stringent than Part 19.27.4 NMAC in that it requires the construction of a surface pad rather than simply recommending one. A concrete pad around a water well is simple and inexpensive to install. For the reasons stated above, DIGCE's proposed language should not be adopted

20.6.2.3223 GROUND WATER MONITORING REQUIREMENTS FOR ALL DAIRY FACILITIES:

A. **Monitoring Wells — Required Locations:** A permittee shall monitor ground water quality hydrologically downgradient of ~~each source of ground water contamination, including but not limited to~~ wastewater, stormwater, and combination wastewater/stormwater impoundments~~,~~ and fields within the land application area. Monitoring wells shall be located pursuant to this section to detect an exceedance(s) or a trend towards exceedance(s) of the ground water standards at the earliest possible occurrence, so that source control or abatement may be implemented as soon as possible.

REBUTTAL - Written Testimony of William C. Olson:

Section 3223 A: NMED opposes DIGCE's proposed deletions in Subsection A. DIGCE's proposed deletion removes language that clarifies that the purpose of monitoring wells is to monitor <u>each</u> potential source of contamination at dairy facilities including but not limited to impoundments and fields within a land application area. As discussed in my written direct testimony for this subsection in NMED NOI Attachment 8, the 2009 amended WQA at Subsection K of Section 74-6-4 requires that the WQCC "shall specify in regulations the measures to be taken to prevent water pollution and to monitor water quality." As required by the amended WQA, this subsection provides for the installation, use and maintenance of ground water monitoring wells to monitor ground water quality at dairy facilities. Ground water monitoring wells are the only technology available to monitor ground water quality and to directly assess whether the discharge, management, or land application of water contaminants at a dairy facility is causing an exceedance of the ground water quality standards as established by the WQCC. It is therefore necessary that each feature or component that contains or receives wastewater or stormwater containing water contaminants that could potentially impact ground water quality have an associated ground water monitoring well to monitor the effect that the specific feature or component is having on ground water quality. Placement of a monitoring well hydrologically downgradient of each feature or component that receives wastewater or stormwater is the most practical location to effectively monitor ground water quality most likely to be impacted by sources of water contaminants. For the above reasons, DIGCE's proposed deletion should not be adopted.

DIGCE's also provides a number of general statements in their comments on this subsection that are not related to the locations of monitoring wells. NMED provides the following responses to these comments.

1) DIGCE comments that vadose zone monitoring should be used to detect potential groundwater impacts and that NMED has not agreed to accept alternative monitoring methods. DIGCE's own exhibits acknowledge the seepage of water contaminants from impoundments and the potential for this seepage to cause ground water contamination. NMED has shown that a large percentage of dairy facilities in New Mexico have caused ground water contamination (approximately 57% of permitted dairy facilities) as discussed in the written direct testimony of

Sarah McGrath in NMED NOI Attachment 2. But, DIGCE seeks to avoid the installation of ground water monitoring wells by adding a new Paragraph (9) later in this subsection that would allow unspecified alternate monitoring systems in lieu of ground water monitoring wells. NMED provides detailed technical and scientific testimony on DIGCE's proposed new Paragraph (9) later in this Subsection. However, NMED strongly disagrees with DIGCE's proposal to substitute vadose zone monitoring for ground water monitoring. As discussed above, the 2009 amended WQA at Subsection K of Section 74-6-4 requires that the WQCC "shall specify in regulations the measures to be taken to prevent water pollution ***and to monitor water quality.*** *" The vadose zone is the unsaturated soil interval that overlies a saturated water bearing zone or aquifer. Vadoze zone monitoring detects leakage from impoundments into the soil and does not monitor water quality. Ground water monitoring wells are the only technology available to both monitor ground water quality and to directly assess whether the discharge, management, or land application of water contaminants at a dairy facility is causing an exceedance of the ground water quality standards as established by the WQCC. Therefore, as DIGCE's proposal does not meet the requirements of the WQA to monitor water quality, DIGCE's proposal should not be adopted.*

2) DIGCE makes a broad comment that "NMED's strict interpretation of the requirement to comply with ground water quality standards, its interpretation of "place of withdrawal of water for present or foreseeable future use", and the consequences of exceedances of standards (including those provided in these rules)" result in disincentives to engage in extra water monitoring that might provide earlier alerts of potential problems." The requirement that discharge permit facilities comply with ground water quality standards is a requirement of WQCC rules in 20.6.2.3103 NMAC and 20.6.2.3109 NMAC, not a requirement of NMED. The interpretation of the phrase "place of withdrawal of water for present or foreseeable future use" has been interpreted by the WQCC after a public hearing in the adjudicatory appeal of Phelps Dodge (In the Matter of the Appeal of Supplemental Discharge Permit for Closure (DP-1341) for Phelps Dodges Tyrone, Inc. - WQCC Docket Nos. WQCC 03-12(A) and WQCC 03-13(A) (Consolidated)), and is not an interpretation of the NMED. In addition, vadose zone monitoring of seepage is not "extra water monitoring" but soil monitoring as discussed in NMED response 1) above.

3) DIGCE makes a broad comment that "the rules also lack criteria for consideration of factors related to determining places of withdrawal." The WQCC after hearing in the adjudicatory appeal of Phelps Dodge (In the Matter of the Appeal of Supplemental Discharge Permit for Closure (DP-1341) for Phelps Dodges Tyrone, Inc. - WQCC Docket Nos. WQCC 03-12(A) and WQCC 03-13(A) (Consolidated)) adopted criteria for determining "places of withdrawal" as they relate to the Phelps Dodge Tyrone Mine. The purpose of this hearing is not to determine if a particular dairy is a "place of withdrawal." As discussed above, the purpose of this hearing is establish rules as required by the 2009 amended WQA for the prevention of water pollution at dairy facilities.

