

# WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

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September 13, 2006

TO: Internal File

THRU: D. Wayne Hedberg, Permit Supervisor *psf*

FROM: *DD* Dana Dean, P.E, Senior Reclamation Hydrologist

RE: 2005 Fourth Quarter Water Monitoring, Nevada Electric Investment Corporation, Wellington Preparation Plant, C/007/0012-WQ05-3, Task #2536

The Wellington Preparation Plant is currently idle. No mining or coal processing activities currently take place there, nor is the site in active reclamation.

Pertinent water monitoring requirement information is in the MRP in Sections 7.23, and 7.31.2-22, and tables 7.24-2, and 7.24-5.

1. Was data submitted for all of the MRP required sites? YES  NO

**Springs** –

*The Permittee is not required to monitor any springs at the Wellington Preparation Plant.*

**Streams** –

*The Permittee is required to sample SW-1, SW-2A, SW-3, SW-4, SW-5, SW-6, SW-7, and SW-8 for flow, and the laboratory parameters outlined in Table 7.24-5 each quarter. They are to sample SW-2 for flow-only each quarter.*

The Permittee monitored and reported the essential data for all streams as required during this quarter.

**Wells**–

*The Permittee is required to sample GW-1, GW-3, GW-4, GW-6, GW-7, GW-8, GW-9, GW-9B, GW-10, GW-12, GW-13, GW-14, GW-15A, GW-15B, GW-16, and GW-17 for depth, and the laboratory parameters outlined in Table 7.24-2 each quarter. They are to sample GW-2 for depth-only each quarter.*

The Permittee monitored and reported the essential data for all wells as required during this quarter.

**UPDES**

*There are six active UPDES sites at the Wellington Preparation Plant. They are all under the permit #UTG040010, and include outfalls 003, 004, 005, 006, 007, and 008. The Permittee is required to monitor each UPDES site monthly.*

The Permittee monitored and reported the essential data for all UPDES sites as required during this quarter. None of the UPDES sites recorded any flow during the period.

**2. Were all required parameters reported for each site?** YES  NO

There was not enough water at GW-3 to properly purge/sample. For this reason, the Permittee was unable to sample the water, and only recorded depth information.

**3. Were any irregularities found in the data?** YES  NO

Several parameters fell outside of 2 standard deviations from the mean encountered at the respective sites. They were:

Site	Parameter	Value	Standard Deviations from Mean	Mean
GW-1	Total Hardness	1900 mg/L	2.08	2106.92 mg/L
GW-1	Sulfate	2610 mg/L	2.11	2976.36 mg/L
GW-1	Total Cations	60.5 meq/L	2.43	69.06 meq/L
GW-1	Total Anions	66.3 meq/L	2.00	74.08 meq/L
GW-1	Dissolved Magnesium	214 mg/L	2.00	248.96 mg/L
GW-1	Dissolved Sodium	516 mg/L	2.08	616.96 mg/L
GW-8	Total Selenium	240 µg/L	4.01	23.06 µg/L
GW-15A	Total Iron	27.9 mg/L	2.40	8.01 mg/L
GW-17	Total Iron	166 mg/L	3.35	34.91 mg/L

Dissolved magnesium has a fairly strong downward trend at GW-1 ( $R^2 = 0.682$ ), with a fairly strong positive correlation to water level. There are no criteria for this metal, but it contributes to water hardness, which also has a fairly strong downward trend at GW-1 ( $R^2 = 0.588$ ). Hardness at this site has always fallen in the very hard (>300 mg/L) category, with all samples above 1800 mg/L.

There is a slight downward trend in dissolved sodium at GW-1 ( $R^2 = 0.140$ ), with a weak positive correlation to well elevation. There is no water quality standard for sodium, but it does

increase the salinity of water. High salinity in irrigation water can decrease yields, depending on the crop. The reduction in sodium is a positive trend.

Sulfate has a weak downward trend at GW-1 ( $R^2 = 0.208$ ), with a weak positive correlation to well elevation. Sulfate is not toxic to plants or animals (even at very high concentration), but has a cathartic effect on humans in concentrations over 500 mg/L. For this reason, the EPA has set the secondary standard as 250 mg/L. The sulfate at GW-1 has always been above 2500 mg/L, therefore this change in concentration is not significant.

The number of cations and anions counted at GW-1 is unusually low. There is a weak positive correlation to water level. The cation/anion balance is within the 5% recommended limit at this site. The number of cations and anions relate to the total dissolved solids in the water sample, and that number is not out of the ordinary.

There is a fairly strong upward trend in total iron at GW-15A ( $R^2 = 0.569$ ), and a weak upward trend in total iron at GW-17. Each site has a weak negative correlation to water level. The secondary water quality standard for iron (based on taste and appearance only) is 0.3 mg/l, and for industrial use, the limit is 0.2 mg/l. The aquatic life standard (warm water fisheries) is 1.0 mg/l. Since the groundwater at the Wellington Preparation Plant does not support aquatic life, and the iron has usually been above 0.2 mg/l, the rise in dissolved iron does not represent a degradation of water quality in GW-15A, or GW-17. The iron values at SW-1 and SW-2A have dropped dramatically from 187 mg/L to 0.88 mg/L at SW-1, and from 142 mg/L to 1.12 mg/L at SW-1.

The total selenium has a very weak upward trend at GW-8, with a weak negative correlation to flow. This is the highest value ever recorded at this site. The drinking water quality standard for selenium is 0.05 mg/L, the fresh-water aquatic life standard is 0.005 mg/L, and the human-life standard is 170 mg/L. The selenium at GW-8, and GW-9B has only been below the drinking water quality standard twice in 46 samples (1999 and 2000). This water is not used as a fishery or for drinking water, and this change in selenium does not represent a degradation of water quality.

