

Docket # 40-8502  
SUA-1341



May 14, 2003

Mr. Don McKenzie, District III Supervisor  
Department of Environmental Quality  
Land Quality Division  
1043 Coffeen Avenue, Suite D  
Sheridan, Wyoming 82801

**RE: Request to Terminate Excursion Status for Well DM-10, Irigaray Site  
DEQ Permit to Mine No. 478**

Dear Mr. McKenzie,

I would like to thank you, Rick Chancellor, Glenn Mooney, Mark Taylor and Steve Ingle for meeting with Wayne Heili and me regarding the shallow and deep monitor zone excursion wells at our Irigaray site.

It is my understanding from the meeting that it is LQD's position that the six shallow zone monitor wells currently on excursion status (SSM-3, SSM-18, SSM-40, SSM-41, SSM-42 and SSM-43) should be removed from excursion status because 1) COGEMA has used BPT to reduce and stabilize the water quality concentrations in the shallow zone; and 2) that the current water quality concentrations do not exceed any of the class of use standards applicable to the shallow monitor zone. You will be seeking NRC's concurrence on this position in June at the NRC/NMA meeting in Denver.

As you are aware, all active groundwater restoration for the Irigaray wellfields was completed in 2001. However, deep monitor well DM-10, located in Production Unit 6 within the Irigaray wellfields, also continues to remain on excursion status. In our meeting, you indicated that additional information would be helpful in concluding your position regarding the removal of this well from excursion status. A chart showing the historical water levels, chloride levels (primary indicator of an excursion), and the production and restoration history of the Irigaray wellfields over time is attached for this purpose. Key dates are noted on the chart; an explanation for the key dates are given in a separate chronology attached to the chart. A map of the Irigaray wellfields is also attached, showing the location of DM-10.

Internally, we have reviewed the chart, and have made several observations regarding the historical record for DM-10. These are provided as follows:

- The chart begins with the first monitoring of DM-10, beginning in May 1988. Water levels in DM-10 were, at that time, already lowered below baseline in response to mining activities in Units 1 through 5. As shown on the chart, DM-10 has a direct response (both water level and chloride) to injection and recovery activities in the Irigaray wellfields (all wellfields). This response is seen during both mining and restoration phases. This response is not surprising, as it has been COGEMA's position that the deep monitor zone to the west/northwest of DM-10 is connected to the production zone, and this is substantiated by the water level responses.

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- May 1988 through June 12, 1989: mining was ongoing in Units 1 through 9. A water fence was in operation between Units 5 and 6 to avoid pulling ammoniated water from Unit 5 into Unit 6. On June 12, all mining activities were placed on standby so that conversions in the plant could be made. Mining was resumed in November 1989, but operations soon ceased in February 1990 pending sale of the company.
- July 5, 1989: DM-10 first went on excursion status. When all mining activity ceased in June of 1989, as well as the operation of the water fence, it was thought that the continued sampling of DM-10 contributed solutions from the ore zone into the deep zone through a nearby connection with the ore zone in the northwest corner of Unit 6, or southwest corner of Unit 5. Hydro-Engineering had previously identified this potential connection during a study of the aquifers adjacent to the production zone in Units 4 through 9 (1987). It was thought that the connection could be man-made, i.e. an injection well that was drilled too deep, or a natural geologic connection. A review of the geologic data for the adjacent aquifers indicated that the confining shales tend to thin at the edges of the ore body, and the ore sand and deep sand could potentially have connection at some point. The deep sand in the areas of Production Units 6 through 9 is a very well developed sand and could actually be part of the production zone (Upper Irigaray Sandstone). The Hydro-Engineering report specifically stated, "From the geologic cross sections, it appears that a direct connection exists between the Deep and UISS aquifers in areas of the Unit 5 and 6 well fields. A discontinuous aquitard appears to exist in the very western portions of the Unit 5 well field. The lower aquitard is thought to pinch out on the western edge of the Unit 6 well field."
- The chloride level in DM-10 peaked at over 60 mg/l during the initial excursion, then corrective actions of pumping individual wells in Unit 5 appeared to create a downward trend (August 16, 1989 letter from Malapai Resources Company to DEQ: corrective action of over-recovery was chosen because an annular leak would presumably create higher chloride values). In June of 1990, groundwater sweep operations were initiated in Units 1 through 5, which provided a significant downward trend in water levels, and chloride. The most prominent decrease in DM-10, however, occurred during the time period that groundwater sweep was specifically conducted in Units 4 and 5 (between June of 1991 and August 1993). This would make sense assuming that a connection exists between DM-10 and the production zone in Unit 5. DM-10 was presumably cleaned up by the groundwater sweep in Unit 5.
- In September 1993 mining resumed in Units 6 through 9. DM-10 again returned to excursion status. On April 15, 1995, groundwater sweep resumed in Units 4 and 5, and also commenced in Units 6 through 9. This action again significantly reduced the water level and chloride concentrations in DM-10, presumably because of the over-recovery in Unit 5. Groundwater sweep was discontinued in Units 4 and 5 in October 1995 and reverse osmosis treatment began.
- When reverse osmosis treatment began in Units 4 and 5 in October 1995, groundwater sweep continued in Units 6 through 9. Groundwater sweep in Units 6 through 9 continued until September 20, 1997. During this time period, water levels and chloride concentrations began to rise in DM-10. We believe that the groundwater sweep in the production zone of Unit 6 through 9 pulled solutions from Unit 5 towards DM-10 and because Unit 5 was only in the initial stages of reverse osmosis, chloride levels were still high thus creating the increase in DM-10 when it was sampled. It was not until groundwater sweep ended in Units 6 through 9, and reverse osmosis operations neared completion in Units 4 and 5, that DM-10