4) DIGCE states that its "position on ground water monitoring is supported by the testimony of Dr. Auvermann." Dr. Auvermann's direct written testimony in DIGCE Exhibit 4 provides scant information and only makes a couple of general statements about alternatives to ground water monitoring. He also makes a general recommendation in his direct testimony that the rule provide alternatives to ground water monitoring but provides no scientific rationale or testimony in DIGCE Exhibit 4 in support of what these appropriate conditions are. Outside of his resume, he only offers one exhibit (DIGCE Exhibit 64) in support of his testimony. DIGCE

Exhibit 64 is a short powerpoint presentation that he prepared. DIGCE Exhibit 64 makes some general statements about the intent of dairy lagoons and their liner materials for containing wastes, earthen liners being better for sludge removal, the cost of liner materials, the fact that clay liners have seepage, unexplained lagoon design criteria, and a couple of generic statements about monitoring wells. Dr. Auvermann's testimony provides no scientific or technical rationale on any specifics related to alternatives ground water monitoring.

5) DIGCE states that its position on ground water monitoring is also addressed in DIGCE Exhibits 40-43, 45-47, 49, 54, 56 and 57." DIGCE does not provide any direct testimony on the technical or scientific relevance of these exhibits. NMED refers the commission to NMED's rebuttal testimony on DIGCE's new proposed Paragraph (9)in 20.6.2.3223.A) for NMED's technical analysis of the science presented in these exhibits and why the methods presented in the exhibits are either inappropriate or lack relevance for monitoring ground water quality.

In conclusion DIGCE's comments are unsupported by their direct testimony and there is no direct testimony as to the scientific or technical basis of alternate systems for monitoring water quality as required by the 2009 amendments to the WQA. For the reasons stated above, DIGCE's proposed language should not be adopted.

(1) **Ground Water Monitoring — Wastewater Impoundments:** A minimum of one

...

(b) For an existing dairy facility, monitoring wells shall be installed within 120 days of the effective date of the discharge permit, provided that NMED may grant an extension of time for good cause shown, such as the lack of availability of well drillers.

REBUTTAL - Written Testimony of George Schuman:

Section 3223 A (1)(b): NMED opposes DIGCE's proposed language addition regarding extension of time for monitoring well installation, as such time extensions are not necessary. Based on comments received from DIGCE during the proposed dairy rule development process, NMED increased the timeframe for monitoring well installation at an existing dairy facility to 120 days; NMED's original timeframe proposal was 90 days. A period of 120 days allows ample time for a dairy facility to seek bids from qualified drilling contractors (Office of the State Engineer records show that there are approximately 190 licensed well drillers in New Mexico, see NMED Rebuttal Exhibit 3223-1) and have the wells installed. Further, the identification of an explicit timeframe requirement in the dairy rule informs the permittee of the requirement even before a final permit is issued, so meeting this requirement should not be problematic.

A process that allows permittees to seek time extensions for monitoring well installation creates a scenario where installation deadlines will be determined through negotiation, thereby leading to different requirements among dairy facilities. NMED believes it is fair and appropriate to apply clear and consistent requirements to all dairy facilities and does not concur with a process that would allow some permittees to negotiate regulatory timelines.

In the event monitoring wells at an existing facility are not installed within the timeframe required by the dairy rule, NMED expects to continue to seek voluntary compliance with the dairy rules and the discharge permit requirements. This approach is consistent with the

enforcement discretion granted to constituent agencies by the Water Quality Act (74-6-9.D NMSA 1978), which states that "constituent agencies may make every reasonable effort to obtain voluntary cooperation in the prevention or abatement of water pollution." NMED has typically utilized voluntary compliance measures as directed under the Water Quality Act prior to taking enforcement actions. This includes setting schedules for a permittee to come back into compliance with WQCC rules.

NMED is proposing revised language to more clearly state, and limit, the circumstances under which monitoring wells must be installed for previously utilized wastewater impoundments. Specifically, NMED is proposing that monitoring wells be installed near impoundments that are no longer authorized to receive wastewater but were authorized to receive wastewater under the most recently issued discharge permit prior to the effective date of the dairy rule. DIGCE made comments about this issue regarding Section 3223.A(2) and (3), thus NMED is proposing revised language to address the same issue associated with Section 3223.A(1). Please see NMED Rebuttal Attachment 2, 3223 A(1) for the proposed language.

For the above reasons, DIGCE's proposed additional language should not be adopted.

(2) **Ground Water Monitoring — Combination Wastewater/Stormwater**

Impoundments: A minimum of one monitoring well shall be located hydrologically downgradient and within 75 feet (measured as horizontal map distance) of the top inside edge of each combination wastewater/stormwater impoundment, including previously utilized impoundments to which wastewater discharge or stormwater collection has ceased and for which closure has not been completed in accordance with previous regulations or these regulations.

(b) For an existing dairy facility, monitoring wells shall be installed within 120 days of the effective date of the discharge permit, provided that NMED may grant an extension of time for good cause shown, such as the lack of availability of well drillers.

REBUTTAL - Written Testimony of George Schuman:

Section 3223 A(2) and A(2)(b): NMED does not concur with DIGCE's language addition of "and for which closure has not been completed in accordance with previous regulations or these regulations", but agrees that it is necessary to more clearly state NMED's intent of the circumstances under which monitoring wells must be installed for previously utilized combination wastewater/stormwater impoundments. Specifically, NMED is proposing that monitoring wells be installed near impoundments that are no longer authorized to receive wastewater or stormwater but were authorized to receive wastewater or stormwater under the most recently issued discharge permit prior to the effective date of the dairy rule. Please see NMED Rebuttal Attachment 2, 3223 A(2) for NMED's amended language for this paragraph.

NMED opposes DIGCE's proposed language addition regarding extension of time for monitoring well installation, as such time extensions are not necessary. Please see my rebuttal testimony regarding Paragraph (1) of Subsection A of 20.6.2.3223 above for NMED's reasons

for opposing DIGCE's proposed language. For these reasons, DIGCE's proposed additional language should not be adopted.

