City of Santa Rosa Offset Credit Proposal for Nunes – Ocean View Dairy BMPs

Credit Proposal Summary

Selected Project:

Install three agricultural Best Management Practices (BMPs) at an existing dairy operation to control and appropriately redistribute accumulated manure/manure-enriched soils to eliminate nutrient runoff.

Eligibility to Generate Nutrient Offset Program Credits at a Dairy:

The authority to generate Nutrient Offset Program credits at this dairy site is granted by the program Resolution No. R1-2008-0061 (Resolution), in combination with language provided in the General Waste Discharge Requirement (GWDR) Order R1-2012-0002.

Discharge Location in the Laguna:

Nutrient loading from the dairy site flows to Windsor Creek, which discharges into the Laguna de Santa Rosa approximately 0.75 miles upstream of the confluence of Windsor Creek with the Laguna de Santa Rosa. The Windsor Creek confluence with the Laguna is located upstream of the Trenton-Healdsburg Road crossing.

Credit Generating Practices:

The following BMPs and actions will reduce nutrient loading from this site and generate offset credits for the City of Santa Rosa's "no net load" requirements:

BMP #1: Empty manure lagoons and appropriately manage for future stormwater collection
BMP #2: Implement BMPs in heavy use areas to address accumulated manure
BMP #3: Distribute 12,700 tons of manure solids for on-site land application

Margin of Safety Factors:

The credit calculation process incorporates the following factors to ensure adequate environmental protection:

- Edge-of-field calculated loads are discounted for attenuation during overland delivery to the stream
- Bioavailability factors for total nitrogen (TN) and total phosphorus (TP) are applied to compare manure versus treated wastewater bioavailability

Summary of Calculated Credits for Proposed BMPs:

Proposed Crediting Option	BMP Elements	Annual Credits (lbs P+N/yr)	Total Credits Based on a Minimum BMP Eligibility Period of 4 years[1]
BMP #1 Empty and Manage Manure Lagoons	Agitation and pumping of liquid slurry, land application at agronomic rates. Dewatering solids & re-applying at agronomic rates. Interim containment using BMPs.	65,730	187,716[2]
BMP #2 Upgrade Heavy Use Areas	Exclusion of dairy milk cows on-site and scraping of accumulated manure followed by conservation cover implementation.[3]	92	368
BMP #3 On-site Re-use of Stacked Manure Solids	Interim containment berm, appropriate on-site land application of stacked manure and implementation of a cover crop	125	498

[1] The justification for four years is provided below in the Credit Eligibility and Credit Life discussion as well as individually under the Proposed Credit Generating Opportunities.

[2] Estimate includes a reduction in nutrient loading after the first year related to nutrient concentration reductions during storage and handling.

[3] The operator will keep six cows on site in order to maintain the successful dairy cow blood line. However, the cows, their manure and process water being generated will be managed in accordance with approvable methods for both the Nutrient Management Plan and Waste Management Plan and will minimally alter the work at the dairy site for BMP credit generation. For instance, the small number of cows will not be used to produce milk. This eliminates the need to process the milk parlor wastewater. In addition, the cows will be managed under an enclosed barn roof during the fall, winter and spring and utilize pastures only during the summer season. With proper grazing management heavy use areas will not be created. Finally, the manure and bedding materials are to be removed by a scraping and hauling solids away periodically for land application. Land applications will use agronomic rates. This eliminates the use of the current flush system to clean the stalls. By removing the flush system and process water components, the former discharges to the manure lagoons are eliminated. The manure and bedding materials will be land applied using the same appropriate methods as the manure separated solids piles discussed in BMP #3.

Nunes – Ocean View Dairy Project Synopsis:

The Nunes – Ocean View Dairy site is located along Windsor Creek (38°30'30.35"N, 122°50'47.17"W) and discharges to the Laguna de Santa Rosa (Laguna). On behalf of the City of Santa Rosa (the City), Kieser & Associates, LLC (K&A) conducted an examination of the dairy site in November 2011, while Erickson Engineering, LLC conducted a site examination in February 2012. These site evaluations identified potential nutrient offset credit opportunities associated with addressing accumulated manure and installing new BMPs. These new practices will reduce the amount of nutrients (total phosphorus and total nitrogen) entering the Laguna. A dairy herd will not be allowed on site for the period of manure removal and credit generation. The City desires to implement these practices at the Nunes – Ocean View Dairy to offset the annual water reclamation plant discharges to the Laguna. The dairy owner is willing to install these practices under an agreement with the City, if the Executive Officer of the Regional Board approves this proposal.

The proposed land management practices are considered eligible for generating nutrient reduction offsets according to the Resolution. This proposal is submitted for Regional Water Board consideration pursuant to the terms of the Resolution. When offsets are described as pounds of phosphorus and nitrogen no longer reaching the Laguna on an annual as related to proposed implementation of land management practices, they are referred to herein as credits. Credit life (i.e., the number of years credits would accrue annually to the City) is proposed to have a minimum four-year duration for new BMPs installed/implemented by the City at this crediting project site.

During this four-year crediting period, alternative agricultural land uses may be considered for this site. It is understood by the City that the Dairy has submitted a Notice of Intent for a Dairy Waiver Order R1-2012-0003 (Waiver). This proposal assumes that the dairy will operate under a GWDR Order so a change from a Waiver to GWDR will be necessary. Working under an agreement with the City, the dairy operation will remove the dairy cattle from the site during the credit generation period. The credit life of proposed BMPs is for a minimum four-year period, or until the Total Maximum Daily Load (TMDL) for the Laguna de Santa Rosa is approved (whichever is longer). Generation of credits after TMDL approval does not infer the City's acceptance of a reduced wasteload allocation in the TMDL. After the period of credit generation, the site is scheduled to return to an operating dairy condition, subject to an applicable GWDR Order, or the site operator can submit a notice of termination and apply for coverage under a Waiver.

In compliance with the Nutrient Offset Program resolution, activities undertaken to address accumulated manure and install the proposed BMPs will include temporary BMPs with equivalent or greater protection until the proposed BMPs are in place. In addition, the GWDR requirements also include a nutrient management plan (NMP) and waste management plan (WMP) scheduled to be submitted by January 19, 2015.

The City is submitting this formal crediting proposal to the Executive Officer of the Regional Board using site-specific details provided by a local agricultural engineer. This submission also follows a verbal request from Mr. Matt St. John of the Regional Board based on staff review of an initial concept proposal for the Ocean View Dairy. Crediting calculations are provided with this proposal. A detailed crediting summary is provided under separate cover. Relevant information on management practice verification and annual reporting also are included with this formal proposal.

The City will work with the current and/or future land owner/manager to implement the proposed measures. BMP installation will begin in as soon as possible after the Executive Officer approval of this formal proposal. Following such approval, the City will finalize contracting arrangements with the dairy owner. If approved by the Regional Board, the City may choose to implement the proposed practices using options such as a contract with a private land management company, and working with the owner to manage proposed site activities.

