



ALAMEDA COUNTY RESOURCE CONSERVATION DISTRICT

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FINAL REPORT

(Note: The recommendations made in this report were approved by SFPUC on 9/26/07)

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This report outlines the Alameda County RCD (ACRCD) recommendation for the creek setback area and grass buffer/filter strip for the Sunol AgPark farm located adjacent to the south side of the San Francisco Public Utilities Commission (SFPUC) Sunol yard and west of the Arroyo de la Laguna. The recommendations were developed in consultation with local USDA Natural Resources Conservation Service (NRCS) staff and are based on NRCS standards and specifications. Appendices following this report contain supporting documents, including designs, diagrams, references, applicable NRCS standards and specifications and a bibliography.

Described in detail below are the recommended dimensions and characteristics of the creek setback area and the allowable land uses/activities within it, the conditions that apply to the allowable uses, and the dimensions, characteristics and maintenance needs of the buffers that are situated between the cropland and the west boundary fence of the AgPark next to the Arroyo de la Laguna. Appendix A includes maps of the farm that show the extent and dimensions of the recommended setback area, the proposed buffer zones, and the farmed area. Appendix B is a more detailed diagram of the setback area and buffers. The text of this report will refer frequently to these documents, so we recommend consulting them early on.

The AgPark is a project of the non-profit organization Sustainable Agriculture Education (SAGE) which has a 9-year lease with SFPUC for the farm property. The farm is located on SFPUC watershed land and is subject to the guidelines in SFPUC's Alameda Watershed Management Plan (AWMP). This plan states that a "300-foot disturbance-free buffer" around all waterbodies and streams is required (AWMP, 2001). This setback was developed from concerns over the effects of grazing on water quality, particularly the pathogen cryptosporidium. The AgPark land will be made available for managed livestock grazing outside of the designated setback area..

The decision was made by SAGE to include NRCS conservation practices in its plan to protect natural resources at the site. ACRCD was contracted by SAGE to determine the appropriate setback and buffer/filter strip dimensions and characteristics for the property based on the current and anticipated farming practices and related activities. Approved by SFPUC on September 26, 2007, the recommendations will be incorporated into the AgPark Management Plan that is scheduled to be completed by SAGE in Fall 2007.

Setting and Background Information

The Sunol AgPark is an 18-acre, primarily organic farm located along the east bank of the Arroyo de la Laguna near its confluence with Alameda Creek in the northwest area of Sunol Valley, near the hamlet of Sunol in Alameda County. The farm is adjacent to the Sunol Water Temple access road, with the Sunol Yard of SFPUC on the northern boundary. The AgPark farmland has been in agricultural production for many years. The deep, loamy Class I soil and nearly level slope qualifies this as prime farmland. This acreage and the immediately surrounding land has produced walnuts, grapes, other row crops, hay, and presently the farm is producing a wide variety of row crops for local East Bay markets. The mix of tall trees that lines the banks of the Arroyo de la Laguna provides a beautiful backdrop to the west side of the farm. Protection of the natural resources in and around the farm, especially the Arroyo de la Laguna riparian corridor, is an important goal of SAGE, SFPUC and ACRC.

The AgPark farmland is nearly flat, and due to excellent soil structure rainfall readily infiltrates into the deep loam soil. Runoff is generally slight, and occurs primarily when soils are saturated from significant storm activity during winter months. The overall slope and direction of drainage of the farm is to the west, toward the Arroyo. The farm is cover cropped during the winter months which reduces erosion and runoff. Other existing and planned features at the farm include small greenhouses, packing sheds, farm roads and parking areas. The presence of these impervious and/or semi-impervious surfaces increases the amount of surface runoff that could make its way towards the creek. ACRC proposes a filter strip and grass buffer strip to treat any incoming runoff containing sediment, nutrients, particulate organics, dissolved contaminants or other constituents from the farmland. No pesticides will be used at the farm and most farmers are working towards organic certification.