Several routine Reliability Checks were outside of standard values. They were:

Site	Reliability Check	Value Should Be...	Value is...
SW-1	TDS/Conductivity	>0.55 & <0.75	1.11
SW-1	Conductivity/Cations	> 90 & < 110	63
SW-1	Mg/(Ca + Mg)	< 40 %	50 %
SW-1	Ca/ (Ca + SO <sub>4</sub> )	> 50 %	28 %
SW-2A	TDS/Conductivity	>0.55 & <0.75	1.09
SW-2A	Conductivity/Cations	> 90 & < 110	66
SW-2A	Mg/(Ca + Mg)	< 40 %	51 %

SW-2A	Ca/ (Ca + SO4)	> 50 %	29 %
GW-1	TDS/Conductivity	>0.55 & <0.75	1.15
GW-1	Conductivity/Cations	> 90 & < 110	66
GW-1	Mg/(Ca + Mg)	< 40 %	47 %
GW-1	Ca/ (Ca + SO4)	> 50 %	27 %
GW-4	TDS/Conductivity	>0.55 & <0.75	1.11
GW-4	Conductivity/Cations	> 90 & < 110	66
GW-4	Mg/(Ca + Mg)	< 40 %	53 %
GW-4	Ca/ (Ca + SO4)	> 50 %	26 %
GW-6	TDS/Conductivity	>0.55 & <0.75	1.28
GW-6	Conductivity/Cations	> 90 & < 110	59
GW-6	Mg/(Ca + Mg)	< 40 %	57 %
GW-6	Ca/ (Ca + SO4)	> 50 %	25 %
GW-7	TDS/Conductivity	>0.55 & <0.75	0.95
GW-7	Conductivity/Cations	> 90 & < 110	76
GW-7	Mg/(Ca + Mg)	< 40 %	58 %
GW-7	Ca/ (Ca + SO4)	> 50 %	20 %
GW-8	Cation/Anion Balance	<5%	5.8 %
GW-8	TDS/Conductivity	>0.55 & <0.75	1.34
GW-8	Conductivity/Cations	> 90 & < 110	55
GW-8	Mg/(Ca + Mg)	< 40 %	77 %
GW-8	Ca/ (Ca + SO4)	> 50 %	11 %
GW-9	TDS/Conductivity	>0.55 & <0.75	1.69
GW-9	Conductivity/Cations	> 90 & < 110	45
GW-9	Mg/(Ca + Mg)	< 40 %	77 %
GW-9	Ca/ (Ca + SO4)	> 50 %	10 %
GW-9B	TDS/Conductivity	>0.55 & <0.75	1.48
GW-9B	Conductivity/Cations	> 90 & < 110	52
GW-9B	Mg/(Ca + Mg)	< 40 %	69 %
GW-9B	Ca/ (Ca + SO4)	> 50 %	16 %
GW-10	TDS/Conductivity	>0.55 & <0.75	1.25
GW-10	Conductivity/Cations	> 90 & < 110	62
GW-10	Mg/(Ca + Mg)	< 40 %	65 %
GW-10	Ca/ (Ca + SO4)	> 50 %	17 %
GW-12	TDS/Conductivity	>0.55 & <0.75	1.80
GW-12	Conductivity/Cations	> 90 & < 110	44
GW-12	Mg/(Ca + Mg)	< 40 %	80 %
GW-12	Ca/ (Ca + SO4)	> 50 %	10 %
GW-13	TDS/Conductivity	>0.55 & <0.75	1.42
GW-13	Conductivity/Cations	> 90 & < 110	52
GW-13	Mg/(Ca + Mg)	< 40 %	64 %

GW-13	Ca/ (Ca + SO4)	> 50 %	8 %
GW-14	TDS/Conductivity	>0.55 & <0.75	1.43
GW-14	Conductivity/Cations	> 90 & < 110	53
GW-14	Mg/(Ca + Mg)	< 40 %	70 %
GW-14	Ca/ (Ca + SO4)	> 50 %	16 %
GW-15A	TDS/Conductivity	>0.55 & <0.75	1.08
GW-15A	Conductivity/Cations	> 90 & < 110	69
GW-15A	Mg/(Ca + Mg)	< 40 %	41 %
GW-15A	Ca/ (Ca + SO4)	> 50 %	35 %
GW-15B	TDS/Conductivity	>0.55 & <0.75	1.22
GW-15B	Conductivity/Cations	> 90 & < 110	64
GW-15B	Ca/ (Ca + SO4)	> 50 %	35 %
GW-16	TDS/Conductivity	>0.55 & <0.75	1.20
GW-16	Conductivity/Cations	> 90 & < 110	62
GW-16	Mg/(Ca + Mg)	< 40 %	54 %
GW-16	Ca/ (Ca + SO4)	> 50 %	27 %
GW-17	Cation/Anion Balance	<5%	6.0 %
GW-17	TDS/Conductivity	>0.55 & <0.75	0.44
GW-17	Conductivity/Cations	> 90 & < 110	135
GW-17	Mg/(Ca + Mg)	< 40 %	54 %
GW-17	Ca/ (Ca + SO4)	> 50 %	41 %

The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. These inconsistencies do not necessarily mean that a sample is wrong, but it does indicate that something is unusual. An analysis and explanation of the inconsistencies by the Permittee would help to increase the Division's confidence in the samples. The Permittee can learn more about these reliability checks and some of the geological and other factors that could influence them by reading Chapter 4 of *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow.

**4. On what date does the MRP require a five-year re-sampling of baseline water data.**

December 10, 2009

**5. Based on your review, what further actions, if any, do you recommend?**

No further actions are required at this time.