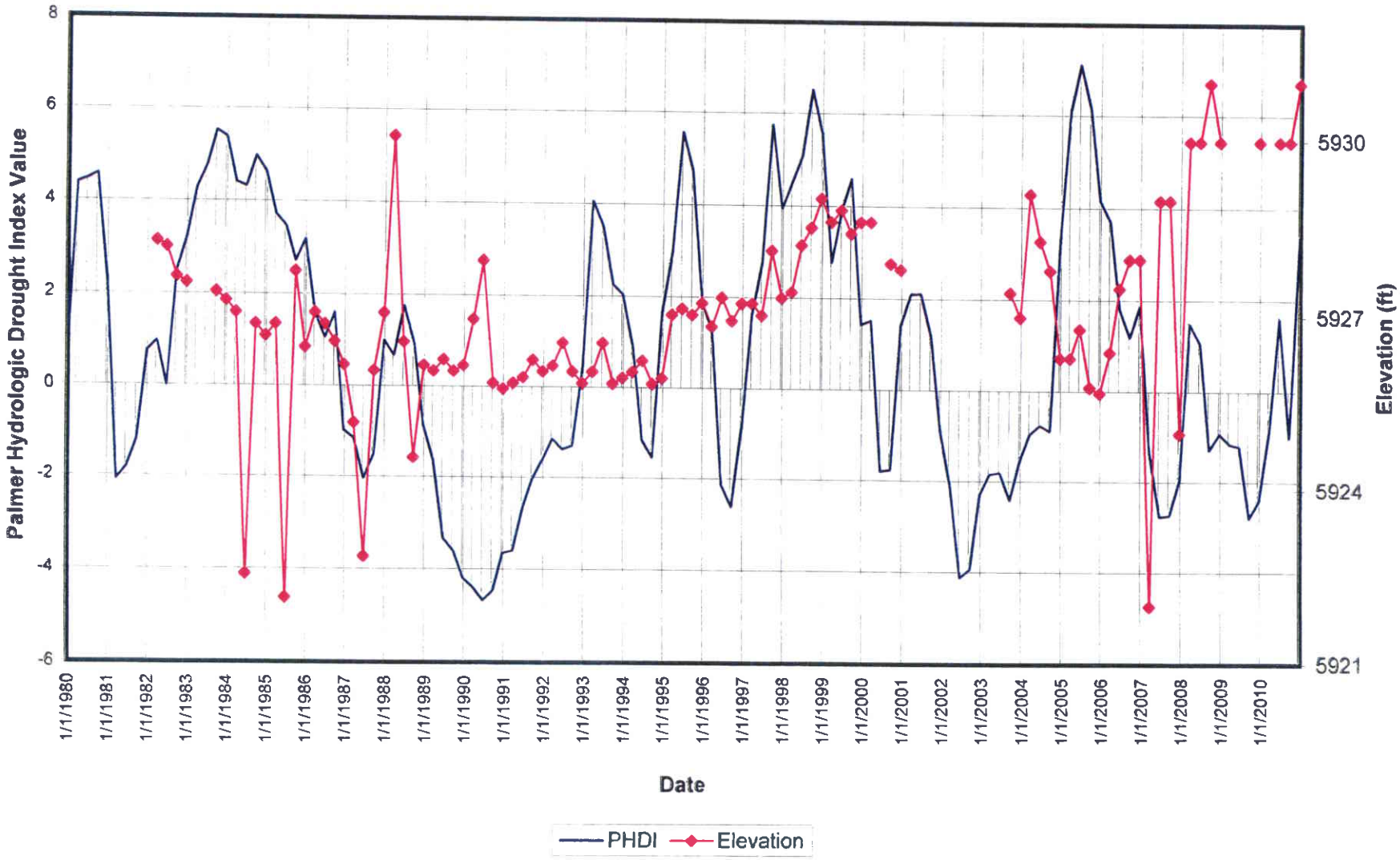
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL RDA4



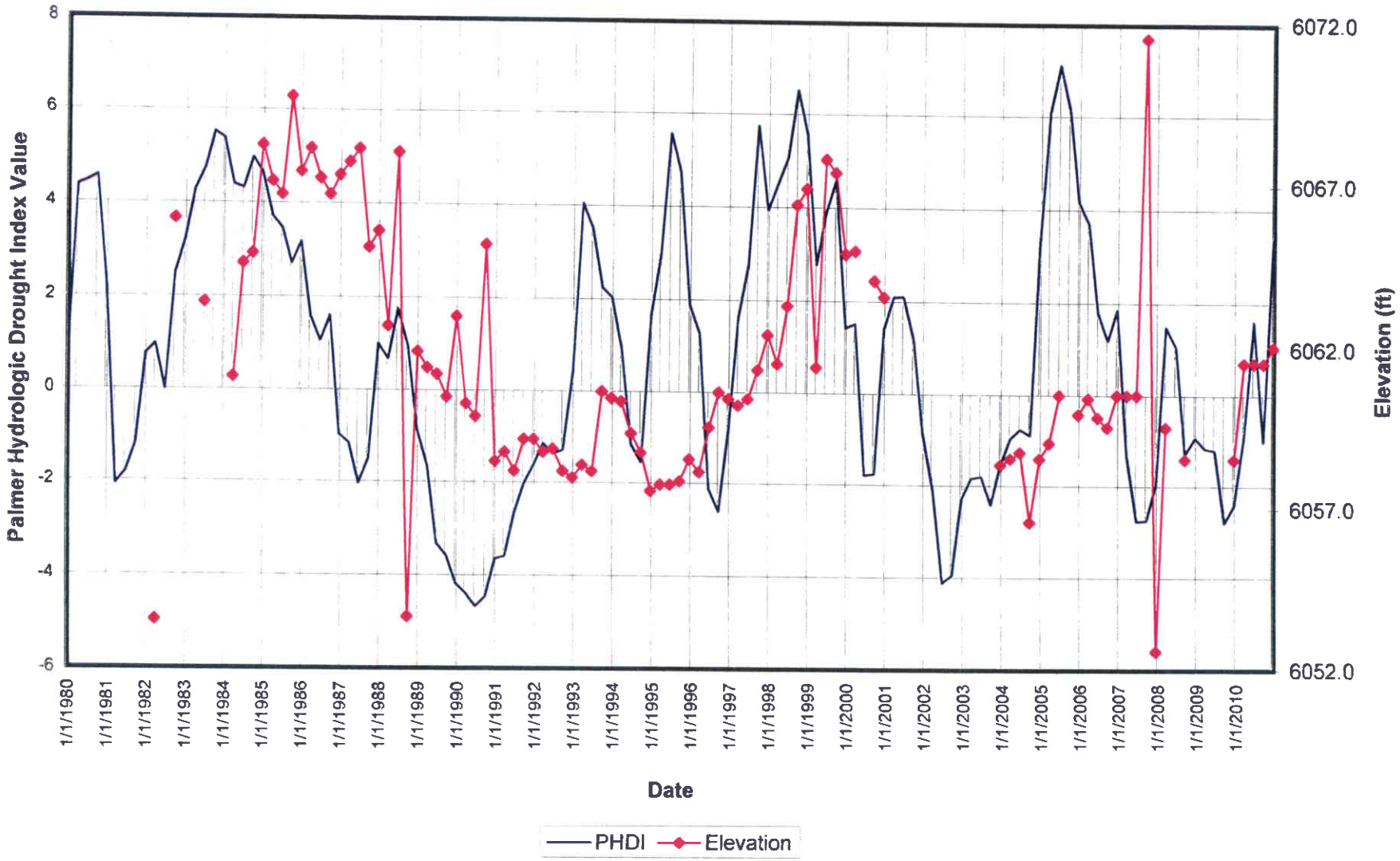