returned to near-normal. We believe that the reverse osmosis operations in Units 4 and 5 had a very positive affect on DM-10 from September 1997 through August 1998.

- After the end of restoration in Units 4 and 5 (September 1998), reverse osmosis treatment occurred in Units 9, 8, 7 and finally 6. Chlorides gradually increased during the time and water levels gradually decreased. The typical recovery bleed in the ore zone during the reverse osmosis operations is 10% to 30%, so the water level decrease in DM-10 is not surprising. And, if the connection with the ore zone in Unit 5 holds true, continued sampling of DM-10 could draw solutions from Unit 5 into the deep zone.
- All active restoration ceased in mid-November 2001. To date, water levels in DM-10 have recovered, and chloride concentrations have stabilized at less than half the value of the original excursion concentration.

Additional information for consideration is as follow:

- Water quality information showing the last full analysis of DM-10 (DEQ Guideline 8) taken on January 21, 2002 is provided in an attached table (Status of DM-10). This analysis is compared to baseline values and Class I drinking water standards. As can be seen from the table, the January 2002 data exceeds DM-10's baseline maximum data for 12 of 35 chemical parameters. The same 12 parameters exceed the DM-10 average baseline plus two standard deviations, except that sulfate and silica only exceed this value by 1 ppm or less, therefore could be considered as consistent with the mean plus two standard deviations. Of these 12 parameters that exceed baseline, only four of have EPA drinking water standards (for these parameters, the standards are secondary standards based on aesthetics, and not human health). As noted on the table, none of these drinking water standards are exceeded.
- As shown on the DM-10 chart, water levels in DM-10 have been recovering since the end of restoration and appear to be stabilizing. Water levels for DM-10 and several production zone wells were obtained on May 13, 2003 for comparison. The results are provided in the following table:

Unit	Well No.	Distance and Bearing from DM-10	Water Elevation (ft. msl)
P.U. 4	FI-40	821' NNW from DM-10	4308.9
P.U. 5	GI-76	382' NW from DM-10	4306.9
P.U. 6	DM-10		4317.0
P.U. 6	HI-39B	40' E from DM-10	4310.9
P.U. 6	HI-49	148' WSW from DM-10	4313.2
P.U. 7	JI-59	519' SSE from DM-10	4314.0

The water elevation information presented above shows that the piezometric head in DM-10 is higher than the surrounding production zone. This is indicative of a gradient from the deep zone into the overlying production zone rather than a higher production zone head flowing into the deep zone. This is very positive, indicating that the deep zone should not be affected in the future by leakage downward from the production zone.