This document contains the required information associated with the Resolution.

Introduction

The Nunes – Ocean View Dairy site has three sources of nutrient loading to the Laguna that the City of Santa Rosa will address to generate nutrient offset credits. These include: substantial accumulation of separated manure solids, eroding heavy use areas, and two full manure lagoons. In addition to nutrients, agricultural runoff from these sources may contribute bacteria and suspended solids to surface waters, as well as nitrate to the groundwater. Relevant on-site conditions include:

- Two full manure lagoons with a total of approximately 5,873,000 gallons of manure slurry
- 3.6 acres of heavy use areas
- 12,700 tons of stacked manure separated solids

The dairy has been for sale for the past two years. A buyer for the site has yet to emerge. This lack of a buyer could be attributed to several factors. Stress in the dairy industry at large certainly plays a role. In addition, several site-specific conditions also have contributed to the farm remaining on the market. One of these conditions is the present status of manure handling, which can be briefly summarized as follows:

- Manure lagoons
    - The lagoons currently are full. Site visits in November 2011 and February 2012 indicated the lagoons were not being drained or cleaned prior to the wet season.
    - Preliminary manure and process water storage volume estimates indicated that operating the dairy at full capacity would result in waste generation that exceeds the lagoon capacity by approximately 10 acre-feet per year.
- Manure separated solids stacking piles
    - The dairy has accumulated more than 18,000 cubic yards (12,700 tons) of stacked manure solids generated by a manure separator process.
    - The solids piles range from 12 to 15 feet high with 1 to 1.5 slopes, creating substantial opportunities for erosion and soluble nutrient runoff.
    - The piles are located on bare ground with no enhancements for groundwater protection.
    - Under current operations, many of these stacking piles are located adjacent to a small ridge where the base of the ridge drains to Windsor Creek, less than 100 feet away from the piles.
    - There have been limited off-site sales of solids; therefore, the solids piles reflect years of surplus manure accumulation.

The crediting activities discussed in this proposal will address the existing manure handling conditions and heavy use areas, thereby allowing the operator to achieve compliance under a GWDR Order.

Nunes – Ocean View Dairy Project Overview

The Nunes – Ocean View Dairy operation occupies 172 acres and has sufficient animal and milk production buildings to manage 610 animals. Approximately 330 animals have been used for dairying as of late. This proposal will temporarily restrict the eligible uses of the site as an operating dairy, including suspending dairy livestock operations during the BMP implementation and credit generation period (consistent with the owner's goal). In addition, interim BMPs will be installed to prevent discharges of runoff that come in contact with manure or dairy process water. Both these interim and proposed project BMPs comply with the GWDR Order by eliminating existing discharges and allowing only the Ag stormwater-related runoff to reach surface waters. In the future, this site is scheduled to return to use as a dairy and would be operated in full compliance with the GWDR Order or Waiver.

In this document, the term "credit" will be used to refer to nutrient load reductions to Windsor Creek that "offset" the City's discharge under the authority of the Nutrient Offset Program. For the purposes of this discussion, a credit is defined as the pounds of phosphorus and nitrogen reduced per year from land management practices, adjusted for an adequate margin of safety. The long-term credit life of a practice depends on whether the practice remains in place and is well-maintained. In addition, credit generation eligibility considers whether the measures are required by another regulatory program.

The City of Santa Rosa will implement on-site BMPs to eliminate nutrient runoff to surface waters from the Nunes – Ocean View Dairy site. All three management practices will produce an estimated 65,946 credits of combined phosphorus and nitrogen reductions in the first year. In the second year and subsequent years, the proposed project will generate approximately 40,879 combined nutrient credits. The City proposes to fund practice implementation as part of the Nutrient Offset Program. The Nutrient Offset Program uses nonpoint source nutrient reductions to offset the City's potential annual Subregional Water Reclamation Facility nutrient loading into the Laguna.

The following materials are submitted for consideration:

- Crediting Project Eligibility and Credit Life
- Proposed Credit Generating Practices
- Crediting Methods Applied for Laguna Offset Calculations (Attachment A)
- Erickson Engineering, LLC Site Map (Attachment B)

Crediting Project Eligibility and Credit Life

The approved Santa Rosa Nutrient Offset Program Resolution No. R1-2008-0061 (Resolution or Nutrient Offset Program) requires the City to operate under a "no net loading" requirement in the absence of the Laguna de Santa Rosa completed Total Maximum Daily Load (TMDL). To meet this requirement, the Regional Water Board allows, among other activities, nutrient reductions initiated by the City at remote sites to offset equivalent nutrient discharges from the City's Subregional Water Reclamation Facility. The Resolution also restricts the use of offsets generated from sources regulated by other permits, waste discharge requirements and/or waivers. Specifically, Item 7, on page two, states:

> "The Nutrient Offset Program is designed to encourage the City to undertake nutrient reduction projects that improve habitat and ecosystem conditions, and to encourage the City to undertake nutrient reduction projects that reduce or eliminate non-point source or other discharges not currently subject to waste discharge requirements, waivers, or other permits. However, the Nutrient Offset Program prohibits the City from continuing to receive nutrient reduction credits for a project that later becomes subject to additional regulatory controls imposed by the Regional Water Board. ..."

Representatives of the City's Nutrient Offset Program had been evaluating the potential for offset opportunities associated with nutrient reductions on dairies even prior to 2011. The City requested that the Regional Water Board clarify the period that dairy improvement projects would remain eligible to generate credits after the pending Dairy Orders were approved. In response, the Regional Water Board included language in the Approved General Waste Discharge Requirement for Existing Cow Dairies Order No. R1-2012-0002 that specifically addressed the schedule for a dairy working with a "special TMDL nutrient offset". Item 39 on page 13 of the GWDR states:

> "The Regional Water Board may give special TMDL nutrient offset dairy projects an alternative schedule for enrollment and submittal of associated documents for a maximum of two years past the due dates in this GWDR. These TMDL nutrient offset dairy projects must provide temporary best management practices of equivalent or greater water quality protection in the interim. Also, these projects must be of long-term water quality benefit to the watershed."

For a TMDL nutrient offset dairy project working under the City's Resolution, this item specifically allows an extension of the deadline for submittal of the GWDR required Nutrient Management Plan (NMP) and a Waste Management Plan (WMP). Item 17 of the GWDR requires dairies ***not*** working on a special TMDL nutrient offset project [1]to develop and implement the NMP and WMP by January 19, 2013. Submission of the NMP and WMP documents for dairies working with the City Nutrient Offset Program can be completed through January 19, 2015.