(3) **Ground Water Monitoring — Stormwater Impoundments:** A minimum of one monitoring well shall be located hydrologically downgradient and within 75 feet (measured as horizontal map distance) of the top inside edge of each stormwater impoundment, including previously utilized impoundments to which stormwater collection has ceased and for which closure has not been completed in accordance with a discharge permit or these regulations. A dairy that has multiple stormwater impoundments constructed and operated in the same manner may use a single monitoring well located downgradient of one impoundment as representative of discharges from the other impoundments..

(b) For an existing dairy facility, monitoring wells shall be installed within 120 days of the effective date of the discharge permit, provided that NMED may grant an extension of time for good cause shown, such as the lack of availability of well drillers.

REBUTTAL - Written Testimony of George Schuman:

Section 3223 A (3) and A(3)(b): NMED does not concur with DIGCE's addition of the language "and for which closure has not been completed in accordance with previous regulations or these regulations", but agrees that it is necessary to more clearly state NMED's intent of the circumstances under which monitoring wells must be installed for previously utilized stormwater impoundments. Specifically, NMED is proposing that monitoring wells be installed near impoundments that are no longer authorized to receive stormwater but were authorized to receive stormwater under the most recently issued discharge permit prior to the effective date of the dairy rule. Please see NMED Rebuttal Attachment 2, 3223 A(3) for NMEDs' amended proposed language for this paragraph.

NMED also opposes DIGCE's addition to this paragraph of language regarding the use of one monitoring well "as representative of discharges from the other impoundments." DIGCE provides no scientific or technical basis for this language. As summarized in my written direct testimony related to this paragraph on pages 74 – 75 on NMED NOI Attachment 8, stormwater impoundments contain water contaminants that can potentially migrate to ground water and impact ground water quality due to impoundment leakage. NMED Exhibit 3217-16 shows examples of the quality of dairy stormwater. The potential impacts to ground water from stormwater impoundments are assessed using a monitoring well. In the written direct testimony of William C. Olson for Subsection D of Section 20.6.2.3224 NMAC on pages 99 – 100 of NMED NOI Attachment 8, there is a discussion regarding the necessity for stormwater sampling and its use for comparing the quality of stormwater in an impoundment to that observed in the monitoring well associated with the impoundment so as to evaluate whether the impoundment is responsible for causing impacts on ground water quality. As discussed in the rebuttal testimony of William C. Olson from Section 20.6.2.3224.D NMAC, stormwater collected in an impoundment varies in quality (specifically total nitrogen concentration) depending on the zones of the production area from which it drains. Therefore, ground water quality analyzed from one monitoring well cannot adequately serve to "represent" the ground water quality associated

with multiple stormwater impoundments. For the above reasons, DIGCE's proposed additional language should not be adopted.

In addition, NMED opposes DIGCE's proposed language addition regarding extension of time for monitoring well installation as such time extensions are not necessary. Please see my rebuttal testimony regarding Paragraph (1) of Subsection A of 20.6.2.3223 for NMED's reasons for opposing DIGCE's proposed language. For these reasons, DIGCE's proposed additional language should not be adopted.

(4) **Ground Water Monitoring — Land Application Area:** Monitoring wells intended to monitor ground water hydrologically downgradient of fields within the land application area shall be installed as follows.

(a) **Flood Irrigation:** Ground water monitoring shall be performed hydrologically downgradient of each flood irrigated field or grouping of contiguous flood irrigated fields. For every 40 acres or less of a single flood irrigated field or a single grouping of contiguous flood irrigated fields, a minimum of one monitoring well shall be located hydrologically downgradient and within 50 feet (measured as horizontal map distance) of the downgradient boundary of the single field or single grouping of contiguous fields, including previously utilized fields to which application of wastewater or stormwater has ceased and previous monitoring has shown an exceedence of any ground water standard of Section 20.6.2.3103 NMAC. or the water contaminant concentration in a ground water sample collected from the upgradient monitoring well, if the water contaminant concentration associated with the upgradient monitoring well exceeds the ground water standard(s) of Section 20.6.2.3103 NMAC.. Flood irrigated fields separated by ditch irrigation systems, acequias and drains shall be considered contiguous for the purpose of this subsection.

(ii) For an existing dairy facility, monitoring wells shall be installed within 120 days of the effective date of the discharge permit, provided that NMED may grant an extension of time for good cause shown, such as the lack of availability of well drillers.

REBUTTAL - Written Testimony of George Schuman:
Section 3223 A(4)(a) and A(4)(a)(ii): NMED does not concur with DIGCE's proposed language addition regarding ground water monitoring near previously utilized fields. DIGCE's comment that "there should be evidence of potential exceedances of standards in order to justify the installation of any additional monitoring wells" is debatable, as the lack of ground water monitoring or inadequate monitoring would be the cause of the lack of such evidence. However, NMED recognizes that it is unreasonable to require ground water monitoring near all fields that received dairy wastewater in the past, as this could involve fields that last received wastewater many years ago. NMED proposes to add language to NMED's January 29, 2010 proposed dairy

rule specifying that ground water monitoring will be required near fields utilized for wastewater or stormwater application under the most recently issued discharge permit. NMED's language reflecting this proposed modification to NMED's January 29, 2010 proposed dairy rule can be found in NMED Rebuttal NOI Attachment 2, 3223 A(4)(a).

NMED also opposes DIGCE's proposed language addition regarding extension of time for monitoring well installation, as such time extensions are not necessary. Please see my rebuttal testimony regarding Paragraph (1) of Subsection A of 20.6.2.3223 above for NMED's reasons for opposing DIGCE's proposed language. For these reasons, DIGCE's proposed additional language should not be adopted.