The filter strip and grass buffer work to treat runoff by slowing the flow of water as it passes through the dense stand of stems of grasses and forbs which increases infiltration, allows plants to take up and utilize nutrients, traps and filters particles from the water and facilitate the breakdown of dissolved contaminants in the soil. The recommended 30 foot width of the filter/buffer meets NRCS standards for removing such contaminants from the approximately 10 acre farm area that is considered the contributing area.

Overview of Creek Setback Area and Buffers

ACRC recommends the following setback area and associated buffers:

The setback area is located in the northwest portion of the farm, where the Arroyo flows just beyond the AgPark fence. It includes the the portion of the AgPark farm land that extends east 60 feet from the AgPark fence line and 800 feet along the west fence from the north fence of the AgPark property. The setback area contains three zones which are described in detail below. In addition to the setback area within the AgPark, the dense vegetation on the east bank of the Arroyo de la Laguna provides water quality protection for the creek and functions as an unmanaged riparian buffer as opposed to the managed filter strip/buffer within the AgPark. The portion of the bank above the high water line serves as a natural extension of the buffers in the setback area.

Existing Riparian Vegetation: There is a wide band of existing riparian vegetation on the east bank of the Arroyo del la Laguna just west of the AgPark fence. The width of the bank varies from 75-120 feet as the creek bends toward the west in the vicinity of the confluence with Alameda Creek downstream of the AgPark. Efforts are underway in the Alameda Creek watershed to restore the native steelhead fish population in Alameda Creek, increasing the importance of water quality protection. The banks of the Arroyo are densely vegetated with groundcover, shrubs, vines and an overstory of trees. This riparian plant community is part of the largest intact stand of Sycamore-Alluvial Woodland in the Alameda Creek Watershed and is an important interface between aquatic and terrestrial communities (AWHCP, 2006). The riparian corridor is situated outside of, but immediately adjacent to the AgPark

property, extending west from the AgPark fence, and is undisturbed except for the SFPUC graveled service road that parallels the top of the bank just on the west side of the AgPark west fence.

Zone 1- Planted Filter Strip: The filter strip is a 15 foot wide strip of existing and planted grasses, forbs, and irrigated shrubs and trees that extends east from the west AgPark fence. The primary purpose of the filter strip is to provide filtration of runoff coming from the cropped areas. The continuous mat of dense grass stems traps sediment, increases infiltration and allows nutrient uptake by grasses and other plants. The perennials, shrubs and trees, mostly native to the area, have been selected to provide a rich habitat to attract and support beneficial insects. These plants will be widely spaced within the filter strip to form an open hedgerow that will not block sunlight to the grass and forbs. A detailed plant list and planting diagram is provided in Appendix C. Funding to plant and irrigate the filter strip is being provided by USDA Environmental Quality Incentives Program (EQIP) funds, with match provided by SFPUC.

Zone 2- Grass Buffer: Continuing in an uninterrupted fashion from the filter strip is a 15 foot wide grass buffer. Together, the filter strip and grass buffer provide 30 feet of dense grass that will function to infiltrate runoff, trap sediment, take up and utilize nutrients. The NRCS filter strip practice requires permanent, herbaceous vegetation (grasses, legumes and/or other forbs) to maintain sufficient stem density. The grass buffer provides the same water quality improvement functions as the filter strip, but is being considered separate because it is not being planted or irrigated as the plants in the filter strip are. Like the filter strip, the grass buffer will provide an important insectary role for the organic farm and can therefore be considered to be a part of the AgPark's Integrated Pest Management plan. Appendix C details the beneficial uses that the plants will provide.

Zone 3- Limited Use Area: For a distance of 30 feet east of and immediately adjacent to the buffer and filter strip is a band of farmland that falls within the setback area. Within this area several land uses/ activities that could potentially be a source of nutrient-rich runoff or leachate, such as composting with animal manures, greenhouses and livestock containment pens, are restricted. Allowed and disallowed uses with this 30 foot zone and associated conditions of use to provide environmental protection are outlined below.