In addition, Item 30 of the GWDR (on page 12) indicates that the Regional Water Board's understanding is that small and medium-sized dairies will take two years to develop NMP and WMP plans (e.g., January 19, 2014). The Nunes – Ocean View Dairy mature dairy cow operation estimate of mature dairy cows is 370; which is well below the Concentrated Animal Feeding Operation threshold of 700. Using this criterion would categorize the Ocean View Dairy as a Medium Animal Feeding Operation. Item 30 states:

[1] The City of Santa Resolution R1-2008-0061 regarding the City's Nutrient Offset Program and the GWDR R1-2012-0002 for existing Cow Dairies have slight terminology differences when referring to nutrient offset programs. The City's Resolution R1-2008-0061 specifically mentions the Laguna TMDL in the findings and refers to all offsets generated as "Nutrient Offset Program" activities. The GWDR allows dairy projects to be a subset of the City's Nutrient Offset Program activities but discusses their involvement using the terminology, "TMDL nutrient offset dairy projects".

> "A discharge of stormwater to surface water from the land application area where manure or process water has been applied is prohibited unless specific management practices have been implemented. These management practices must be consistent with a WMP, NMP or, if the WMP and NMP have not yet been required to be implemented (e.g., during the two years of development at dairies other than Large CAFOs), then land application areas must be managed consistent with BMPs as described in this Order."

The GWDR does not include a WMP or NMP implementation schedule for dairies working with the Nutrient Offset Program. Therefore, the Regional Water Board would need to determine when the required NMP and WMP Best Management Practices (BMPs) should be implemented, and determine the eligible credit life, on a case-by-case basis. This proposal for the Nunes – Ocean View Dairy proposes a minimum of four years of credit life be granted for the practices defined in this document. Four years of credit life is based on a reasonable estimate of the period of time required to land apply the manure in the lagoons and solids stacking piles on the available pasture land at agronomic rates. The site assessment done by Erickson Engineering, Inc. states that based on the nitrogen stored in the solids, there is approximately three to five years of on-site forage production potential in the stockpiles. This is a conservative estimate as the nutrient balance used does not consider the land application of manure slurry in the lagoons in the three to five year estimate.

Proposed Credit Generating Practices

Discussions by K&A and observations at the Nunes – Ocean View Dairy by Erickson Engineering, Inc. yielded three opportunities for practices and activities that could generate nutrient offset credits. Figure 0-1 is an aerial view depicting the locations of all three BMP opportunities.

Attachment A to this document presents a summary of the credit calculations examined for these proposed practices at this dairy. These calculations assume nutrient content and concentration values based on published animal livestock research. The publications that were used to supply these estimates are widely recognized as the industry's leading source of accurate information and/or are developed for assessing and designing livestock environmental controls in other states[2,3,4]. Site-specific sampling is being pursued by the City and thus, credit calculations may be adjusted and later communicated with the Regional Board. Attachment B to this document provides a site map produced

[2] American Society of Agricultural Engineers. 2005. ASAE Standards, Manure Production Characteristics. Authored by the Engineering Practices Subcommittee of the ASAE. March 2005 ASAE D384.2

[3] Midwest Plan Service. 2004. Manure Characteristics – Manure Management System Series MWPS -18, Section 1. Iowa State University, Ames Iowa

[4] University of Missouri, Extension. 1993. Fertilizer Nutrients in Dairy Manure. Publication number WQ307. July 1993. Available at: http://extension.missouri.edu/explore/shop/

by Erickson Engineering, LLC from which areal calculations were derived. The three proposed crediting options are described as follows.

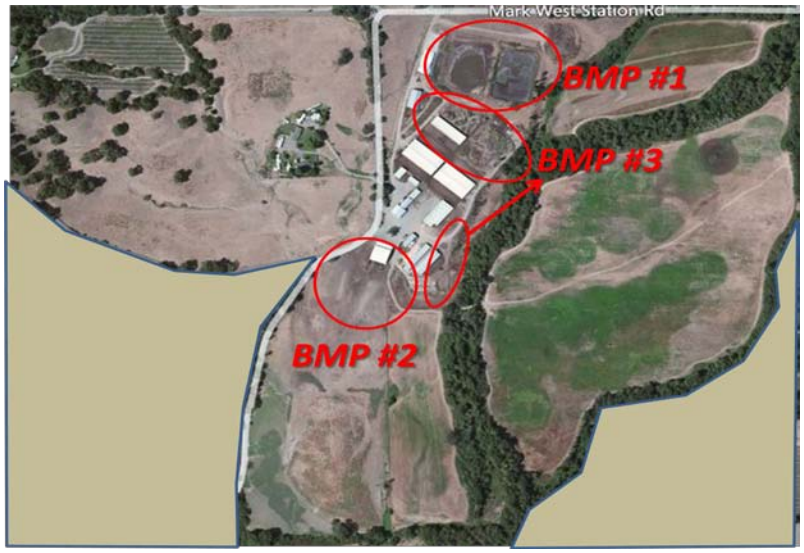


Figure 0-1. Location of the three management sites proposed for installation of new practices to generate nutrient offset credits.

BMP #1 — Manure Lagoon Cleanout and Management of Future Storage

The two full manure lagoons have an imminent potential to contribute nutrients to Windsor Creek during precipitation events. As an interim measure, a berm will be established to prevent nutrient loading to Windsor Creek while cleanout is initiated. The crediting project will result in emptying the full lagoons and land applying the manure slurry at agronomic rates. The method used for emptying the lagoons will be either hauling the manure to forage fields on-site or land application on-site utilizing the reclaimed water irrigation system already available on the farm. Figure 1-1 is an aerial view of the two manure lagoons (A) and direction of downgradient runoff (B). The interim containment berm (C) will contain onsite any runoff during the manure removal process serving both the lagoon system and the manure separated solids piles.

A typical lagoon cleanout process first empties the liquids in the lagoons by agitating the waste and pumping the liquid portion. The remaining solids then are stacked next to the lagoon to dewater. The proposed stacking pile is shown as point (D) in Figure 1-1. After dewatering, these solids will be similarly managed with the manure separated solids pile under BMP #3 of this crediting proposal. The production area contributing to the lagoons will be scraped and subsequently planted with cover crops in open areas. After manure removal, the lagoons will be temporarily closed allowing only Ag stormwater to enter.