COGEMA's conclusions for the DM-10 excursion are as follows:

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- Best practicable technology (BPT) in the form of groundwater sweep and reverse osmosis treatment was used to effectively reduce the concentrations of mining solutions that affected the deep zone at DM-10.
- By employing BPT, DM-10's water quality has been returned to the pre-mining use classification of drinking water. Close to 70% of all parameters analyzed in DM-10 in January 2002 were consistent with baseline values.
- Due to the higher piezometric head levels in the deep zone, plus the recovering water level history over the last two years in DM-10, the Class I waters of the deep zone should be protected from further influences from the production zone.
- Additional groundwater sweep and reverse osmosis processing in Production Unit 5 could be attempted to further reduce the chloride, etc. concentrations in DM-10. However, in our opinion, the economics of this (over \$3/kgal for treatment), plus the time delays of resuming restoration and repeating stabilization monitoring, outweigh the benefit that may (or may not) be seen in DM-10. Because the quality of use has not been affected for DM-10, we recommend against any further restoration efforts in Unit 5.
- Based on all the information, we respectfully request that DEQ approve the removal of DM-10 from future excursion status.

I hope that this additional information helps with your final determination for DM-10. However, if you should require anything else, please do not hesitate to call me.

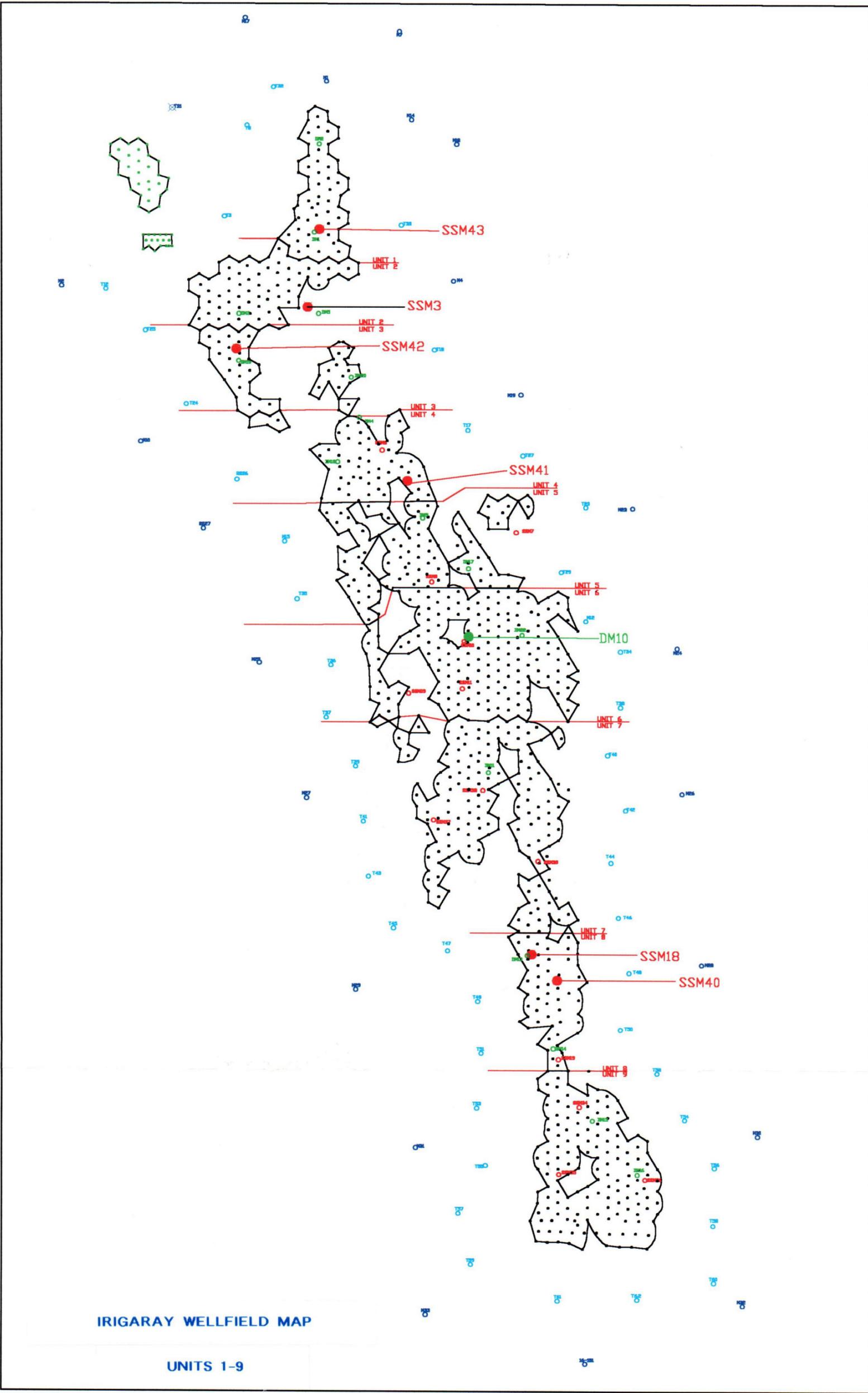
Sincerely,



Donna L. Wichers  
General Manager

Enclosures

cc: DEQ/LQD – R. Chancellor, Cheyenne  
NRC – Headquarters  
NRC – Region IV  
COGEMA – W. Heili, T. Nicholson

