

# San Jacinto Dairy Salt Offset Groundwater Monitoring Additional Investigations Work Plan for Dairies with Inconclusive Impacts

April 1, 2016

## Introduction

In November 2014, the Western Riverside County Agriculture Coalition (WRCAC) submitted a report, San Jacinto Salt Offset and Dairy Impact Report (Salt Report), that fulfilled the provisions included in the National Pollutant Discharge Elimination System (NPDES) permit and Waste Discharge Requirements (WDRs) for Dairies and Related Facilities in the Santa Ana Region (Order R8-2013-0001). The *Salt Report* findings of no impact, potential impact, and inconclusive impact to groundwater total dissolved solids (TDS) and nitrate quality for individual dairies or groups of neighboring dairies were based on comparison of available groundwater data from wells that are hydrologically upgradient and downgradient of each facility or group of facilities and wells that are on-site at each facility or group of facilities. The Santa Ana Regional Water Quality Control Board's (Regional Board) response letter, dated May 21, 2015, outlined the need for further investigation based on the findings of the Salt Report. The response letter categorized the specific needs for further investigation based on three possible outcomes of the Salt Report: no impact, potential impact, and inconclusive impact.

Where the dairy impact is listed as "inconclusive impact" for TDS and/or nitrate, the Regional Board requires CAFOs to conduct further investigations and collect additional data that can be used to make a determination of impact or no impact on groundwater quality. The CAFO must submit a work plan to the Regional Board for these groundwater investigations. It is recognized that dairies in the San Jacinto River watershed have taken positive steps to manage their potential impacts on surface and ground water quality. However, site differences such as soil permeability, aquifer depth and transmissivity, and local groundwater flow can lead to different impacts among facilities following similar management practices. The goal of the additional investigations required by the Regional Board is to generate data and information that will support a determination of "no impact" or "potential impact" for all dairies.

In January 2016, after consultation with the Regional Board, WRCAC initiated activities to conduct the first re-evaluation of groundwater monitoring data to incorporate updated data collected since the 2014 report was prepared and to reflect revisions to the selection of wells for individual dairies and groups of dairies based on new information on groundwater flow direction. Table 1 shows the dairies for which the updated analysis, dated April 1, 2016, is inconclusive.

This work plan summarizes options for conducting further investigations and collecting additional data that can be used to make a determination of impact or no impact on groundwater quality for dairies with a finding of "inconclusive impact." **Note that this Work Plan does not establish specific investigations or data collection efforts to be implemented by individual dairy operators. Each dairy operator is responsible for working directly with the Regional Board to identify additional investigations appropriate to that dairy.**

**Table 1. Dairies with a finding of “Inconclusive Impact” for NO<sub>3</sub> or TDS in the April 1, 2016 updated Salt Report**

Dairy	Inconclusive for: (source(s) of uncertainty) <sup>a</sup>
Goyenette Dairy #2	NO <sub>3</sub> and TDS (1-4,7-9)
E.L. Farms <sup>b</sup>	NO <sub>3</sub> and TDS (1-4,7-9)
Ed Vander Woude Dairy	NO <sub>3</sub> and TDS (1-6,8)
R&J Haringa Dairy	NO <sub>3</sub> and TDS (1-5,7-9)
Scott Brothers Dairy – north of fault	NO <sub>3</sub> and TDS (1-4,7-9)
Scott Brothers Dairy – south of fault	NO <sub>3</sub> (1-4,8)
John & Margie Oostdam Heifer Ranch <sup>b</sup>	NO <sub>3</sub> and TDS (1-5,8,9)
Herman De Jong Dairy	NO <sub>3</sub> and TDS (1-5,8)

a. Sources of uncertainty:

- 1) Unknown impact of non-dairy sources of nitrate and/or TDS.
- 2) Lack of groundwater samples collected over a similar time period.
- 3) Comparison of samples from wells with different perforated intervals.
- 4) Uncertainty of rate of groundwater movement.
- 5) Uncertainty in groundwater flow direction and/or impact of groundwater withdrawal on short-term flow patterns.
- 6) Close proximity of groups of dairies leads to uncertainty in impact of individual dairy.
- 7) No upgradient groundwater quality information.
- 8) No facility groundwater quality information.
- 9) No downgradient groundwater quality information.

b. Facility vacant as of March, 2016.