Allowed and Disallowed Uses and Conditions for Farming and Other Activities

The setback area and buffers have been designed based on allowed, appropriate activities and uses (and conditions of use for each) of the AgPark land. These allowable uses have been drawn from the following which have been proposed at various times in AgPark planning: planting of a filter strip, cultivation of annual & perennial crops, establishment of agricultural buildings (i.e., greenhouses, shed packing) and other infrastructure, livestock facilities, composting, stock-piling of agricultural materials, and other uses. For uses that have been selected to be appropriate, certain conditions may apply that will serve to ensure the uses are environmentally benign or even beneficial.

Recommended Allowed Uses and activities within the Filter Strip and Buffer- Zones 1 and 2

1. Planted filter strip along west fenceline

Seeded with grasses and forbs, planted with perennials, native shrubs, and limited numbers of deciduous trees to create a combination grass filter strip and insectary. Drip irrigation provided to perennial plants, shrubs and trees. Bee boxes may be situated throughout the filter strip.

Conditions- not disced or plowed, greenwaste for mulch, only thoroughly composted and aged compost used for mulch and planting mix, no herbicides for weed control. Bi-annual mowing to maintain stem

density and reduce fire hazard. Periodic removal of mowed grass clippings to remove nutrients that are contained in the plant tissue. No parking on filter strip, no construction or materials storage. Maintain plantings with irrigation until established.

2. Grass buffer- adjacent to and continuous from the filter strip

Dense stand of grass and forbs.

Conditions- *bi-annual mowing for weed control and to address fire hazard, not disced or plowed, annual re-seeding with grass, wildflower seed to crowd out weeds as needed and maintain stem density. Use of flamer, solarization to control Bermuda and bindweed. No parking on filter strip, no construction or materials storage.*

3. Bee hives

Boxes situated throughout filter strip as needed.

Conditions- *No chemicals used in upkeep.*

4. Picnic/education area – picnic tables in shade of trees near back gate in filter strip- groundcover is mowed grass.

Conditions- *No parking in Zones 1 and 2 .*

5. Path -mowed grass path or greenwaste mulch covered path meanders through filter strip for educational walks

Conditions- *mow at least twice annually to control weeds*

6. Weed control- i.e., use of flamer, sheet mulch, solarization

Conditions: *Round-Up (or other more environmentally benign product) on Bermuda grass and bindweed as necessary only to control infestations, drift will be controlled.*

Recommended Allowed Uses and activities within the Limited Use Area- Zone 3

1. Primarily organic farming of row crops and perennials

Conditions- *organic farming method (most farmers), only thoroughly composted and aged compost applied (and immediately incorporated into the soil), organic fertilizers. Farmers are working towards becoming certified organic at varying rates. No use of pesticides that are not allowed by accepted organic practices.*

2. Farm crop residue and greenwaste composting

Conditions-*no manure inputs*

3. Mowed grass or dirt (unimproved) access road

Conditions- *minimize extent of road, keep weeds low by mowing or light disking*

4. Cover crop – EQIP funded annually.

Cropped areas seeded to green manure crop (i.e., bell beans) in late fall, plowed under in early spring. May spread and disk in aged manure (at a rate equivalent to no more than approximately 10 cubic yards per acre) as cover crop is plowed in during early spring; soil testing may be undertaken to help determine quantity of manure that is needed.

Conditions- *seed immediately after disking in crop residue, late fall*

5. Picnic/education area – picnic tables in shade of trees near back gate; groundcover is mowed grass. Limited parking.

Conditions- *no parking on wet soils or in filter strip or grass buffer.*

6. Path -mowed grass path or greenwaste mulch covered path meanders through filter strip for educational walks

Conditions- mow at least twice annually to control weeds

7. Weed control- i.e., use of flamer, sheet mulch, solarization

Conditions: Round-Up (or other more environmentally benign product) on Bermuda grass and bindweed as necessary only to control infestations

8. Agricultural materials stockpiling: picking and packing boxes, row covers, greenhouse parts, irrigation supplies, other

Conditions: no trash, maintain/empty recycling containers, periodic cleanup and organization to avoid creation of rodent habitat

9. Other infrastructure: small sheds, parking, storage of farm machinery (tractors, vehicles), drying yard for fruit and vegetables

Conditions: do not allow vehicles and farm equipment to leak oil or other liquids onto soil surface. Roof runoff shall be managed to ensure that no concentrated flows of water are formed that may cause soil erosion.