In summary, proposed actions for this credit-generating BMP include:

- Agitation and agronomic rate land application of the liquid slurry from the two manure lagoons
- Dewatering and removal of all solids in the two manure lagoons
- Handling dewatered solids consistent with others for on-site land application at agronomic rates

- Installation of an interim containment berm
- Removal of accumulated manure in production buildings and corrals
- Introduction of cover crops in corrals
- Installation of clean water diversion structures to redirect the production area stormwater runoff away from refilling manure lagoons

Figure 1-1. Current manure lagoons serving the free stall milking cow barn. Manure from the production area is flushed and placed into the two manure lagoons (A). Overtopping of manure slurry from the lagoons contributes to nutrient loading to Windsor Creek at point (B). An interim berm (C) will be placed along the ridge located above Windsor Creek to protect against manure-related nutrient loading. The solids will be stacked and dewatered adjacent to the existing manure separated solids piles (D). The interim berm will serve to protect the Creek from nutrient loading from both the overtopping of lagoons and runoff from the separated solids stacking pile. (Photo Credit: Google Earth)

BMP #1 Credit Calculations

The Erickson Engineering, Inc. evaluation of rainfall runoff entering these lagoons is provided in Table 1-1. The results estimate total runoff managed in an average weather year as 15.62 acre-feet. Contact with manure remains highly probable for many of the contributing catchment areas, and the runoff will be further mixed with existing lagoon slurry. Therefore, the typical nutrient concentrations for dairy liquid manure in pits were used to calculate the nutrient loading.

Table 1-1. Production Area Stormwater Runoff Volume Estimates (based on 36-inch rainfall zone per SCWA flood control design manual, Plate B2).

Description	Acres	Runoff Coefficient	Average Acre-feet
Manured Concrete	0.23	1.00	0.68
Silage Pad Runoff	0.52	1.00	1.57
Liquid Manure Storage	2.09	1.00	6.26
Manured non-concrete	3.11	0.50	4.67
Crop/pasture	2.03	0.40	2.44
Totals	**7.46**	--	**15.62**

The manure lagoon credit calculation includes consideration of the flow entering the lagoons and the nutrient concentrations of liquid slurry. Nutrient content estimates of manure lagoon slurry were

provided by the Midwest Plan Service[5]. To incorporate the appropriate considerations for a margin of safety, the following discount factors were applied to the credit calculations (as percent remaining nutrients reaching Windsor Creek):

- Lagoon runoff nutrient loading:
  - Edge-of-field factor = 39.9% calculated at 85 feet
  - Bioavailability factors:
    - TP = 94.5%
    - TN = 85%

Resulting credits are shown in Table 1-2.

Table 1.2 - Proposed credits (combined pounds of TP + TN) calculated for BMP #1.

Proposed Crediting Option	BMP Elements	Annual Credits (lbs P+N/yr)	Proposed BMP Eligibility Minimum Period	Total Credits
BMP #1 Empty and manage manure lagoons	Agitation and pumping of liquid slurry, land application at agronomic rates. Dewatering solids & re-applying at agronomic rates. Interim containment using BMPs.	65,730 for 1st year 40,662 for 2nd, 3rd and 4th years	4 years	187,716

A minimum credit life of four years is proposed based on the expected period of time to agronomically land apply the amount of manure slurry and separated solids on the Nunes – Ocean View Dairy's available pasture acreage. The site assessment performed by Erickson Engineering, Inc., indicates that three to five years is required for the solids stacking piles' nitrogen content alone. The manure slurry will be managed by land applying at agronomic rates along with the stacking pile solids. In addition, the remaining solids within the lagoons after slurry application are assumed to be appreciable as they are visible from the surface. These solids will be removed, dewatered and managed along with the solids in the stacking piles. To ensure lagoon-related credit calculations are conservative, a discount factor is also applied that reduces the estimates of nitrogen reductions by 40 percent and phosphorus reductions by 30 percent on credits after the first year given there will be no new inputs.

[5] Midwest Plan Service, 2004. Manure Characteristics: Manure Management System Series. Second Edition. MWPS-18 S-1. Iowa State University. http://www.mwps.org/index.cfm?fuseaction=c_Products.viewProduct&catID=719&productID=6421&skunumber=MWPS18S1. Accessed March 1, 2011.

Supporting justification for a minimum four-year credit life also includes consideration of the longer-term recycling of the organic content of runoff in the riverine system. Once these nutrients reach Windsor Creek, they are conveyed downstream to the Laguna de Santa Rosa. In the Laguna these nutrients, associated organic solids and bacteria experience different attenuation rates and pathways depending on the flow regimes of the Laguna and the Russian River.

High water conditions in the Russian River can result in flow reversals in the lower Laguna. This provides opportunities for the Windsor Creek loading to flow upstream in the Laguna and be temporarily sequestered in low flow pools and then later be re-released. The potential for this recycling (internal loading) is difficult to quantify. However, its effects are in part, the reason the Nutrient Offset Program remains in effect even though the City has altered its operations whereby it only discharges from Delta Pond, which is also downstream of the Laguna low flow pools. The Regional Water Board contends that flooding in the Laguna with backwater flow from the Russian River redirects some of the Delta Pond nutrient loading into Laguna low flow pools and riparian floodplains.

The Regional Water Board's assumption that nutrients are persistent after moving upstream during flooding conditions are considered to be similar for all downstream sources within the Laguna. Backwater effects for nutrients entering the Laguna from Windsor Creek and the Nunes – Oceanview Dairy would experience similar physical and biological effects as Delta Pond discharges. While the amount of this loading to low flow pools from either source during flow reversals is not well-understood, the impacts from the dairy are likely to be higher than from the treated wastewater for two reasons. First, the dairy experiences more frequent opportunities for release during wet weather conditions. Second, the release from manure lagoons also contains organic solids, which more readily deposit in pools and riparian areas than soluble nutrients from the treated wastewater. Therefore, absent City intervention for offset credits, these nutrient additions to Windsor Creek and their Laguna impacts would continue as long as the manure lagoons at this site remain full.

Expected ancillary benefits of the proposed BMPs bolster support for additional water quality outcomes. Fine organics associated with manure can enhance the bacterial environment extending periods when counts can remain high. Organic materials are easily re-suspended along with bacteria associated with fines during periods of bed scouring. Such occurrences can extend the periods of higher bacterial concentrations beyond the first order decay curves encountered in healthier functioning systems[6,7].

BMP #2 — Heavy Use Area Restoration

For a 3.6-acre heavy use heifer loafing area situated adjacent to Mark West Creek Road, proposed activities will include scraping and closing this area, followed by the addition of a cover crop to increase

[6] Jamieson, RC.,, Joy, DM., Lee, H., Kostaschuk, R., Gordon, RJ. 2004. Persistence of enteric bacteria in alluvial streams. Journal of Environmental Engineering and Science, 2004, 3(3): 203-212, 10.1139/s04-001

[7] Kim, J., Pachepsky, YA., Shelton, DR., Coppock, C. 2010. Effect of streambed bacteria release of E. coli concentrations: Monitoring and modeling with the modified SWAT Ecological Modeling 221 (2010) 1592-1604

nutrient uptake and reduce erosion. The heavy use area was historically used as a heifer loafing area. The heavy use history results in higher soil nutrient concentrations. Figure 2-1 is an aerial view of the loafing area. Cows were released to this area daily and the cattle allowed to graze in the associated pasture. The total pasture is 19.4 acres, including the 3.6-acre loafing area. An adjacent 7.4-acre pasture also exists. Some 160 animals were kept 365 days per year in the open heifer barn and associated heavy use area and pastures. Animals were provided with supplemental feed bunkers and water near the barn.