(b) **Sprinkler or Drip Irrigation:** Ground water monitoring shall be performed hydrologically downgradient of each sprinkler or drip irrigated field, or grouping of contiguous sprinkler or drip irrigated fields. For every ~~125~~ 160 acres or less of a single sprinkler or drip irrigated field, or a single grouping of ~~125~~ 320 contiguous acres of sprinkler or drip irrigated fields, a minimum of one monitoring well shall be located hydrologically downgradient and within 50 feet (measured as horizontal map distance) of the downgradient boundary of the single field or single grouping of contiguous fields, including previously utilized fields to which application of wastewater or stormwater has ceased~~.~~ and previous monitoring has shown an exceedence of any ground water standard of Section 20.6.2.3103 NMAC. or the water contaminant concentration in a ground water sample collected from the upgradient monitoring well, if the water contaminant concentration associated with the upgradient monitoring well exceeds the ground water standard(s) of Section 20.6.2.3103 NMAC. Sprinkler or drip irrigated fields separated by ditch irrigation systems, acequias and drains shall be considered contiguous for the purpose of this subsection.

(ii) For an existing dairy facility, monitoring wells shall be installed within 120 days of the effective date of the discharge permit, provided that NMED may grant an extension of time for good cause shown, such as the lack of availability of well drillers.

REBUTTAL - Written Testimony of George Schuman:
Section 3223 A(4)(b) and A(4)(b)(ii): NMED concurs with DIGCE's proposed language deletion and addition regarding the acreage of a single sprinkler or drip irrigated field requiring a ground water monitoring well. The change from 125 acres to 160 acres is appropriate, as 160 acres represents the acreage of a quarter section of land and the entire quarter section could be effectively irrigated by sprinkler or drip methods. However, NMED opposes DIGCE's proposed language changing the acreage of a single contiguous grouping of sprinkler or drip irrigated fields requiring a ground water monitoring well from 125 acres to 320 acres. The purpose of the acreage limitation is to identify the maximum area of land that should be monitored by a single monitoring well. It is therefore irrelevant if the acreage is attributable to one field or multiple contiguous fields. Based upon the above discussion, NMED proposes to change the acreage limitation for a single contiguous grouping of sprinkler or drip irrigated fields requiring a

monitoring well from 125 acres to 160 acres. NMED's proposed language reflecting its proposed modification to the January 29, 2010 proposed dairy rule can be found in NMED Rebuttal NOI Attachment 23223 A(4)(b).

NMED does not concur with DIGCE's proposed language addition regarding ground water monitoring near previously utilized fields. Please see my rebuttal testimony regarding Subparagraph (a) of Paragraph (4) of Subsection A of 20.6.2.3223 above for NMED's reasons for this position. However, NMED recognizes that it is unreasonable to require ground water monitoring near all fields that received dairy wastewater in the past, as this could involve fields that last received wastewater many years ago. NMED proposes to amend the language of its January 29, 2010 proposed dairy rule to specify that ground water monitoring will be required near fields utilized for wastewater application under the most recently issued discharge permit. NMED's proposed language reflecting its proposed modification to the January 29, 2010 proposed dairy rule can be found in NMED Rebuttal NOI Attachment 2 A(4)(b).

NMED opposes DIGCE's proposed language addition regarding extension of time for monitoring well installation, as such time extensions are not necessary. Please see my rebuttal testimony regarding Paragraph (1) of Subsection A of 20.6.2.3223 above for NMED's reasons for opposing DIGCE's proposed language. For these reasons, DIGCE's proposed additional language should not be adopted.

(5) **Ground Water Monitoring — Upgradient:** A minimum of one monitoring well shall be located hydrologically upgradient of all ground water contamination sources at a dairy facility in order to establish ground water quality conditions at a location not likely to be affected by contamination sources at the dairy facility.

(b) For an existing dairy facility, monitoring wells shall be installed within 120 days of the effective date of the discharge permit, provided that NMED may grant an extension of time for good cause shown, such as the lack of availability of well drillers.

REBUTTAL - Written Testimony of George Schuman:
Section 3223 A (5)(b): NMED opposes DIGCE's proposed language addition regarding extension of time for monitoring well installation, as such time extensions are not necessary. Please see my rebuttal testimony regarding Paragraph (1) of Subsection A of 20.6.2.3223 for NMED's reasons for opposing DIGCE's proposed language. For these reasons, DIGCE's proposed additional language should not be adopted.

(6) **Use of Existing Monitoring Wells:** A monitoring well in existence before the effective date of the dairy rules and was constructed in accordance with Department policies or guidelines in effect at the time of installation shall be approved for ground water monitoring at a dairy facility provided all of the following requirements are met.

REBUTTAL - Written Testimony of George Schuman:

Section 3223 A(6): NMED opposes DIGCE's proposed additional language regarding wells constructed in accordance with policies or guidelines in effect at the time of installation because such language is unnecessary. A monitoring well must have certain attributes to be an effective ground water monitoring device. To effectively monitor ground water at a dairy facility, a monitoring well must be in close proximity to the source it is intended to monitor (or be located upgradient of dairy facility sources if intended to monitor ground water at an area unaffected by these sources) and must not have an excessive length of well screen below the water table. The requirements contained in Subparagraphs (a) through (c) of this paragraph define the attributes of an appropriate monitoring well for a dairy facility and allow the continued use of monitoring wells with greater screen lengths previously approved by NMED. For the above reasons, DIGCE's proposed language should not be adopted.

(7) **Exceptions to Monitoring Well Requirements:** When appropriate, based on the documented ground water flow direction, one monitoring well may be authorized by a discharge permit to monitor ground water hydrologically downgradient of more than one contamination source under any of the following circumstances.

