

Staff's Verification Issue	Staff's Interpretation of Licensee's Perspective	Staff's Perspective	Potential Resolution
Field QA/QC	(1) Mistakes are made	(1) Mistakes do occur; however, in accordance with the ALARA process, the QA/QC should identify the root cause and SOPs be modified to reduce the likelihood of similar mistakes in the future. Based on the language, staff could consider the ill completion of well MU-108 as falling into the category of "Mistakes are made", which is not acceptable.	(1) Provide clarification of the QA/QC evaluation of errors including steps that meet ALARA.
	(2) Outlier test corrected deficiencies	(2) Statistical outlier tests are not to be used to simply eliminate data; the first step in outlier test includes a review of the potential source for the outlier. Furthermore, although one or two parameters are identified as outliers, other parameters from the sample were not and used incorrectly in the statistical analysis.	(2) Correct the baseline database to account for errors and re-evaluate the baseline. In addition, staff's recommendation is to provide a separate table in the Package that clearly list production zone baseline data.
	(3) "operator error"	(3) Use of imprecise language such as "operator error" leads to difficulty in staff verifying the information as presented. For example, staff is unsure whether or not "operator error" means, in the case of anomalous water levels, that the operator merely wrote the incorrect measurement or that the operator was at the wrong well.	(3) See (1) above.
Inadequate Evaluation of Potential Fluid Migration and Ability to Perform Corrective Actions	(1) Monitoring (or trend) wells are located within 800 feet of production units and can be used to detect/correct excursions.	(1) Importance of the 800-foot capture zone to the monitoring wells is not discussed in the Package. Furthermore, based on experience reported by another licensee, excursions in one zone may not be correctable by wells screened in multiple or different zones	(1) Provide adequate evaluation of fluid migration and corrective actions
	(2) Water levels will be monitored to evaluate likelihood for excursion	(2) Based on experience at ISL facilities to date, water levels alone are poor indicators of an excursion due to constant changing of production rates and other temporal variations. Furthermore, staff is unclear why the licensee did not characterize the water quality at the proposed trend wells. Staff's understanding that trend wells do not have any regulatory significance but aids the licensee in controlling fluid migration. However, other ISR facilities that utilize trend wells have collected initial water quality data for trend wells. That information has been useful in cases where excursions have extended to the trend wells.	(2) Provide SOP on how water levels will be used to identify potential out of balance
	(3) Corrective actions are listed in Wyoming Permit to Mine Documents	(3) The Package includes many references to outside documents which make staff's verification difficult. In this case, staff cannot verify that the proposed corrective actions for an excursion are adequate.	(3) Provide the appropriate pages of the external document
	(4) Numeric modeling demonstrates ability to perform corrective actions	(4) The numeric model was deficient in that it was comprised of only of a single layer and thus could not evaluate the vertical anisotropy within the HJ Horizon. Furthermore, the vertical anisotropy was demonstrated by the regional pumping test at LC16M, which is only a HJ-Horizon-partial-penetrating well. The pumping tests for MU1 can not be used to evaluate vertical anisotropy because the pumping wells are fully penetrating. (See Attachment 1 documenting staff's verification of the vertical anisotropy.)	(4) Provide an analysis of deficiencies in staff's verification, document why vertical anisotropy is not significant, or steps to ensure vertical anisotropy will be evaluated in any proposed corrective action for an excursion.

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	(5) Subdividing the HJ Horizon into 4 zones is artificial; the intervening mudstones are not contiguous and HJ should be evaluated as single entity	(5) Based on the licensee's recent comment that 5 feet of the overlying or underlying aquitards were sufficient to not warrant additional evaluation for placement of overlying and underlying monitoring wells and the lack of mapping by the licensee to demonstrate the distribution of non-contiguous mudstones within the HJ Horizon, staff reviewed the available data to verify the distribution (see Attachment 2). Staff's verification evaluation indicates that mudstones do exist through several areas of the proposed wellfields. Using an Analytical Element Model, staff has verified that the vertical anisotropy will pose a problem for the licensee's proposed monitoring and corrective action programs.	(5) See (4) above.
	(6) Multiple zones have been subject to ISR operations at other facilities	(6) Staff is aware that ISR operations at other facilities have included more than one production zone at a single wellfield. In general, the individual horizons were subjected to sequential operations which contrasts with Lost Creek's proposed staggered simultaneous operations. Furthermore, a wellfield package provided by another licensee for multiple horizons in a wellfield, which is probably most analogous to MU-1, takes into vertical anisotropy in determining adequate monitoring, partial penetration effects, and commitments to abandoned all fully penetrating wells that may act as conduits to other zones within the production aquifer. (Also see Attachment 3 on Staff's verification of a well PW-102 being a conduit.)	(6) Provide an evaluation that the proposed monitoring within the production aquifer is adequate, that the existing wells will not act as conduits and that the flare factor used in the financial surety calculations reflect site conditions.
	(7) The entire HJ Horizon is part of the exempted aquifer and additional monitoring within this zone has no safety issue	(7) Recent evaluations of restorations have demonstrated that long-term excursions are attributed to unintended lixiviant migration into portions of the exempted aquifer outside of the production units. This has enormous implications on safety primarily to potential for migration to the surround aquifers and also ensuring that adequate financial surety is determined.	(7) See (6) above
	(8) Based on geology well M-114 is located on the south side of the fault; based on drawdown, it is on the north side of the fault; the numeric modeling has it within the fault	(8) Staff cannot verify that the location of well M-114 is position correctly to monitor impacts downgradient of MU1	(8) Provide support that M-114 can provide adequate monitoring downgradient of the fault; If it is determined to be on one side of the fault, provide justification that the existing monitoring program on the other side of the fault is sufficient
	(9) The Wellfield Package is is not a high-risk safety issue for NRC staff; Wyoming DEQ evaluated it under the UIC permit	(9) See (7) above.	(9) See (6) above.
Use of methodologies not previously described in or contrary to those in the application	(1) A line drive is a modification of a 5-spot pattern and are commonly used in industry	(1) Staff verified that applications for four of the five other existing NRC-licensed ISR facilities includes a statement that line drives will be used. The language in the Lost Creek application is similar to that used in the one NRC-licensed facility application that did not expressly state that line drives would be used. Staff notes that line drives which are used at NRC-licensed facilities are generally connected or offsets to conventional 5-spot production patterns. The licensee did provide justification for the assumed 25-foot radius of influence for a line drive. Staff review indicates that a 25-foot radius of influence may underestimate impacts to the aquifer (See Attachment 4).	(1) Provide documentation on use of line drives at ISR facilities and justification of the 25-foot radius of influence
	(2) Excursion Parameter Upper Control Limits (UCLs) are based on average value for the entire perimeter ring, overlying and underlying well sets	(2) UCLs based on the wellfield average is contrary to the license and commitments in the application	(2) Provide list of UCLs that are in accordance with the license and commitments in the license application