BMP #2 Credit Calculations

The Pennsylvania Department of Environmental Protection (PA DEP) Chesapeake Bay Water Quality Trading Program[8] calculation method for pastures was adapted for heavy use areas here. The adjusted method calculates the reductions in phosphorus related to enriched soil concentrations from the past heavy use activities. The calculations estimate the reductions in phosphorus loading that result from implementation of a conservation cover BMP which will reduce surface erosion. This BMP will reduce both particulate and dissolved phosphorus loadings (but does not credit nitrogen). Site-specific credit calculations consider:

- Manure deposited in heavy use area
- Remnant manure after scraping
- Soil erosion rates for heavy use area
- Cover treatment efficiency

Figure 2-1. A dairy heavy use heifer loafing area. BMP #2 eliminates nutrient loading contributions from a heifer heavy use area that has been utilized for loafing and feed bunkers. Approximately 160 milk cows have accessed the heavy use area 365 days per year. Current water quality protection is assumed to include scraping of the area in previous years prior to the wet season. The proposed project scrapes the lot in 2012, restricts the area from further cattle use for the length of credit generation, and implements a perennial cover crop in the area outlined in red. This BMP also has the ability to generate nutrient credits and other water quality protection in the longer-term if the area is left in perennial cover. (Photo Credit: Bing Maps)

[8] PA DEP. 2007, 2008. Nutrient and Phosphorus calculation spreadsheets. Accessed May 15, 2012; available at http://www.dep.state.pa.us/river/nutrienttrading/calculations/index.htm

To incorporate appropriate considerations for a margin of safety, the following discount factors were applied to phosphorus credit calculations (as percent remaining phosphorus reaching Windsor Creek):

- Removal of legacy manure and Conservation Cover
  - Edge-of-field factor: 38.6% (calculated at 100 feet)
  - Bioavailability factor:
    - TP = 94.5%

Proposed credits calculated with these assumptions are provided in Table 2.1.

Table 2.1 - Preliminary credits (pounds of TP) calculated for BMP #2.

Proposed Crediting Option	BMP Elements	Annual Credits (lbs P/yr)	Minimum BMP Eligibility Period	Total Credits
BMP #2 Upgrade Heavy Use Areas	Exclusion of dairy milk cows and scraping of accumulated manure followed by conservation cover implementation.[1]	92	4 years	368

[1] The operator will keep six cows on site in order to maintain the successful dairy cow blood line. However, the cows, their manure and process water being generated will be managed in accordance with approvable methods for both the Nutrient Management Plan and Waste Management Plan and will minimally alter the work at the dairy site for BMP credit generation. For instance, the small number of cows will not be used to produce milk. This eliminates the need to process the milk parlor wastewater. In addition, the cows will be managed under an enclosed barn roof during the fall, winter and spring and utilize pastures only during the summer season. With proper grazing management heavy use areas will not be created. Finally, the manure and bedding materials are to be removed by a scraping and hauling solids away periodically for land application. Land applications will use agronomic rates. This eliminates the use of the current flush system to clean the stalls. By removing the flush system and process water components, the former discharges to the manure lagoons are eliminated. The manure and bedding materials will be land applied using the same appropriate methods as the manure separated solids piles discussed in BMP #3.

A credit life of four years is assumed for the site consistent with rationale for BMP #1. This is a reasonable estimate of time for credit generation eligibility. The BMP will reduce nutrient loading associated with runoff by establishing vegetation and temporarily resting the site for as long as the dairy does not have active milking operations during the period of crediting. Furthermore, the change in site soils will enhance infiltration for improved hydrology and will also serve to protect the Creek from loadings of both suspended solids and bacteria. In the future, a portion of the credits related to vegetation establishment could remain eligible if it exceeds the requirements for GWDR compliance.

BMP #3 — On-site Re-use of Stacked Manure Solids

The proposed credit-generating activity for BMP #3 will eliminate nutrient loading contributions to Windsor Creek by first constructing an interim containment berm, land applying on-site the manure separated solids, and then establishing a cover crop on exposed ground surfaces. During previous site

visits, at least five areas were identified where manure stacking is persistent and nutrient and bacteria loading contributions to surface water are possible via runoff. The areas of activity will be consolidated into zones that provide protection against surface water nutrient loading with temporary berming until full land application of the solids is completed. The current estimate of on-site stacked manure separated solids is 12,700 tons. Figures 3-1 and 3-2 are aerial photos depicting the location and quantity of stacked manure that persisted across the wet season.

Figure 3-1. Stacked Manure Separated Solids. BMP #3 involves land application of separated manure solids on site. Currently the 12 to 15 foot high piles of manure solids (A) may erode with runoff contributing nutrient loading to the adjacent Windsor Creek. (Manure in the adjacent corral pens is addressed as part of BMP #1.) (Photo Credit Google Earth, taken on October 24, 2009)

Figure 3-2. Stacked Manure Outside of Calf Barn. BMP #3 involves land application of manure solids on site at agronomic rates. Currently, manure piles dewater in-place contributing to nutrient loading to the adjacent Windsor Creek via runoff. (Photo Credit Google Earth, taken on October 24, 2009)

BMP #3 Credit Calculations

The credit calculations for manure and separated solids manure pile protection and land application consider erosion rates of the organic solids and the particulate attached nutrient loading, as well as soluble nutrients in runoff. The method calculates the before (current condition) and assumes that removal and cover crop protection combined with natural re-establishment of the riparian corridor buffer will eliminate manure-related nutrient loading. Site-specific credit calculations consider the following assumptions:

- The volume of manure deposited
- Nutrient content of manure
- Nitrogen loading available from remnant manure
- Solids pile erosion rates
- Buffer treatment efficiency
- Distance from Windsor Creek

To incorporate appropriate considerations for a margin of safety, the following discount factors were applied to preliminary credit calculations (as percent remaining nutrients reaching Windsor Creek):

- Removal of manure piles
    - Edge-of-field discount factor = 39.9% (as calculated at 85 feet)
    - Bioavailability factors
        - TP = 94.5%
        - TN = 85%

Preliminary credits calculated for BMP #3 using these assumptions are provided in Table 3.1.

Table 3.1 - Preliminary credits (combined pounds of TP + TN) calculated for BMP #3.