(c) Adjacent or adjacent groupings of contiguous sprinkler or drip irrigated fields are oriented along a line that is parallel or approximately parallel to the direction of ground water flow beneath the fields ~~and the average depth to most shallow ground water measured in on-site monitoring wells pursuant to Subsection F of this section or measured in a site specific test boring pursuant to Subsection Z of 20.6.2.3220 NMAC is 300 feet or greater~~. A monitoring well(s) installed hydrologically downgradient of a sprinkler or drip irrigated field or a grouping of sprinkler or drip irrigated fields pursuant to Paragraph (4) of this subsection may be authorized by a discharge permit to monitor ground water hydrologically downgradient of not more than two adjacent sprinkler or drip irrigated fields or adjacent groupings of sprinkler or drip irrigated fields.

REBUTTAL - Written Testimony of William C. Olson:

Section 3223 A(7)(c): NMED opposes DIGCE's proposed language deletion regarding a ground water depth threshold beyond which fewer monitoring wells would be required for ground water monitoring near adjacent sprinkler or drip irrigated fields. DIGCE provides no direct testimony as to the scientific and technical basis for their proposed language. DIGCE's proposal would allow the use of one monitoring well to monitor ground water downgradient of two adjacent sprinkler or drip irrigated fields regardless of depth to ground water.

The proposed change is inappropriate because the thickness of the unsaturated zone above the water table plays a significant role in the protection of ground water quality from the migration of contaminants released at the ground surface through land application. The transport of solutes in water that is moving downward through the unsaturated zone may be retarded by various sorption processes (NMED Rebuttal Exhibits 3223-2 and 3223-3). A thicker unsaturated zone results in a longer flow path for the migrating water and solutes, thereby resulting in more extensive contact of the water and its solutes with geologic materials, and a greater opportunity for retardation of solute movement.

Therefore, NMED believes the use of 300 feet as a threshold beyond which one monitoring well may be used to monitor ground water near two adjacent sprinkler or drip irrigated fields (provided they are aligned with the direction of ground water flow) is appropriate.

For the above reasons, DIGCE's proposed language should not be adopted.

(9) Alternative Monitoring Systems: An applicant may propose and the department may approve an alternative monitoring system to assess the potential for impacts to ground water from a particular source in lieu of installing and/or monitoring one or more ground water monitoring wells otherwise required by this section. An alternative monitoring system may not be used in place of the minimum monitoring wells needed to assess ground water flow direction. Examples of an alternative monitoring system may include subsurface leak detection systems or vadose zone monitoring systems designed to assess potential leakage or impacts to ground water closer to the potential source than a ground water monitoring well or soil sampling in land application areas.

(1) The applicant proposing an alternative monitoring system shall submit a proposal describing the proposed system, the method and frequency of monitoring, the type of data to be collected and reported, the method by which data will be analyzed and assessed, and the type of report to be submitted to the department. The proposal shall contain sufficient information regarding the demonstrated reliability of the proposed monitoring system to assess potential leakage and/or ground water impacts from a dairy facility impoundment or land application area or a reasonably similar source.

(2) The department shall approve the alternative monitoring system in lieu of otherwise required ground water monitoring wells if the proposal demonstrates, based on sound scientific information, that the alternative monitoring system can reasonably be expected to detect leakage or impacts to ground water before they would be detected by a ground water monitoring well.

(3) If the results from an alternative monitoring system indicate that the monitored impoundment or land application area likely has adversely impacted ground water quality, the department may require the installation of one or more ground water monitoring wells, which shall be installed and monitored in accordance with the requirements of subsections A through M of this section, as applicable.

REBUTTAL - Written Testimony of William C. Olson:

DIGCE New Section 3223 A(9): As I discussed in my testimony for 20.6.2.3223 above, DIGCE seeks to avoid the installation of ground water monitoring wells by adding a new Paragraph (9) that would allow unspecified alternate monitoring systems in lieu of ground water monitoring wells. NMED strongly disagrees with DIGCE's proposal. The 2009 amended WQA

*at Subsection K of Section 74-6-4 requires that the WQCC "shall **specify in regulations** the measures to be taken to prevent water pollution and **to monitor water quality.**" DIGCE's language provides no specificity in the rule regarding the methods to be used to monitor water quality as required by the WQA. DIGCE only adds language allowing unspecified alternate monitoring systems as a substitute for ground water monitoring, and suggests as examples subsurface leak detection systems, vadose zone monitoring, and soil sampling in land application areas. DIGCE provides no specificity in their proposed rule language of the type of systems that are required to be installed, nor how these systems will be designed, constructed, and maintained In short, DIGCE's proposal does not provide any clarity or specificity to the applicant or permittee on how to comply with the rule or the WQA regarding monitoring of water quality.*

In regards to vadose zone or soil sampling, the vadose zone is the unsaturated soil interval that overlies a saturated water bearing zone or aquifer. Vadoze zone monitoring detects leakage from impoundments into the soil or, as applied to land application areas, the seepage of water contaminants into subsurface soils. Vadose zone monitoring or soil sampling does not monitor water quality as required by the WQA. Ground water monitoring wells are the only technology available to monitor ground water quality and to directly assess whether the discharge, management, or land application of water contaminants at a dairy facility is causing an exceedance of the ground water quality standards as established by the WQCC.

DIGCE comments that "there are many examples of alternate monitoring approaches, as shown in DIGCE Exhibits 40-43, 45, 46, 49, 54, and 56." DIGCE does not provide any direct written testimony from any witness of the technical or scientific relevance of these exhibits. In fact, DIGCE exhibits 45, 46, and 49 are journal articles on seepage from impoundments and are not relevant to methods of ground water monitoring. In lieu of any direct testimony from DIGCE, George Schuman below provides NMED's technical and science based evaluation of DIGCE's exhibits.

In conclusion DIGCE's comments are unsupported by the direct testimony of any witness and there is no testimony from any DIGCE witness as to the scientific or technical basis of alternate systems for monitoring water quality as required by the 2009 amendments to the WQA. For the reasons stated above, DIGCE's proposed language should not be adopted.