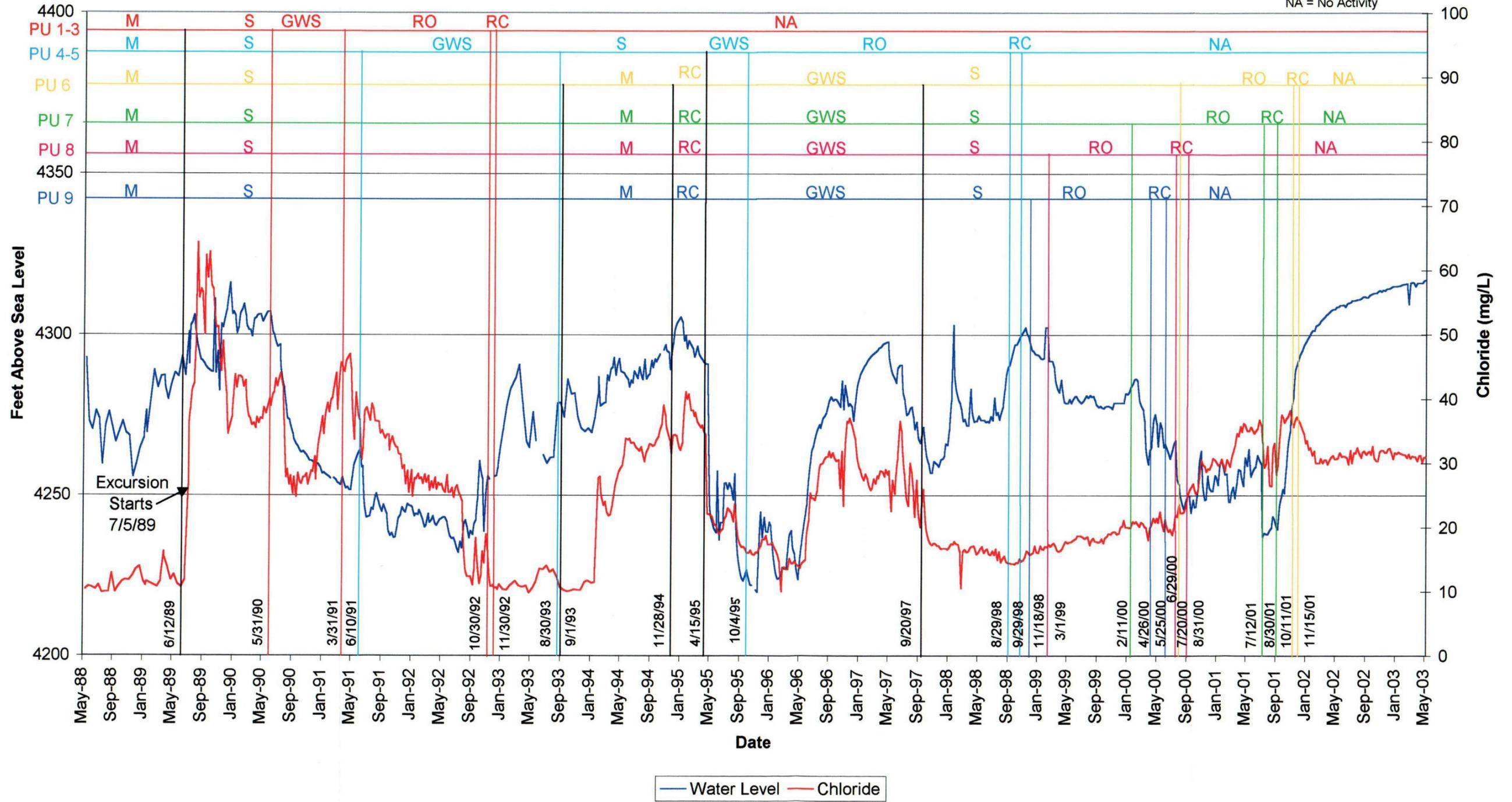


IRIGARAY WELLFIELD MAP

UNITS 1-9

# DM10 HISTORY

M = Mining  
 S = Standby  
 GWS = Ground Water Sweep  
 RO = Reverse Osmosis  
 RC = Recirculate  
 NA = No Activity