## Further investigations and data collection

The issue of what actions – if any – to take on dairies for which the groundwater analysis is inconclusive is a difficult one. Dairy operators should and must be given full credit for the measures they have already taken to protect ground water quality through compliance with their permit and with other applicable regulations as well as through additional voluntary measures. However, even verified full regulatory compliance cannot be taken as certain confirmation that no impacts on groundwater have occurred or might occur in the future. First, the permit and regulations are of necessity broadly applicable to a regional setting and may not fully account for localized situations such as soil permeability or depth to groundwater table; measures to protect groundwater must be site-specific. Control measures that are protective of water quality on one dairy may not be equally protective on another simply due to variability in physical site characteristics. Second, even facilities in full compliance may have some risk factors that are associated with threats to groundwater quality, even unintentionally. Finally, the assessment of potential dairy impacts on groundwater in the San Jacinto basin has in most cases not provided certainty of either impact or no impact by dairies. The varying ages of monitoring data, ambiguity in the conditions reflected in individual wells, uncertainty about regional and local groundwater movement, and gaps in groundwater data coverage combine to make documentation of groundwater impacts highly uncertain. This is particularly true for the “inconclusive” group, for which groundwater data are largely nonexistent. Therefore, it cannot be assumed that compliance with regulatory conditions alone justifies taking no further action on the part of dairies to protect groundwater quality.

In the absence of definitive data proving or disproving impacts, it is safe to take a conservative approach. This approach does not necessarily assume dairy impacts on groundwater quality but is based on the possible link between risk factors observable on the land surface and the potential for groundwater impacts. In the same way that surface runoff management practices are often required on cropland to control erosion and nutrient losses based on assessment of conditions and activities on the land rather than on definitive water quality monitoring data, so too should control measures for groundwater protection be applied based on conditions and

activities on the land, even in the absence of adequate groundwater quality data. Therefore, this work plan calls for a four-phase program to address the Regional Board requirements for dairies identified as having inconclusive impacts for TDS and/or nitrate.

It should be noted that representatives of the Milk Producers Council (MPC) and its members, who are also WRCAC members, have voiced strong objections to the Regional Board's requirement for dairies to conduct additional investigations based on the results of the *Salt Report* analysis. It is MPC's position that verification of full regulatory compliance under Phase 1 is adequate to document groundwater protection. Specifically, MPC believes that the best way to protect valuable groundwater resources is to continue enforcing the best management practices (BMPs) required in the General Permit, while also continuing to conduct monitoring from readily available sources that will continue to validate the success of those BMPs.

Until such time as this question is settled through ongoing negotiations with the Regional Board, this work plan recommends proceeding through all four phases described below.

### **Phase 1: Verify current conditions**

Conduct a complete inspection of each facility listed in Table 1 to ensure that facilities and operations are in full compliance with their permit conditions. At a minimum, the inspection should document the presence, condition, and proper operation of:

- An approved, up-to-date Engineered Waste Management Plan (EWMP) that fully reflects current facility conditions;
- All wastewater and stormwater infrastructure specified in their EWMP;
- All berms, catch basins, lagoons and other containment structures;
- An RWQCB-approved Nutrient Management Plan (NMP) for dairies that have active cropland that receives their manure;
- Manure export for dairies that do not have an end use for their manure as fertilizer; and
- Facilities and measures to minimize the volume of water and wastewater generated by the dairy operation.

This Phase 1 assessment should encompass not only current conditions/operations but also to the extent possible conditions and operations that prevailed over the past 5 to 10 years. This assessment of current and past operations may be based on operator reports, records of inspections, data from NMP implementation, manure shipping manifests, well pumping records, etc. and supplemented by current observations where necessary. Where the Phase 1 assessment reveals that a facility is not in full compliance with its permit, including implementing its EWMP and NMP, as applicable, corrective actions should be implemented to ensure full compliance as a first step to ensuring the dairy does not impact groundwater quality.

For dairies for which wells exist to characterize up-gradient, facility, and down-gradient groundwater quality, Phase 1 also includes periodic re-analysis of data provided by EMWD (or other agencies as appropriate). The first such updated analysis was completed on April 1, 2016. To the extent that sufficient data are available to support a determinative analysis for a dairy, that dairy will be moved to the appropriate category (no impact or potential impact) and will follow the work plan for that category.