Proposed Crediting Option	BMP Elements	Annual Credits (lbs P+N/yr)	Proposed Minimum Credit Eligibility Period	Total Credits
BMP #3 On-site Re-use of Stacked Manure Solids	Interim containment berm, appropriate on-site land application of stacked manure and implementation of a cover crop	125	4 years	498

A minimum credit life of four years is proposed based on the expected annual nutrient requirements of the pasture land available at the Nunes Dairy for land application. The site evaluation by Erickson Engineering, Inc. indicated that a three to five year period for these applications would be reasonable for appropriate nitrogen applications of the solids stacking piles given their estimated nitrogen content. The persistence of runoff that comes into contact with the manure solids is also a consideration in this longer credit life where, if left unaddressed, recycling of organics in the riverine system as noted above would remain problematic for low flow pools in the Laguna. BMP #3 will eliminate these persistent loading conditions.

Monitoring and Reporting Plans

This section outlines the proposed monitoring and reporting plan that the City will implement if this proposal is approved by the Regional Board Executive Officer. Expected agreements between the local Resource Conservation District will be completed to ensure this plan is followed.

Monitoring and Reporting:

The City will require all BMPs implemented for credit generation to be maintained to Natural Resources Conservation Service (NRCS) standards and/or specific engineering designs to ensure nutrient reductions and water quality benefits continue throughout the life of the contract period (either short-term or long-term). This will be accomplished through a contractual agreement and confirmed through annual site inspections to verify the proper operation and maintenance of each BMP. Similar to other environmental trading programs in the nation, the following verification protocol is proposed:

- Annual site visit to inspect and confirm operation and maintenance of BMP prior to the appropriate season of expected operation (as applicable). RCD or other authorized agent will visit the BMP site.
    - Agent will inspect all components of the BMP and surrounding area to ensure proper function /operation (using final engineering specifications).
    - Agent will document BMP operation and maintenance through forms and photographs.
    - Any deficiencies must be noted on the inspection documentation.
    - All site inspection documentation must be submitted to the City within a set period following inspection.
- Deficiencies
    - All deficiencies will be reported to the land owner immediately after the City receives the inspection documentation.
    - These must be appropriately corrected to previously specified conditions within 60 days of discovery, or within 90 days if an alternative improvement is necessary to avoid future failures. (The Regional Board will be notified of this latter condition where applicable.)
    - Temporary BMPs considered acceptable under the GWDR Order will be installed within 15 days of the City's receipt of inspection documentation.
    - Agent must complete a second site visit to verify all deficiencies have been corrected.
- Verification letter stating the BMP passed the annual inspection will be included in the City's annual report to RWQCB.
- Verification letters for all BMPs will be forwarded to the Regional Water Board as proof that credits are being maintained.

Agreements for Implementation:

The City anticipates entering into several agreements to fully implement, verify, and monitor the proposed BMP projects at the Nunes-Ocean View Dairy, once Regional Water Board approval is obtained. The City will rely on written agreements for the following activities:

- Project implementation oversight
- Engineering
- Construction
- Long-term maintenance
- Annual site inspections

The City will likely enter into an agreement with the local RCD to oversee implementation of the BMPs and provide annual BMP verification. The City may choose to implement the proposed practices using options such as a contract with a private land management company, and working with the owner to manage proposed site activities.

Description of Anticipated CEQA Documentation

Final engineering review of the BMPs will provide further information on whether permits might be necessary for implementing the proposed projects. The Gold Ridge RCD anticipates no need for a permit from the US Army Corps of Engineers or other California State Resource Agencies due to the location of the projects. The need for a permit from the Sonoma County Permit and Resource Management Department or Water Agency will depend on the final design (e.g., amount of excavation involved in BMP implementation). The RCD will be responsible for obtaining all permits related to the BMP projects. CEQA documentation that may be required for any necessary permits is described in the following paragraph.

Section 15168(c)(2) of the CEQA Guidelines provides that, "If the agency finds that pursuant to Section 15162, no new effects could occur or no new mitigation measures would be required, the agency can approve the activity as being within the scope of the project covered by the program EIR, and no new environmental document would be required." The Discharge Compliance Project (DCP) EIR evaluated an Enhanced Nutrient Removal (ENR) component at a program-level. The EIR Project Description for the ENR component specifically includes manure management at up to eight dairies and agricultural land management in the Laguna Watershed. The Nunes—Ocean View Dairy Nutrient Removal Project is entirely consistent with the Project Description for the ENR component in the DCP EIR. Further, the City has evaluated whether the Ocean View Dairy Nutrient Removal Project would have new effects that are greater than those identified in the DCP EIR and that, pursuant to Section 15162 of the CEQA Guidelines, would be new significant impacts or significant impacts of a substantially more severe nature. The

evaluation found no new significant impacts or significant impacts of a substantially more severe nature beyond those impacts already identified for the ENR component in the DCP EIR. And, therefore, the Ocean View Dairy Nutrient Removal Project is adequately evaluated by the program-level review in the DCP EIR, and no subsequent environmental document is required.

Attachment A

Crediting Methods Applied for Laguna Offset Calculations

Site Name: Nunes -- Ocean View Dairy - BMP #1

Address: 3975 Mark West Station Road, Windsor, CA 95436

Location Information: **Description of watershed location:**

Watershed Segment Adjacent to Windsor Creek, drains to Laguna de Santa Rosa

Location Factor 100%

Distance to nearest conveyance 85 **feet**

Delivery Ratio (Edge-of-Field) 39.88%

(Based on MN delivery ratio formula: distance$^{-0.2069}$)

Area Served: 7.46 acres

Runoff Calculation from Erickson Engineering, Inc.

Surface Areas	Acres	Runoff Coefficient	Average Acre-feet	Wet Acre-feet
Manured Concrete	0.23	1.00	0.68	1.01
Silage Pad Runoff	0.52	1.00	1.57	2.33
Manure Storage, liquid	2.09	1.00	6.26	9.33
Manured non-concrete	3.11	0.50	4.67	6.96
Crop/pasture	2.03	0.40	2.44	3.64
Totals	7.46		15.62	23.27

15.62 acre feet

Nutrient content estimates from Midwest Plan Service, Section 1, Second Edition. 2004. Iowa State University Table 7. Estimated liquid pit manure characteristics.

5,089 1000 gallons

lbs/1000 gallons of manure

Total N	P205	TP
31	15	6.5

Midwest Plan Service, 2004. Manure Characteristics: Manure Management System Series. Second Edition. MWPS-18 S-1. Iowa State University. http://www.mwps.org/index.cfm?fuseaction=c_Products.viewProduct&catID=719&productID=6421&skunumber=MWPS18S1. Accessed March 1, 2011.

Assumed concentration strength of lagoon (1st year)

TN released during over topping **157,772.8 lbs/year**

TP released during over topping **32,826.9 lbs/year**

Years 2, 3, 4, ...