Other uses yet to be proposed- need to develop process for review, with conditions to be determined based on potential impacts of the land use activity.

Recommended DISALLOWED Uses and activities within the Limited Use Area –Zone 3

1. Compost operation- (with animal manures) due to potential percolation of leachate into soil.

2. Greenhouses- due to infiltration into the soil (greenhouse "floor" is native soil) of nutrient-rich drainage from plant containers

3. Livestock- due to potential infiltration of nutrients into the soil from small farm animals (chickens) livestock pens, or manure in stormwater runoff from pens. Note: the limited numbers of small farm animals (chickens) that may be maintained at the AgPark may be contained in pens located outside the setback area and a grass buffer strip will be located downslope of each pen to filter runoff. Pens will be cleaned as necessary to prevent manure build up. Managed grazing is permitted outside of the proposed setback area on AgPark property.

Setback Area and Filter Strip/Buffer Determination

As described above, based on site physical characteristics, local requirements and NRCS Conservation Practice Standards, the ACRCDD and NRCS suggest that the AgPark setback area extend 60 feet to the east from the AgPark west fence. This setback area includes the two planted and managed buffers, the EQIP filter strip (Zone 1) and grass buffer (Zone 2). Together they have a flow length (width) of 30 feet. Included is a 30 foot wide Limited Use Area (Zone 3) which has restricted land uses as outlined above, and will serve to protect groundwater (located 20-30 feet below soil surface) that flows parallel to the creek channel (DEIR,1999) .

The soil at the site has low erosion potential and most of the runoff is infiltrated into the soil rather than forming concentrated, channelized flows that carry sediment and contaminants to the creek. The

addition of the filter strip/grass buffer will further prevent concentrated runoff from entering the creek due to increased infiltration of potential runoff into the soil.

AgPark Soil Characteristics

Soil Survey Alameda Area (SSAA, 1966)

- Yolo Loam soil (YmA) is found on 0 – 3% slopes on level valley floors
- Soil has good natural drainage
- Runoff potential is very slow to slow
- Water holding capacity is high
- Erosion hazard is slight in cultivated areas

Climate/Hydrology Characteristics

- Storm Events: Once every two years the Alameda area will have storms that can produce 1.2 inches of rain in 24 hours. Once every 100 years storms can produce 2.75 inches of rain in 24 hours. (SSAA,1966)
- Average annual precipitation ranges from 10 to 20 inches (AWHCP, 2006)
- Sunol Valley shallow groundwater levels are 20-30 feet below the ground surface (DEIR, 1999)
- Streamflow is subsurface during a majority of the dry season (June-October) (AWHCP, 2006)
- Direction of groundwater flow is parallel to the creek (AWHCP, 2006)

Filter Strip Determination:

NRCS Conservation Practice Standard 393- Filter Strip requires:

- A minimum 30 foot wide filter strip for reduction of sediment and dissolved contaminants in runoff
- The ratio of the amount of drainage area to the size of the filter strip shall be less than 60:1 in regions with RUSLE R factor values, based on annual rainfall intensity, of 35-175
 - Alameda County has RUSLE R factors that range from 40-60
 - The AgPark has approximately 10 acres contributing runoff to the filter strip. The filter strip will be 30 feet in width x 800 feet in length (north/south, parallel to fence line) to infiltrate and treat runoff
 - Determination of ratio:
$$\frac{10 \text{ acres (approx. contributing area)}}{30' \times 800' \text{ (filterstrip dimensions)}} = \frac{435,600 \text{ sq. ft.}}{24,000 \text{ sq. ft.}} = 18:1 \text{ ratio}$$

NRCS states that filter strips as short as 15 feet have been effective for removal of sediment. Very little increase of sediment removal is seen with filters that are larger (NRCS, 2003). A buffer that is 30 feet in width will be more than effective at sediment and nutrient removal that is occurring on the site. Stuart et al (2006) and Tate et al (2006) contain many references to recent literature that cover the effectiveness of filter strips.