### **Phase 2: Collect additional data**

When Phase 1 inspections/reviews confirm that a facility is in full compliance with its permit, is implementing its EWMP, and follows management measures common to dairies in the San Jacinto basin, a dairy operator may choose to collect additional groundwater data on and around the facility. Priority for additional data collection should be given to those facilities that currently lack appropriate upgradient, facility, and/or downgradient wells for full assessment of groundwater impacts. Additional data collection may include, and dairy operators may consider,

the options listed below (generally in order of increasing cost, although actual cost for each option will be site specific). Each dairy operator will determine what additional data they will collect, if any, based on specific dairy conditions and the economic benefit to the dairy balanced against the cost of data collection. WRCAC on behalf of the dairy operators in the San Jacinto basin will continue to work with EMWD staff and coordinate monitoring efforts, both existing and new.

- Conduct more frequent sampling of existing wells, e.g., monthly. Where wells are available to characterize upgradient, downgradient, and onsite groundwater quality, more frequent collection of data to yield a dataset adequate to support a defensible conclusion of “no impact” or “potential impact” may be adequate. Data should be collected to meet or exceed the data quality requirements described in the 2014 *Salt Report* and the *Annual Analysis Work Plan*.
- Use Cone Penetrometer Tests (CPTs) to characterize the soils in the shallow, unsaturated zone beneath the facility area. A CPT is a subsurface soil characterization method that involves hydraulically pushing a probe into a soil deposit while recording the friction and resistance of the soil to penetration by the probe (WEI 2011). CPT investigations should follow the methodology used by EMWD in evaluating infiltration of recycled water in wetlands in the San Jacinto Lower Pressure groundwater Management zone (*Id.*). CPT testing showing that fine-grained soils underlying the facility effectively impede infiltration to the aquifer would support a conclusion of no impact on ground water nitrate and TDS from the dairy. If CPT analysis does not support such a conclusion, further site investigations may be advisable.
- Collect groundwater samples using “point in time” samplers. In certain settings, groundwater samples can be collected without installing wells by using temporary samplers relying on direct push technology, wherein small-diameter steel rods with attached sampling tools is driven, pushed, or vibrated into the ground to collect a grab sample of groundwater. (Note that this is different from direct push monitoring well installation, which is discussed below.) Note that point in time sampling is not appropriate for long-term trend monitoring, but can be used to determine the presence or absence of plumes or hotspots (USEPA 2005). In appropriate settings, such devices could be used to investigate groundwater quality around areas of potential risk to determine the presence, absence, or extent of a TDS or nitrate plume. If a plume or hotspot is detected, one of the other options in this list should be used for further investigation and monitoring. Direct push technology is appropriate for use in unconsolidated formations, such as those that exist at the surface throughout the San Jacinto basin. However, the technology may not be useful in formations with significant amounts of gravel or cobbles, or where specialized technologies are needed to prevent migration of contaminants below confining layers (*Id.*).
- Conduct soil profile sampling to document soil nitrate/TDS concentrations and variation with depth (e.g., Daniel B. Stephens & Associates, Inc. 2007, Geisseler and Horwath 2013, Rhoades et al. 1999). Methods used for soil sampling should be consistent with those recommended by USDA-NRCS (Schoeneberger et al. 2012). Collecting samples at varying soil depths may yield data to illustrate the extent of nitrate and/or TDS movement through the soil profile. Such investigations should focus on potential risk areas identified in the September 2015 on-site assessments (individual risk factors with a ranking of 1 or 2 in the dairy site assessment forms). These data may be sufficient to indicate whether nitrate and/or TDS from facility operations is reaching groundwater.

Similarly-located dairies (i.e., those with similar soil types and operating conditions) may be able to coordinate efforts to collect representative data on TDS and/or nitrate movement through the soil profile beneath potential risk areas.

- To the extent possible with model structure and available data, use the EMWD San Jacinto Groundwater Model to estimate local groundwater flows. The model currently does not support evaluation of groundwater quality impacts. However, similar to conducting geophysical investigations (see below), model results showing limited movement of water to and within the groundwater system could support a presumption of no impact. For example, a clay confining layer underlying the San Jacinto Upper Pressure groundwater management zone restricts the downward flow of water through the soil profile so that infiltrated water might not reach the aquifer for 500 to 1,000 years or more (John Daverin, personal communication, January 28, 2016).
- Perform local geophysical investigations to verify local groundwater conditions, including elevation of water table, hydraulic gradients, soil and aquifer permeability, and direction and velocity of groundwater flow). As described above, detailed knowledge of local groundwater flow direction and velocity could, for example, support a presumption of no impact if it can be shown that transport of pollutants to and within the groundwater system is minimal or very slow.
- Install new ground water monitoring wells according to California standards ([Bulletin 74-90](#)) based on knowledge of local groundwater conditions and existing wells and/or the results of on-site geophysical investigations. Install groundwater monitoring wells in locations appropriate to sample ground water up- and down-gradient from potential sources. See TAIC (2003), on file with the Regional Board, for an example of an approved RWQCB-approved ground water monitoring work plan. Integrate the new wells in to the ongoing groundwater monitoring program. This option may be advisable for cases where no appropriate wells currently exist or where there are few wells available for sampling, and where the above options do not yield adequate data to assess the dairy's potential impact on groundwater quality. It should be noted, however, that initial reaction from dairy representatives indicates that installation of deep monitoring wells will be cost-prohibitive and is not an option likely to be selected by dairy operators.