TN **Assume an additional 40% loss after year 1** **94,663.7** **Conservative MOS**

TP **Assume an additional 30% loss after year 1** **22,978.8** **Conservative MOS**

MOS:

Delivery Ratio	**39.9%**	
Location Factor	**100%**	
P Bioavailability	**93.5%**	**80% manure bioavailability/85.5% WWTP bioavailability**
N Bioavailability	**85%**	**80% manure bioavailability/94.5% WWTP bioavailability**

1st Year Credits

TN credit **53,487.8**

TP Credit **12,241.8**

Combined **65,729.5**

2nd, 3rd and 4th Year

TN **32,092.7**

TP **8,569.3**

40,661.9

Total for All Four Years

187,715.3

Site Name: Nunes -- Ocean View Dairy - BMP #2

Address: 3975 Mark West Station Road, Windsor, CA 95436

Description of watershed location:

Watershed Segment Adjacent to Windsor Creek, drains to Laguna de Santa Rosa

Location Factor 100%

Distance to nearest conveyance	100	**feet**
Delivery Ratio (Edge-of-Field)	38.57%	**(Based on MN delivery ratio formula: DR = distance$^{-0.2069}$)**
Area Served:	3.6	acres

Soil Information:

Classification:	Huichica	Loam	Htc
Hydrologic Group:	D	**Soil C; Manure pack D**	

RUSLE estimate factors:

R Factor:	**120**	**From EPA Rainfall Erosivity Factor Fact sheet**
K Factor:	**0.37**	**From EPA Rainfall Erosivity Factor Calculator for Small Construction Sites at: http://cfpub.epa.gov/npdes/stormwater/lew/lewcalculator.cfm**
LS Factor	**2.2**	**From NRCS Web Soil Survey at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm**
C Factor	**0.05**	**From Guidelines for the Use of the Revised Universal Soil Loss Equation (RUSLE) Version 1.06 on Mined Lands, Construction Sites and Reclaimed Lands, T.J. Toy and G. R. Foster, Co-editors J. R. Galetovic Publishing Editor. Accessed April 25, 2012 at: http://www.greenfix.com/Channel%20Web/pdfs/RUSLE%20Guidelines.pdf**
P Factor	**1**	**(no erosion practice)**
A= R*K*LS*C*P	**4.884**	**tons/acre/year (if less than 1 ton/acre/year, use 1)**

Erosion Rate:	4.884	**tons/acre/year**	
Phosphorus Soil Test:	750	**ppm**	**Type:** Mehlich - 3
Field Condition:	Poor		

COUNTY	Climate Zone	Mean Precip (in/yr)	2 year, 24 hour rainfall event (in)	# of these events in 1 year:
Sonoma	3	30.98	3.34	9.28

2-year 24-hour rainfall event (in): gathered from CA Water Gov precipitation data available at: ftp://ftp.water.ca.gov/.../DDF%20D%20F90/F90%20D%20Santa%20Rosa%20CIMIS.xls
Mean Precipitation (in/yr) is calculated from 30-yr record, missing data filled in using monthly long-term average.

Calculating Rainfall Runoff using the SCS Curve Number:

County **Sonoma** **1.96** **Runoff from one 2yr, 24 hr storm event (in)**

Number of 2 year, 24 hour storm events in 1 yr:	**9.28**
Average Annual Rainfall Runoff (in)	**18.16 in**
Hydraulic Condition	**0**
Curve Number Based On:	**Pasture Poor Conditions**
Curve Number:	**89**

Soil P	**3.0**	**kg/ton P**
Background Soil P Loss from Erosion	**64.6**	**lbs/acre**

Soluble P Concentration	1,544	ug/L (microgram/liter OR ppb)	
Average Annual Runoff	1,866,201	L/ac	Average Annual Runoff Conversion
Background Dissolved P Loss	2,880,480,541	ug/ac	
Background Dissolved P Loss	**6.3**	lbs/ac	
P Load Available from Soils:	**70.9**	lbs/ac	

P Load Available from Soils and Nutrient Applications: 70.9 lbs/acre

Site P Loading Available: **255.4** lbs P/yr

Application of cover: **100%** **Treatment Efficiency** **Conservation cover provided using a conservative treatment efficiency; applied as a buffer removal efficiency.**

Site P Loading Reduction From Cover:
255.4 lbs P/yr

Field Total P Reduction:
255.4 lbs P/yr

MOS:

Location Factor:	**1**	**0**	**Adjacent to Windsor Creek, drains to Laguna de Santa Rosa**
Edge-of-field delivery:	**38.57%**	**100**	**feet from conveyance**
P Bioavailability:	**93.5%**	**80% manure bioavailability/85.5% WWTP bioavailability**	

Phosphorus Credits without discount factors	**255.4 P credits per year**
Phosphorus Credits using:	
Bioavailability & Edge-of-Field	**92.1 P credits per year**

Total for Four Years **368.3**

Site Name: Nunes, Ocean View Dairy

Address: 3975 Mark West Station Road, Windsor, CA 95436

Description of watershed location:

Watershed Segment Number Adjacent to Windsor Creek, drains to Laguna de Santa Rosa

Location Factor 100%

Distance to nearest conveyance 85 feet

Delivery Ratio (Edge-of-Field) 39.88% **(Based on MN delivery ratio formula: distance$^{-0.2069}$)**

Area Served: 3 acres

Soil Information:

Classification: Huichica | Loam | Htc

Hydrologic Group: D — **Soil identified as a C; manure pack/compaction assumed a D rating**

RUSLE estimate factors:

R Factor:	**120**		**From EPA Rainfall Erosivity Factor Fact sheet**
K Factor:	**0.1**		**From EPA Rainfall Erosivity Factor Calculator for Small Construction**
LS Factor	**1.84**	**12 foot length**	**From NRCS Web Soil Survey at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm**
C Factor	**0.42**		**From Guidelines for the Use of the Revised Universal Soil Loss Equation (RUSLE) Version 1.06 on Mined Lands, Construction Sites, and Reclaimed**
P Factor	**1**	**(no practice)**	**From Guidelines for th(if less than 1 ton/acre/year, use 1)**
A= R*K*LS*C*P	**9.27**	**tons/acre/year**	
Erosion Rate:	**9.27**	**tons/acre/year**	

Field Condition: Poor

Content of screened solids

		lbs per ton	**Separated Solids nitrogen content**	**5**
TN	**5**	**lbs per ton**	**Separated Solids phosphorus content**	**0.9**
TP	**0.9**	**lbs per ton**	Pacific Northwest Extension Service	
			http://cru.cahe.wsu.edu/cepublications/pnw0533/pnw0533.pdf	
TN	**2.5**	**kgs per ton TP**	***metric ton* = 1.10231131 *standard tons***	
TP	**0.45**	**kgs per ton TN**	**0.453592 kgs per pound**	
		Mehlich - 3	**equivalent**	**112.51 ppm TP**

Eroded/Particulate Attached

TN	**306.7**	**lbs per year**
TP	**55.2**	**lbs per year**

Soluble TP

Soluble P Concentration	269	ug/L (microgram/liter OR ppb)	
Average Annual Runoff	1,866,671	L/ac	Using 18.16 inches annual average runoff
Background Dissolved P Loss	501,243,054	ug/ac	
Background Dissolved P Loss	**1.1**	lbs/ac	
Total TP	**56**	lbs/ac	
		Additional conservative assumption; soluble nitrogen loading not credited	
Total TN	**307**		