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# DM 10 History Chart

## Explanation of Contents

The attached chart entitled "DM10 History" presents the trends over time of the water level and chloride concentration data collected from Irigaray Deep Monitor well # 10. The timeline (X - axis) starts in May of 1988 when the well was added to the suite of deep monitor wells, just prior to the commencement of mining in production unit 6 (PU-6) where the well is located. The timeline goes through to the end of April 2003.

Operational activity data from the production units overlies the chart. The unit information is divided to separately illustrate the activities in the production unit groups: PU's 1-3 (red), PU's 4-5 (cyan), PU-6 (yellow), PU-7 (green), PU-8 (magenta) and PU-9 (blue). Vertical lines in colors matching the production unit color code mark "key" operational dates. The vertical lines extend from the X-axis to the horizontal line for the matching production unit. Black vertical lines indicate that more than one of the production unit groups were changed at that date.

A key to the phase abbreviations appears in the upper left-hand corner of the chart. A table of all the important dates with a description of the activities is attached.

## Irigaray Wellfield History

<u>DATES</u>	<u>ACTIVITY</u>
1978	Mining Starts in Production Units 1 through 5
1982-1987	Operations placed on Standby
Jun-87	Mining Resumes in Units 1-5
Jun-88	Mining Starts in Production Units 6-9
06/12/1989	Operations placed on Standby, no wellfield flow.
07/05/1989	<b>DM-10 first goes on Excursion Status</b>
05/31/1990	Groundwater Sweep restoration starts in Units 1-3
03/31/1991	Reverse Osmosis restoration starts in Units 1-3
06/10/1991	Groundwater Sweep restoration starts in Units 4-5
Nov-92	Recirculation phase of Units 1-3
08/30/1993	Groundwater Sweep of Units 4-5 placed on Standby
Sep-93	Mining resumes in Units 6-9
11/28/1994	Mining concluded in Units 6-9, Recirculation flow maintained
04/15/1995	Groundwater Sweep of Units 4-5 resumes Groundwater Sweep of Units 6-9 started
10/04/1995	Reverse Osmosis restoration starts in Units 4-5
09/20/1997	Groundwater Sweep of Units 6-9 completed
Sep-98	Recirculation phase of Units 4-5
11/18/1998	Reverse Osmosis restoration starts in Unit 9
03/01/1999	Reverse Osmosis restoration starts in Unit 8
02/11/2000	Reverse Osmosis restoration starts in Unit 7
May-00	Recirculation phase of Unit 9
Jul/Aug 2000	Recirculation phase of Unit 8
07/20/2000	Reverse Osmosis restoration starts in Unit 6
Jul/Aug 2001	Recirculation phase of Unit 7
Oct/Nov 2001	Recirculation phase of Unit 6, Pumping ends on 11/15/2001.

# Status of DM-10

## Irigaray Production Unit 6

(Analyses by Energy Laboratories, Inc., Casper, WY)