For example, one source estimated costs of approximately \$40,000 - \$45,000 per well for 600-foot monitoring wells in Fresno County in 2012 (DWR 2012). Recent local costs to install deep monitoring wells have been much higher (Bruce Scott, personal communication, November 18, 2015). However, the Regional Board has suggested that monitoring studies with shallow monitoring wells could be acceptable for some locations. An example study provided by the Regional Board used four 60-foot monitoring wells (TAIC 2003). The cost of well installation is impacted by variable costs of fuel and materials, making it difficult to predict the future cost of installing monitoring wells. However, it is reasonable to assume that shallow monitoring wells would be much less expensive than deep wells. Small-diameter wells installed through methods such as direct push, where appropriate and accepted by the Regional Board, could be more cost effective. Installing direct push wells can save up to half the installation cost of conventionally-drilled wells, depending on the well depth and diameter, screen length, and other factors (USEPA 2005, ITRC 2006).

Detailed Phase 2 work plans must be developed specifically for each facility for which the operator elects to collect additional data. Each dairy operator will evaluate weigh data collection

options relative to his or her economic circumstances, future plans, and individual need for collecting additional data. In addition, the appropriate data collection method will depend on the dairy's location and geologic conditions. Therefore, coordination with the Regional Board is necessary to ensure the data collected will be sufficient and acceptable to make a determination of each dairy's potential impact on groundwater. Dairy operators should select their desired data collection method and work directly with the Regional Board to clarify the details of what data will be collected, how the data will be collected, and how the data will be used to determine whether the dairy is impacting groundwater. It is critical that these site-specific decisions be approved by the Regional Board before investing time and money to collect additional data.

Such site-specific work plans provide the opportunity to explore the possible impacts of other land uses (e.g., residential, commercial) on local groundwater. Data collected under Phase 2 should be reviewed and reported annually, with a full analysis to re-evaluate potential impacts to groundwater quality at a minimum once during every permit period.

If additional monitoring data support a conclusion of no impact, the dairy will be moved into that category and included in ongoing management and monitoring activities for that group. If the new data indicate potential or actual impact, the facility will be moved to the potential impact group and should implement additional control measures to mitigate TDS and/or nitrate impacts.

If a dairy operator does not wish to invest in additional groundwater investigations or monitoring, he may choose to proceed to Phase 3 to address risk conditions on the land surface.

### **Phase 3: Address risk conditions**

Where impacts remain inconclusive even with additional data, or where the operator chooses to do so without collecting additional data, the conservative approach is to address existing risk factors as a precautionary measure. In those cases, the dairy operator should consider adopting additional control measures to address identified risk factors on the facility. These measures may include:

- Source relocation;
- Diversions;
- Well repair/reconstruction;
- Pond sealing or other containment structure repair;
- Protection of temporary manure storage areas from precipitation and runoff;
- Milking center wastewater treatment;
- Improved management of surface infiltration of wastewater; and
- Ag chemical handling facility.

Detailed Phase 3 work plans must be developed specifically for each facility, as described in the *Additional Control Measures Work Plan*.

### **Phase 4: Ongoing Regional Board consultation**

Whether a dairy elects to collect additional data or simply address risk conditions, each dairy operator should coordinate with the Regional Board's dairy program on an ongoing basis to ensure that the selected data collection or corrective actions continue to meet the needs of both the dairy operator and the Regional Board with regard to making a final determination of a dairy's status and long-term obligations with respect to groundwater impact and permit compliance. Dairy operators are encouraged to consult with the Regional Board annually, at a minimum, to discuss:

- Status and results of data collection, if applicable
- Status of corrective measure implementation
- Sufficiency of data or activities to make a determination of no impact or potential impact

Dairy operators should document the results of such consultations, including the consultation date, participants, data presented, and Regional Board recommendations.

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