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL RDA5



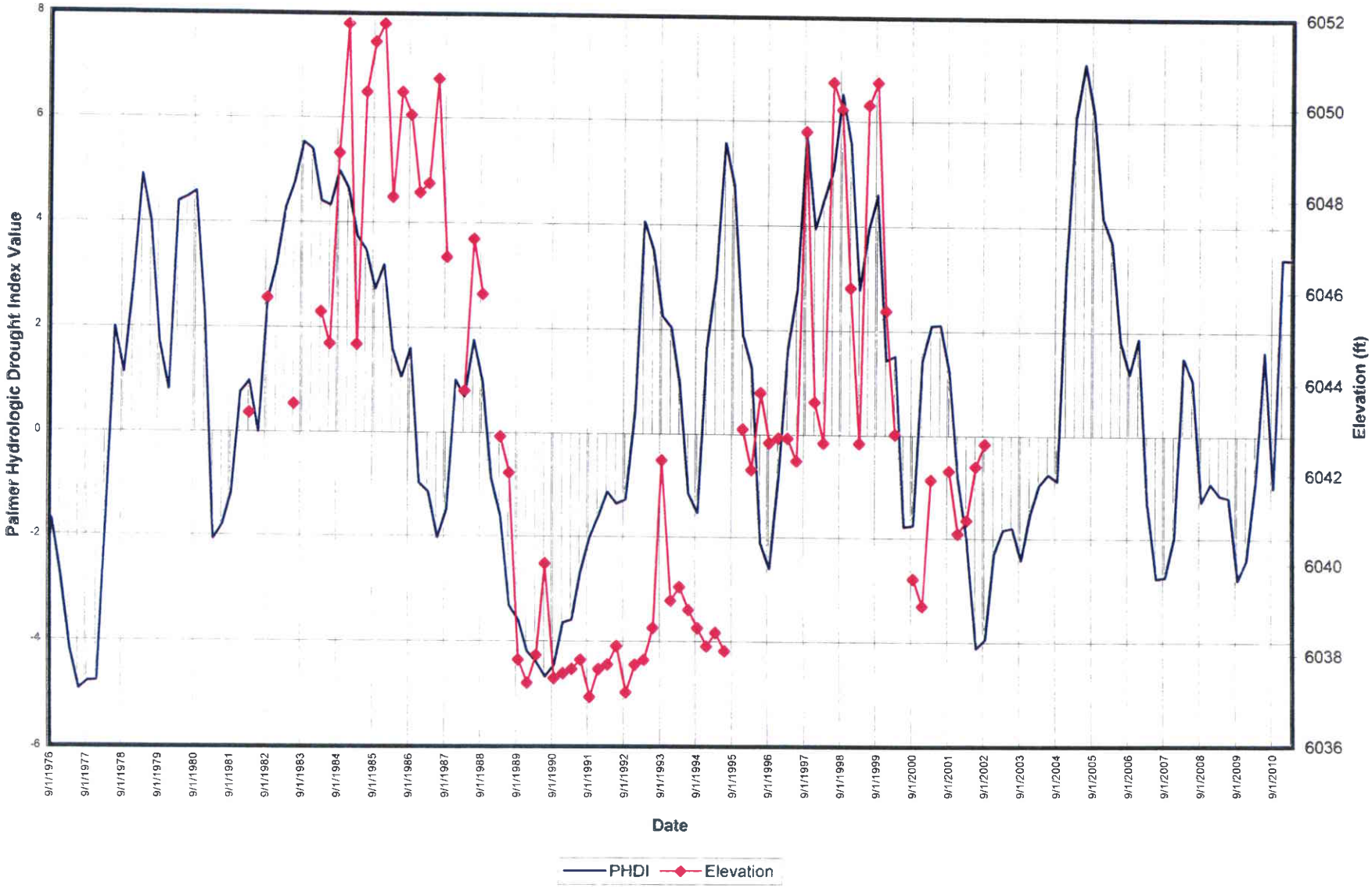