REBUTTAL - Written Testimony of George Schuman:
Paragraph (9) NMED opposes DIGCE's proposed language additions that would allow the use of alternative monitoring systems in place of one or more monitoring wells required by Section 20.6.2.3223 NMAC of the proposed dairy rule. The technical reasons for NMED's opposition to DIGCE's proposed language are explained below.

Pursuant to Section 20.6.2.3101 NMAC, the purpose of Sections 20.6.2.3000 through 20.6.2.3114 NMAC (titled "Permitting and Ground Water Standards") is to protect ground water for present and potential future use. Additionally, Section 20.6.2.3101 NMAC states that ground water standards represent the maximum concentrations of water contaminants which still allow for present and future use of ground water. The Water Quality Act (74-6-5.J(2) NMSA 1978) allows the WQCC to impose reasonable conditions through regulation for the sampling of receiving waters for any known or suspected water contaminants. Monitoring wells allow for

the sampling of "receiving waters" (i.e., collection of ground water samples) to determine if the permitted discharge is causing ground water standards to be exceeded. It is therefore appropriate and necessary to require the use of monitoring wells at dairy facilities. Any proposed alternative to the use of monitoring wells must allow for the direct assessment of compliance with the ground water standards.

DIGCE's proposed language for alternative monitoring systems suggests that acceptable examples of alternatives "may include sub-surface leak detection systems or vadose zone monitoring systems designed to assess potential leakage." DIGCE's comments on its proposed language note that examples are provided in several DIGCE exhibits. It should be noted that several of the cited exhibits (DIGCE-45, DIGCE-46, and DIGCE-49) do not address alternative monitoring systems; rather, they address impoundment seepage studies. DIGCE Exhibits 40, 41, 42, 54, and 56 provide information on the use of electromagnetic surveys to detect contaminant plumes in the sub-surface. Electromagnetic surveys measure the average electrical conductivity between two coils placed on the ground surface that are separated by a specific distance (see DIGCE-40, p. 196). DIGCE's exhibits demonstrate that electromagnetic surveys have several limitations:

1. *Electromagnetic surveys have depth restrictions. DIGCE Exhibit 40 indicates that surveys for depths up to 60 meters (approximately 200 feet) have been reported (see DIGCE-40, p. 196). Electromagnetic surveys would be unable to examine ground water for the existence of a contaminant plume where the ground water depth exceeds this survey restriction.*
2. *Electromagnetic survey readings are affected by factors other than the ion content of pore water or ground water. DIGCE Exhibit 40 indicates that conductivity of earthen materials is also dependent upon the degree of water saturation and the amount and type of clays present (see DIGCE-40, p. 196). At one survey location, the variable nature of the soils (textures ranged from loamy sand to clay) produced survey readings that were difficult to interpret (see DIGCE-40, p. 202). DIGCE Exhibit 41 indicates that electromagnetic surveys are subject to passive interference (e.g., buried metallic objects and surficial metallic objects that are grounded) and active interference (e.g., power lines, radio transmitters, electric fences). Interference can cause the conductivity meter to produce erroneous readings (see DIGCE-41, p. 215).*
3. *Researchers have found correlations between electrical conductivity measurements and constituent concentrations in ground water, however, these correlations are inconsistent. DIGCE Exhibit 54 cites research of Brune et al. (1993) that found correlations between conductivity measurements and the sum of the concentrations of several anions in ground water. Coefficient of determination (r^2) values ranged from 0.92 (92% of the variation in conductivity is explained by the linear relationship between conductivity and concentration, which indicates a reasonably strong correlation) to 0.36 (36% of the variation in conductivity is explained by the linear relationship between conductivity and concentration, which indicates a rather weak correlation) (see DIGCE-54, pp. 1083-1084). DIGCE Exhibit 54 also presents the original research of Drommerhausen et al. A statistically significant correlation was found between conductivity measurements from a shallow electromagnetic survey and nitrate-*

nitrogen concentrations in ground water; however, only about half of the variation in conductivity is explained by the linear relationship between conductivity and concentration ($r^2 = 0.56$). A statistically significant relationship was not found between conductivity measurements from a deep electromagnetic survey and nitrate-nitrogen concentrations in ground water (see DIGCE-54, p. 1089).

DIGCE's proposed language for alternative monitoring systems also suggests that an example of acceptable alternatives "may include...soil sampling in land application areas." To determine if soil sampling is a suitable alternative monitoring system for land application areas, it is necessary to consider the movement of water through the unsaturated zone. NMED conducted a review of the published literature on the movement of water through the unsaturated zone that reveals the following limitations on the use of soil sampling:

1. *Water does not move uniformly through the unsaturated zone. Rather, water moves primarily along "preferential flowpaths" through the unsaturated zone (see NMED Rebuttal Exhibit 3223-2, pp. 196-198; NMED Rebuttal Exhibit 3223-3, pp. 413-418; NMED Rebuttal Exhibit 3223-4, pp. 1290, 1292, 1293, 1295; NMED Rebuttal Exhibit 3223-5, pp. 127-128).*
2. *Due to preferential flow, water and contaminants can move through the unsaturated zone at rates that exceed those that would be expected if movement occurred uniformly through the unsaturated zone (see NMED Rebuttal Exhibit 3223-2, p. 196; NMED Rebuttal Exhibit 3223-5, pp. 129, 131).*
3. *Breakdown of nitrate by denitrification may be limited due to rapid downward movement through preferential flowpaths (see NMED Rebuttal Exhibit 3223-5, pp. 130-131).*
4. *Due to preferential flow, collection of random soil samples below the root zone and the use of constituent concentrations (e.g., nitrate-nitrogen and chloride) from these soil samples to assess movement of constituents beyond the root zone is inappropriate (see NMED Rebuttal Exhibit 3223-4, pp. 1290-1291; NMED Rebuttal Exhibit 3223-5, p. 131; NMED Rebuttal Exhibit 3223-6, p. 1303).*