List of Discount Factors

		Segment	**Name**
Location Factor:	**100%**		**Windsor Creek**
Edge-of-field delivery:	**39.88%**	**85**	**feet from conveyance**
P Bioavailability:	**93.5%**		**80% manure bioavailability/85.5% WWTP bioavailability**
N Bioavailability:	**85%**		**80% manure bioavailability/94.5% WWTP bioavailability**

Phosphorus Credits without discount factors **55.2**

Phosphorus Credits using:

Bioavailability & Edge-of-Field **20.6** **P credits per year**

Nitrogen Credits without discount factors **306.7**

Nitrogen Credits using:

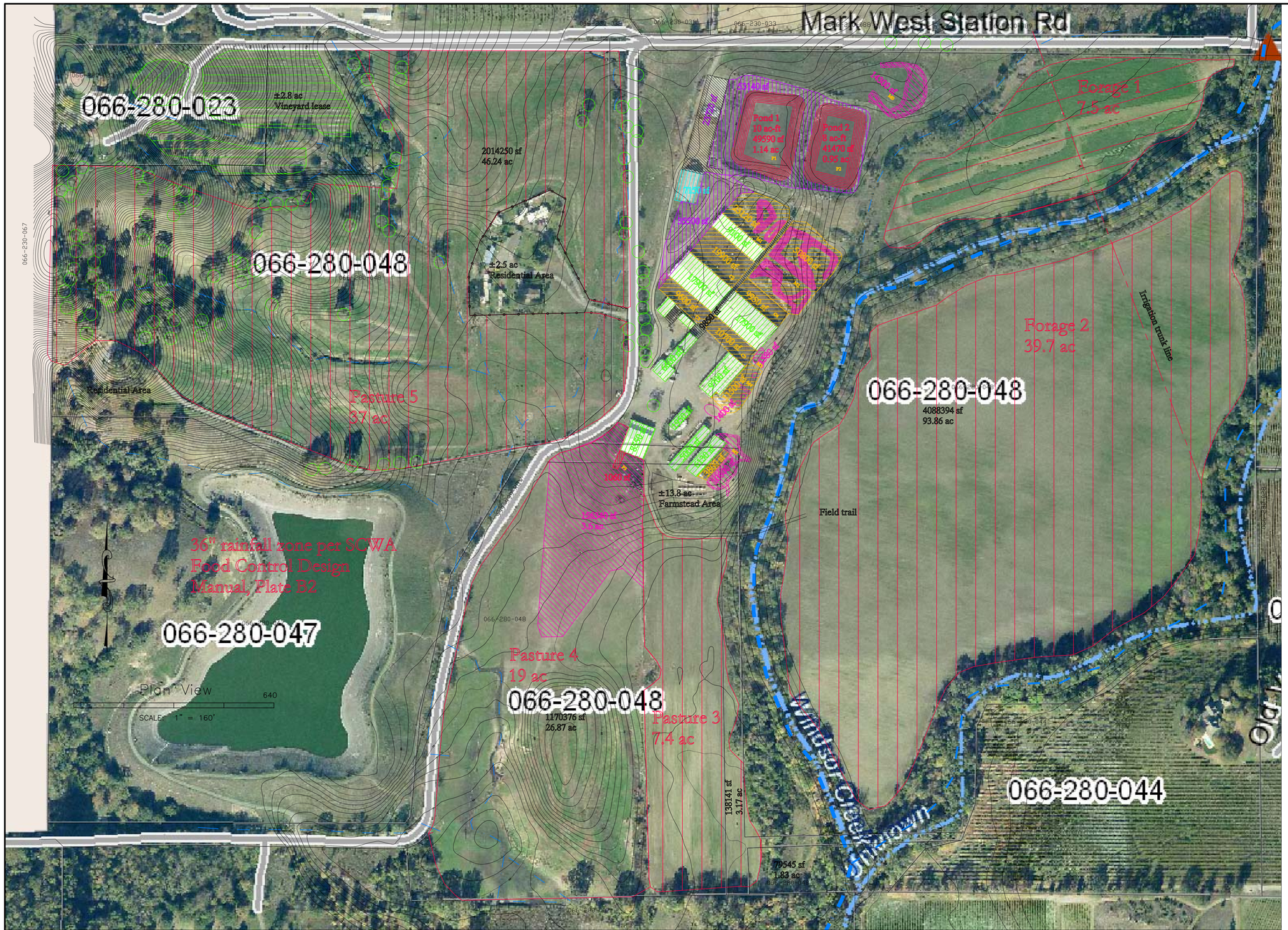
Bioavailability & Edge of Field **104.0** **N credits per year**

Combined TN & TP

With Bio & Edge-of-field	**1 year**	**124.6**	**combined credits**
	4 years	**498.2**	**combined credits**

Attachment B

Erickson Engineering, LLC Site Map



Site

N

Location Sketch

No Scale

Map data: 2009 Color aerial photo from Google Earth.

Horizontal and vertical coordinates per State Plane Coordinate System, California Zone 2, NAD83, US survey feet. Contour lines are highly approximate, per USGS National Digital Terrain Model. Property line has not been located. Field verify critical elevations and dimensions at time of construction.

Planning–level document, subject to revision and adjustment per priorities, inputs, and budget of Owner and Operator. See companion spreadsheet for evaluation of manure production, manured and clean runoff areas, storage sizing requirements, and nutrient budgeting estimates.

Dairy facility geometry is approximate, developed via corrected submeter GPS augmented by tape measurements, visual estimates, and scanned and scaled color aerial photo. Detailed site topo will be required to design and implement some facilities improvement recommendations.

LEGEND

- UNPAVED ROAD
- FENCE
- DRAINAGE
- CULVERT

- 6590 sf Upland tributary
- 6590 sf Manured - concrete
- 6590 sf Manured - pond
- 6590 sf Manured - soil
- 6590 sf Manured - not controlled
- 6590 sf Buildings - guttered
  Gutter - exist
- 6590 sf Buildings - unguttered
  Gutter - proposed
- 6590 sf Buildings

Erickson Engineering Inc.
Civil and Agricultural Engineering
707.795.2498
erickson@ap.net

Dairy Waste Management System
Plan View

Lands of: OCEAN VIEW DAIRY
APN 066-280-048
3975 Mark West Station Road, Windsor CA

03.11.2012

Scale: 1" = 160'

20311 OceanVue.dwg

Sheet C1 of 1

REGISTERED PROFESSIONAL ENGINEER
Lee R Erickson
AE 468
CE 45660
Expires 12/12
Agricultural
Civil
STATE OF CALIFORNIA