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL RDA6



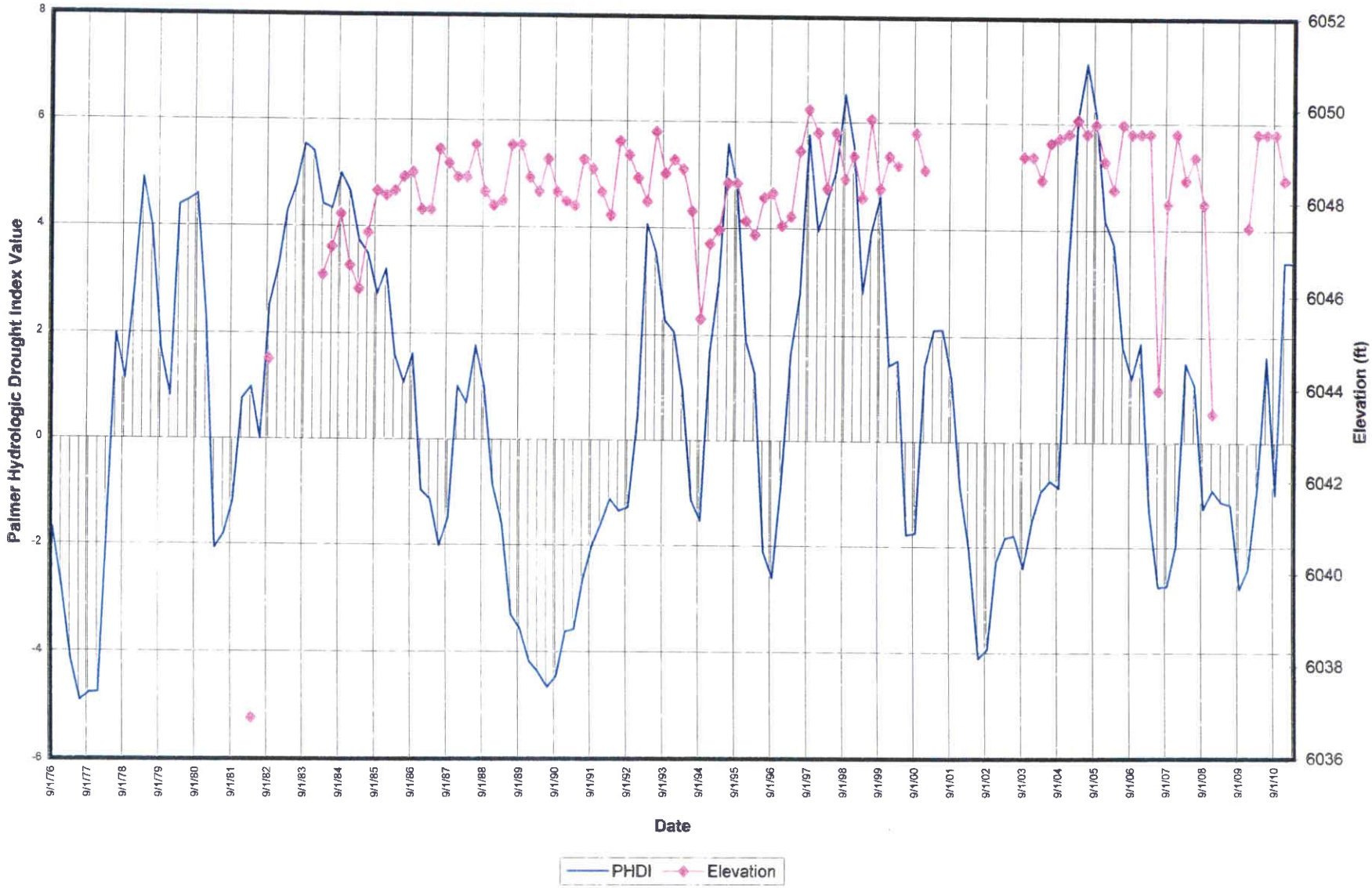
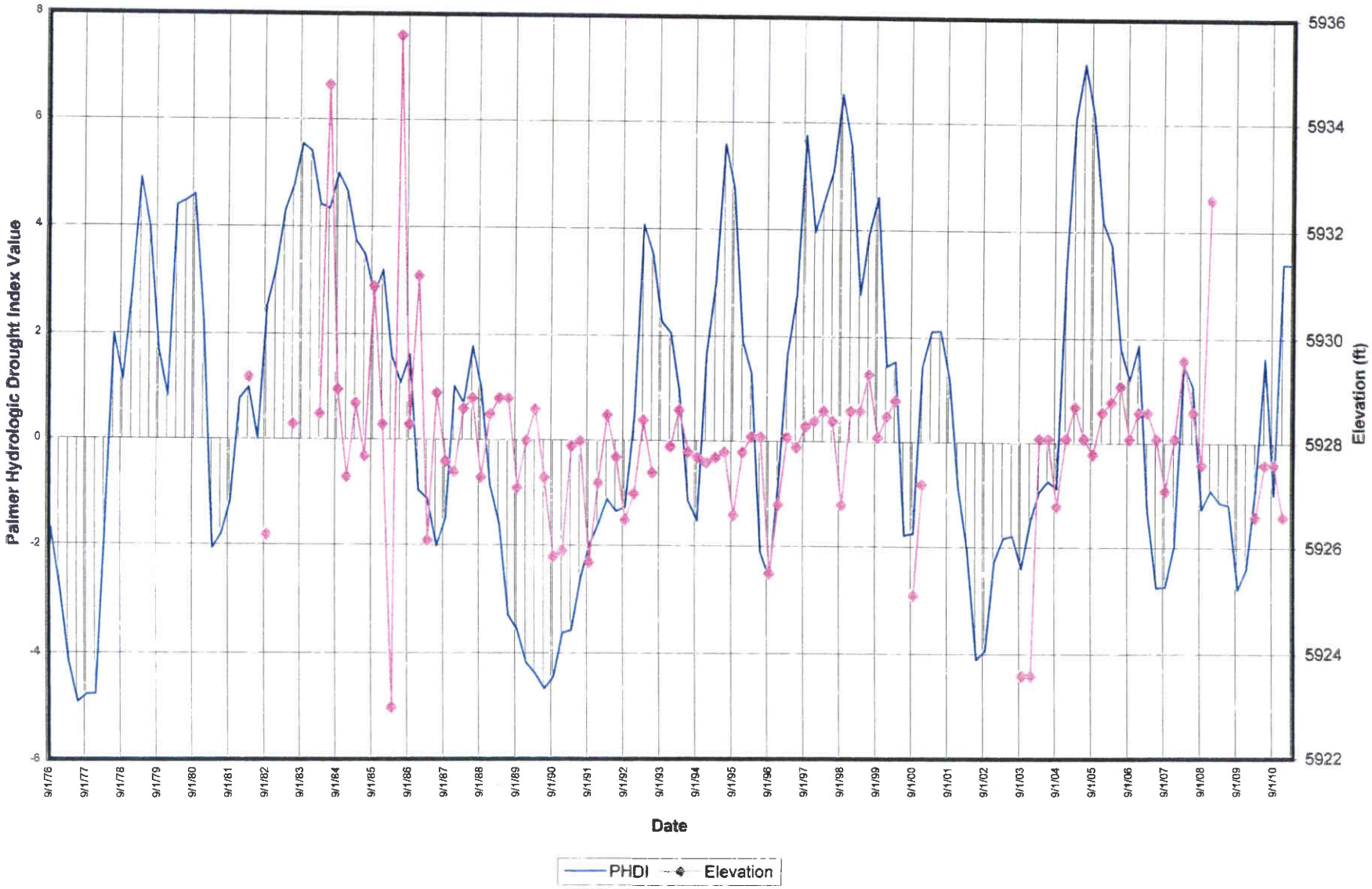
COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL SM1-1



COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL SM1-2



COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL SM1-3



COMPARISION OF ELEVATION AND PALMER HYDROLOGIC DROUGHT INDEX IN ALLUVIUM LAYER AT WELL SM1-4