Electromagnetic surveys and soil sampling are inferior to ground water monitoring because both fail to produce results that can be directly compared to ground water standards to assess whether the permitted discharge is meeting regulatory requirements. Based on the exhibits provided by DIGCE, electromagnetic surveys appear to have applicability for the detection of contaminant plumes in the unsaturated zone and ground water. The dairy industry may wish to make use of this technology in addition to the use of ground water monitoring wells, but not in place of ground water monitoring wells given the limitations summarized in this testimony. Based on NMED's rebuttal exhibits, the use of soil sampling below the root zone as a means of assessing the potential for contaminant migration to ground water has significant flaws and could produce misleading results. NMED concludes that soil sampling below the root zone should not be used to assess the potential for contaminant migration to ground water, either in addition to the use of ground water monitoring wells or in place of the use of ground water monitoring wells.

In conclusion, NMED opposes DIGCE's proposal for the use of alternative monitoring systems in lieu of ground water monitoring wells for the reasons provided above.

F. **Ground Water Sample Collection Procedure:** A permittee shall perform all ground water sample collection, preservation, transport and analysis according to the following procedure.

~~(3) Following purging and immediately before sample collection the following field parameters shall be measured and recorded: pH, specific conductance, and temperature.~~

REBUTTAL - Written Testimony of William C. Olson:
Section 3223 F (3): NMED opposes DIGCE's proposed language deletion regarding the measurement of pH, specific conductance, and temperature immediately prior to sample collection. DIGCE's contention that such field measurements are not typically accepted for reporting purposes is irrelevant, as the justification for this requirement pertains to general sample quality and integrity. In addition DIGCE provides no scientific or technical basis for the deletion of this water quality sampling procedure. Please see pages 90-91 of NMED NOI Attachment 8 (written testimony of William C. Olson regarding Paragraph (3) of this subsection) for the scientific reasons justifying the measurement of these field parameters. For the above reasons, DIGCE's proposed language should not be adopted.

G. **Ground Water Sampling and Reporting - Routine:** A permittee shall collect ground water samples quarterly from all monitoring wells required by Subsection A of this section and Subsection C of 20.6.2.3227 NMAC. Samples shall be analyzed for nitrate as nitrogen, total Kjeldahl nitrogen, chloride, ~~sulfate~~ and total dissolved solids pursuant to Subsection B of 20.6.2.3224 NMAC. Sulfate may be added as a constituent of concern if the dairy discharges wastewater treatment reject water. A permittee shall submit to the department in the quarterly monitoring reports the depth-to-most-shallow ground water, the field parameter measurements, the parameter stabilization log (if applicable), the analytical results (including the laboratory quality assurance and quality control summary report) and a map showing the location and number of each well in relation to the contamination source it is intended to monitor.

REBUTTAL - Written Testimony of William C. Olson:
Section 3223 G: NMED opposes DIGCE's proposed language eliminating sulfate as an analytical constituent for ground water samples. NMED also opposes DIGCE's proposed additional language that would allow sulfate to only be "added as a constituent of concern if the dairy discharges wastewater treatment reject water", as this is not a factor in determining whether ground water should be tested for sulfate. DIGCE provides no scientific or technical basis for the deletion of this water quality monitoring parameter. Please see NMED NOI Attachment 8 (written testimony of William C. Olson and Bart Faris regarding this subsection) for the scientific reasons justifying the inclusion of sulfate as a constituent for ground water sample analysis. For the above reasons, DIGCE's proposed language should not be adopted.

H. **Ground Water Sampling — New Monitoring Wells:** A permittee shall collect ground water samples from all newly installed monitoring wells. Samples shall be analyzed for nitrate as nitrogen, total Kjeldahl nitrogen, chloride, ~~sulfate and~~ total dissolved solids pursuant to Subsection B of 20.6.2.3224 NMAC.

REBUTTAL - Written Testimony of William C. Olson:

Section 3223 H: NMED does not concur with DIGCE's proposed language deletion to eliminate sulfate as an analytical constituent for ground water samples. DIGCE provides no scientific or technical basis for the deletion of this water quality monitoring parameter. Please see NMED NOI Attachment 8 (written testimony of William C. Olson and Bart Faris regarding Section 3223.G) for the scientific reasons justifying the inclusion of sulfate as a constituent for ground water sample analysis. For the above reasons, DIGCE's proposed language should not be adopted.

L. **Ground Water Elevation Contour Maps:** A permittee shall develop ground water elevation contour maps on a quarterly basis using data associated with all monitoring wells used for ground water monitoring at the dairy facility. Top of casing elevation data, obtained from monitoring well surveys completed pursuant to this section and quarterly depth-to-most-shallow ground water measurements in monitoring wells, shall be used to calculate ground water elevations at monitoring well locations. Ground water elevations between monitoring well locations shall be estimated using common interpolation methods. Ground water elevations shall be expressed in feet. A contour interval appropriate to the data shall be used, but in no case shall the interval be greater than two feet. Ground water elevation contour maps shall depict the ground water flow direction, using arrows, based on the orientation of the ground water elevation contours, and the location and identification of each monitoring well, impoundment, and field within the land application area. A permittee shall submit ground water elevation contour maps to the department in the quarterly monitoring reports. Upon a showing that ground water elevation contours have been stable over a period of two years of quarterly monitoring, a permittee may, following notice to the department, reduce the preparation and submission of ground water contours to an annual basis. The department may require, by written notice, resumption of quarterly contour mapping if significant changes in contours are shown.

