Final Report
October 1, 2010 – September 14, 2012

Comparison of objectives to actual work completed

Below is a comparison of objectives, activities, and deliverables to actual work completed for the reporting period October 1, 2010 through September 14, 2012. Objectives and planned activities / deliverables are bulleted and listed by task.

Task 1 – Select cooperating dairy farms (TASK COMPLETE)

- *Finalize criteria for site selection and develop producer survey*
  A survey was developed for interested producers to complete to collect information about dairy facilities and pond characteristics in order to guide the selection process.

- *Develop participant agreement*
  A project description and participant agreement was developed to clarify for participating producers what the project entailed and what they would be agreeing to should they decide to participate.

- *Solicit project participants from among all Central Valley dairies*
  The project team promoted the project to dairy producers and solicited participants from throughout the Central Valley through a variety of media, including newsletters, emails, and direct producer contact.

- *Interested producers to return surveys and signed participant agreements*
- *Project team to develop a list of at least 10 prospective sites and contact producers to confirm selection*
  The project team received 14 producer surveys. The team reviewed the surveys and ranked the facilities based on the range of characteristics necessary for the project (e.g., depth to groundwater, proximity of buildings and structures to the lagoons, ability to shut off inflow to and outflow from lagoons, and so on). The project hydrogeologist made initial site visits with Western United Dairymen field representatives to visually inspect prospective dairies to determine if the facilities were appropriate for this project. Five dairies were initially selected to participate, and signed agreements were collected from the producers prior to commencement of field work.

  This task was later reopened as WUD requested a modification of the work plan to include additional dairy sites as appropriate in order to strengthen project results. The project team reviewed the original pool of potential participants and considered additional sites for possible inclusion in the project based on the range of characteristics necessary for the technology demonstration (as noted above). Site visits were conducted for two additional dairies to determine suitability for inclusion in the project; one of the two was selected to participate and a signed producer agreement was subsequently obtained from the additional producer. The remaining prospective sites were ruled out due to compatibility limitations.

Task 2 – Select instrumentation (TASK COMPLETE)

- *Review of instrumentation specifications*
- *Ensure compatibility between measurement and logging devices*
- *Instrumentation purchase and quality check*
  All necessary equipment and instrumentation was researched, selected, ordered, received, and quality checked. The following data acquisition and storage instrumentation components were purchased: pressure transducers with internal storage for waste level monitoring; meteorological station with sensors for measurement of air temperature, wind speed and direction and relative humidity; infrared thermometer for measurement of waste surface temperature/energy transfer from waste surface to atmosphere; rain gauge; and data storage device.

Task 3 – Instrumentation performance testing and configuration (TASK COMPLETE)

- *Near-office performance testing and configuration of component compatibility*
  The project hydrogeologist configured and tested the equipment.

Task 4 – Conduct field work / technology demonstration on five dairies (TASK COMPLETE)

- *Finalize schedule for conducting field work and technology demonstrations*
  In coordination with WUD staff, the project hydrogeologist established and finalized the schedule for all field work.

- *Project team to conduct field work and data collection as proposed including preliminary analyses and ongoing project evaluation*
  The project hydrogeologist conducted field work as planned at the six participating dairies. Data acquisition and storage instrumentation (outlined in Task 2 above) was configured and the methodology demonstrated on all sites.

  The project hydrogeologist returned to one of the ponds previously measured, redeployed equipment and conducted and completed new measurements to investigate potential temporal changes in the measured rates.

  All field work was completed in June 2011 and the equipment removed, cleaned and stored.

Task 5 – Cumulative data evaluation (TASK COMPLETE)

- *Compile, organize, process, and analyze the data collected during technology demonstrations*
  For all field work completed, the project hydrogeologist compiled and evaluated all data; carried out pond measurement computations; and aggregated, plotted, and analyzed measurements of air temperature, waste surface temperature, relative humidity, wind speed and direction. Additionally, waste samples were retrieved and waste density was determined at project partner UC Davis laboratory. The project hydrogeologist completed all data evaluation work in preparation for Task 6 report production activities.

Task 6: - Report of results / produce technical field manual (TASK COMPLETE)

- *Prepare a technical field manual as a guidance document for the implementation of the demonstrated methodology*

  The draft Technical Field Manual, entitled *Protocols for Measuring Dairy Lagoon Seepage Using the Water Balance Method*, was co mpleted and circulated to the review team for discussion and feedback. The review team exchanged feedback and clarifications with the principal author. Revisions were made, and the document finalized.

Task 7 – Technology transfer – publicity / outreach (TASK COMPLETE)

- *Publicize results of technology demonstration and availability of technical field manual*

  In late 2009 and early 2010, the project team promoted the project to dairy producers and solicited participants from throughout the Central Valley through a variety of media, including newsletters, emails, and direct producer contact via field representative visits and at various producer meetings.

  The technology and methodology was demonstrated on site at a participating dairy in February 2011 for staff of California Department of Food & Agriculture, East Stanislaus Resource Conservation District, and WUD, and for Regional Water Quality Control Board (RWQCB) staff at a different participating dairy in March.

  The technology and methodology was again demonstrated on site at a participating dairy in April 2011 for staff of California Department of Food & Agriculture, Dairy Cares, NRCS, Regional Water Quality Control Board (RWQCB) and WUD.

  Central Valley dairy engineering and consulting firms, industry representatives, and staff of government service agencies gathered on April 4, 2012 to attend a presentation on *Protocols for Measuring Dairy Lagoon Seepage Using the Water Balance Method*, a technical field guide intended to help interested parties carry out field measurements and computations to estimate the water balance of dairy lagoons.

  WUD and ESRCD extended over 120 personalized invitations to the technical presentation. Invitations to were targeted to dairy engineering / consulting firms in the Central Valley, industry partners and representatives, and staff of state and federal regulatory and government service agencies, including CDFA, SWRCB, RWQCB, USDA NRCS, and US EPA. The presentation was well-attended and participants engaged in a thoughtful question and answer session with the author of the technical field guide.

  Protocols for Measuring Dairy Lagoon Seepage Using the Water Balance Method was printed for distribution at the April 4 technical presentation and is available online at http://www.westernuniteddairymen.com/environmental-mainmenu-34. A one-page Fact Sheet on the water balance methodology was also prepared made available for distribution to producers as needed through local NRCS/RCD offices, WUD, and CDQAP.

  WUD also reported on the conclusion of the project in its weekly newsletter, announcing that the water balance methodology has been demonstrated as an alternative method for estimating the water balance of dairy lagoons, provided the lagoons can be hydraulically isolated.

Task 8 – Administration (TASK COMPLETE)

- *Manage project and oversee administration*
  WUD conducted ongoing project management and administration, including coordination of all project work, activities, and tasks among project partners, dairy producers and project contractor.

  WUD worked with the East Stanislaus Resource Conservation District and the California Department of Food and Agriculture to develop an agreement so CDFA-held industry funds could be used as matching funds for this project. The agreement was finalized January 14, 2011, at which time ESRCD and CDFA formally joined as partners in this project.

- *Reporting*
  WUD compiled monthly progress reports for submission to ESRCD and CDFA and provided ongoing Form 270 requests for payment with documentation of work performed to NRCS, and submitted Forms 425, semi-annual progress reports, and this final project report.