Well I.D.:	DM-10 Baseline Min*	DM-10 Baseline Mean*	DM-10 Baseline Max*	DM-10 Mean Plus 2 Std. Dev.*	DM-10 08-Aug-95	DM-10 18-Aug-98	DM-10 21-Jan-02	Jan-02 Exceeds DM-10 Baseline Max	Jan-02 Exceeds DM-10 Mean + 2 Std. Dev.	Jan-02 Exceeds Class I Drinking Water	WDEQ Class I Drinking Water
Production Unit: IR 6											
Sample Date:											
Major Ions mg/l:											
Ca	4.6	6.0	7.9	8.8	10.1	8	12.3	YES	YES		
Mg	0.46	0.59	0.76	0.85	1.1	< 1.0	1.4	YES	YES		
Na	100	111	117	123	144	133	173	YES	YES		
K	1.4	1.6	1.8	1.9	1.7	1.5	2.4	YES	YES		
CO3	1.2	9.7	17.6	23.6	3.4	< 1.0	< 1.0	NO	NO		
HC03	89.1	97.9	102.4	107.9	180	179	262	YES	YES		
SO4	132	138	146	148	152	148	149	YES	YES	NO	250
Cl	10.1	11.4	12.6	13.4	19.4	14	31.8	YES	YES	NO	250
NH4	0.21	< 0.39	< 0.5	< 0.39	0.05	0.21	0.20	NO	NO	NO	0.5
NO2+NO3 (as N)	< 0.02	< 0.61	< 1.00	< 0.61	< 0.10	< 0.10	< 0.10	NO	NO	NO	1.0
NO3 (N)	< 0.02	< 0.61	< 1.00	< 0.61	< 0.10	< 0.10	< 0.10	NO	NO	NO	2.4
F	0.2	0.32	0.43	0.48	0.31	0.29	0.20	NO	NO		
SiO2	7.9	8.9	9.4	10.1	10.1	9.7	10.5	YES	YES		
TDS	298	335	353	375	433	387	499	YES	YES	NO	500
Cond. (umho/cm)	536	551	570	581	730	681	825	YES	YES		
Alk. (as CaCO3)	85	93.5	99	107	152	146	215	YES	YES		
pH (units)	8.39	8.93	9.3	9.7	8.53	8.25	8.30	NO	NO	NO	6.5-9.0
Trace Metals mg/l:	0										
Al	< 0.05	< 0.10	0.2		< 0.10	< 0.10	< 0.10	NO	NO		
As	0.002	0.003	0.004	0.005	< 0.001	< 0.001	< 0.001	NO	NO	NO	0.05
Ba	< 0.05	< 0.07	< 0.10		< 0.10	< 0.10	< 0.10	NO	NO	NO	1.00
B	< 0.10	< 0.16	< 0.20		< 0.10	< 0.10	< 0.10	NO	NO	NO	0.75
Cd	< 0.002	< 0.005	< 0.01		< 0.01	< 0.005	< 0.005	NO	NO	NO	0.01
Cr	< 0.005	< 0.023	< 0.05		< 0.05	< 0.05	< 0.05	NO	NO	NO	0.05
Cu	< 0.008	< 0.011	0.016		< 0.01	< 0.01	< 0.01	NO	NO	NO	1.0
Fe	0.04	< 0.10	0.32		< 0.05	< 0.05	< 0.05	NO	NO	NO	0.3
Pb	< 0.005	< 0.023	< 0.05		< 0.05	< 0.05	< 0.05	NO	NO	NO	0.05
Mn	< 0.005	< 0.007	< 0.01		0.02	0.02	0.04	YES	YES	NO	0.05
Hg	< 0.0002	< 0.0005	< 0.001		< 0.001	< 0.001	< 0.001	NO	NO	NO	0.002
Mo	< 0.05	< 0.07	< 0.10		< 0.10	< 0.10	< 0.10	NO	NO		
Ni	< 0.01	< 0.026	< 0.05		< 0.05	< 0.05	< 0.05	NO	NO		
Se	< 0.001	< 0.0016	< 0.002		< 0.001	< 0.001	< 0.001	NO	NO	NO	0.01
V	< 0.05	< 0.07	< 0.10		< 0.10	< 0.10	< 0.10	NO	NO		
Zn	< 0.01	< 0.11	0.31		0.01	0.01	0.01	NO	NO	NO	5.0
Radiometric pCi/l:											
U (mg/l)	< 0.0003	< 0.0056	0.0085		0.0008	< 0.0003	< 0.0003	NO	NO	NO	5.0
Ra 226	< 0.5	< 1.18	3.9	4.1	0.4	< 0.2	< 0.2	NO	NO	NO	5.0
Ra 226+/-	0.2	0.3	0.5		0.2	0.2					

\*Baseline data taken from "Production Unit 6 Baseline Water Quality Data Package, Irigaray Mine, Malapai Resources Company, April 4, 1988", submitted to DEQ April 4, 1988.

CURRENT VALUES Christensen Lab	DM-10 14-Apr-03	DM-10 12-May-03	DM-10 UCL
Cl	31.2	30.3	16.4
Cond. (umho/cm)	802	825	606
Alk. (as CaCO3)	206.2	206.3	107.5
pH (units)	8.3	8.4	
U (mg/l)**	< 0.3392	< 0.3392	

\*\*Site Laboratory Detection Limit = 0.4 mg/l U3O8, equals 0.3392 as U.