REBUTTAL - Written Testimony of George Schuman:

Section 3223 L: NMED opposes DIGCE's proposed language addition to reduce the frequency of ground water elevation contour map preparation to an annual basis if "ground water elevation contours have been stable over a period of two years of quarterly monitoring." Stability of ground water contours and flow direction over any specified period of time does not ensure that such conditions will continue into the future. Changes in ground water withdrawal patterns (for example, installation of new production wells in the vicinity of a dairy facility that affect the volumes and locations of ground water withdrawn from an aquifer) can cause changes

in ground water contours and flow direction. In addition, such changes may not persist throughout a year but may be seasonal in nature (for example, ground water withdrawals for crop irrigation). It is more likely that changes in ground water contours and flow direction would go undetected if these are prepared and evaluated annually rather than quarterly. Therefore, DIGCE's proposed additional language should not be adopted.

M. **Monitoring Well Inspection:** The department may perform downhole inspections of all monitoring wells. At least 60 days before the inspection, the department shall provide written notice to the permittee by certified mail stating the inspection date and identifying the monitoring wells to be inspected. At least 48 hours before the department's inspection, the permittee shall remove all existing dedicated pumps to allow adequate settling time of sediment agitated from pump removal. If a permittee decides to install a dedicated pump in a monitoring well, the permittee shall notify the department ~~so that the~~ and the department ~~may have the opportunity to~~ shall perform a downhole well inspection before pump installation.

REBUTTAL - Written Testimony of George Schuman:

Section 3223 M: NMED opposes DIGCE's proposed language changes that would require NMED to perform downhole monitoring well inspections prior to the installation of dedicated ground water sampling pumps. The proposed dairy rule does not require dedicated pumps to be installed in monitoring wells. However, the permittee may choose to install dedicated pumps to simplify ground water sampling efforts. When a permittee chooses to install dedicated pumps, NMED makes its best effort to accommodate the permittee by performing downhole monitoring well inspections prior to pump installation. For example, at the request of the permittee, NMED has performed downhole monitoring well inspections prior to the installation of dedicated pumps for at least 15 dairy facilities over the past couple of years.

While NMED would prefer to perform downhole monitoring well inspections of all monitoring wells, NMED cannot ensure its capability to perform these inspections due to uncertain staff employment levels and reduced funding for equipment repair and replacement. Therefore, NMED proposes that the language contained in NMED's January 29, 2010 proposed dairy rule remain as written, which allows NMED the opportunity to perform, but does not require NMED to perform downhole monitoring well inspections prior to pump installation.

The proposed rule language stating that NMED shall provide written notice to the permittee by certified mail at least 60 days prior to the downhole monitoring well inspection requires further clarification. This language does not identify the specific "trigger" that would start the 60-day timeframe. NMED proposes that the initiation of the 60-day timeframe be tied to the date of postal notice (i.e., the date when the United States Postal Service (USPS) first makes notice of arrival of certified mail to the permittee). NMED proposes to add a definition of "date of postal notice" to Section 20.6.2.3202 NMAC of NMED's January 29, 2010 proposed dairy rule and add language to Subsection M of 20.6.2.3223NMAC tying the start of a timeframe to the date of postal notice. NMED's revised language reflecting its proposed modifications to the January 29, 2010 proposed dairy rule regarding postal notice can be found in NMED Rebuttal Attachment 2, 3202 B(9) and 3223 M.

20.6.2.3224 MONITORING REQUIREMENTS FOR ALL DAIRY FACILITIES:

C. **Wastewater Volume Measurement and Reporting:** A permittee shall measure the daily volume of all wastewater discharged to the wastewater impoundment(s) using flow meters or another approved measuring device or method, such as a staff gauge. The permittee shall ~~include daily meter readings~~ record weekly measurements including the date, time and units of each measurement, and shall report the daily volumes of wastewater discharged to the wastewater impoundments based on an average over the preceding 180 day period, reported in gallons, in the quarterly monitoring reports submitted to the department.

REBUTTAL - Written Testimony of William C. Olson:

Section 3224 C: NMED opposes DIGCE's changes to this subsection. DIGCE appears to be proposing that the daily volume of wastewater discharged is measured and recorded weekly and then averaged over a 180 days (i.e., six months), which is intended to represent the discharge volume from the facility over the previous 180-day period. This approach to calculating an "average" discharge volume has the potential to grossly misrepresent the facility's actual daily discharge volume.

NMED also opposes DIGCE's proposal to eliminate the daily measurement of flow using flow meters. Daily flow meter readings are necessary as discussed in my written direct testimony for this subsection on pages 98-99 of NMED NOI Attachment 8. For the above reasons, DIGCE's proposal should not be adopted.

In addition, NMED opposes DIGCE's proposed additions to this subsection related to alternate measuring devices. For the reasons previously stated in NMED's Rebuttal Testimony for 20.6.2.3206.K above DIGCE's proposed language should not be adopted.

In response to DIGCE's comments associated with this subsection stating, "a permittee could be considered in violation of the rules for failure to take daily measurements when a flow meter is out of service for repair", this situation is addressed in NMED's proposed Subsection P of Section 20.6.2.3220 NMAC of the rule, which requires the permittee to inspect the meter daily and to repair or replace the meter within 30 days of discovery of a malfunction. For NMED's rationale for flow meter inspection, refer to the direct testimony of Robert George for 20.6.2.3220.P on pages 53-54 of NMED NOI Attachment 8.

REBUTTAL - Written Testimony of Robert George:

Section 3224 C: In response to DIGCE's comments associated with this subsection stating, "additional staff training and recordkeeping at the dairyman's expense and would not provide much, if any, additional useful data", NMED would like to note that making a daily recording of the totalized volume(s) discharged is only problematic when a manual method of measuring flow is used (such as the method proposed by DIGCE). Modern flow totalizers can be equipped to register and record daily totalized flow (and many other parameters), so that the information can be retrieved as needed for completion of monitoring reports. The level of training necessary for retrieving recorded flow measurement data from a totalizer does not differ