Setback Determination

The activities that will be occurring at the AgPark site do not necessitate a setback greater than 135 feet from the centerline for the creek (60 feet setback area plus 75 feet (minimum) from fence to centerline of creek). Organic farming will not be contributing pesticides and the adjacent filter strip and grass buffer will trap and treat any sediment, nutrients or other contaminants carried towards the creek by surface runoff.

Setback Requirements (local):

Alameda County Ordinance requires a 20 feet minimum setback distance from streams. See diagram Appendix D.

Alameda Watershed Management Plan

In the Alameda Watershed Management Plan (AWMP), SFPUC requires a “300-foot disturbance-free buffer” around all water bodies and streams (2001).

Please see Appendix G for additional sources of information concerning setbacks and buffers that relates to the reasoning employed in developing these recommendations.

Maintenance Considerations for Buffers

Filter Strip with Hedgerow, Grass Buffer and Associated Management Practices

The NRCS states the filter strip should contain permanent herbaceous vegetation consisting of grasses, legumes, and/or other forbs adapted to the local climate. Use of native plants increases the potential for habitat improvement and increase in beneficial insect populations (NRCS, 2006).

The Yolo County RCD has developed an effective protocol for establishing hedgerows for habitat improvement. The hedgerow can include trees, shrubs, perennial forbs and grasses that attract beneficial insects, mammals, reptiles and birds. Hedgerows that are planted with native species have a lower maintenance requirement once they are established and suppress weeds, decrease wind and water erosion, and can also serve as a filter to improve water quality.

The grass buffer and filter strip combination will provide a filter strip area of 15 feet of continuous herbaceous vegetation as well as a hedgerow area including shrubs, forbs and herbs for habitat improvement.

Zone 1 (filter strip with hedgerow) and Zone 2 (grass buffer) are contiguous and will together provide 30 feet of dense groundcover. Management considerations are listed below. See Appendix F for more information on NRCS Standards and Specifications.

Filter Strip Operation and Management (NRCS, 2006)

- Permanent filter strip vegetative plantings should be harvested as appropriate to encourage dense growth and continued nutrient/sediment removal.
- It is important to control noxious weeds.
- Inspect the filter strip after storm events, remove deposited sediment accumulation, and reseed disturbed areas where applicable.
- Encourage sheet flow across filter, and if evidence of channelized flows in or upslope of the filter strip is observed, make adjustments to divert water away and/or spread out flows.
- Sediment should be removed before it accumulates to a height higher than 6 inches and begins to divert runoff around the strip; removal by tillage or other equipment may be required followed by reestablishment of vegetation.
- Nutrient uptake and carbon sequestering is more efficient if area of biomass is mowed and removed. A mowing and harvest schedule should be a vital part of the management plan.
- Shallow trenches can be constructed across the flow direction to enhance infiltration

Hedgerow Maintenance (Yolo County RCD, 1999)

- Irrigation is essential, especially during dry periods.
- Weed control is most important for success, even when native grasses are planted.

The filter strip/hedgerow should not be disturbed by equipment and vehicular traffic.

- It is important to ensure equipment is out of the way. Placing a hedgerow too close to a road may be problematic if the equipment damages the plants (Yolo County RCD, 1999).
- Vehicles should not be parked in the filter strip

Tree and Shrub Management (NRCS, 2006)

- At a minimum, an annual inspection will be conducted to determine 'spots' where additional attention is needed, if necessary.
- Replant, as necessary and practical, to maintain a fully productive stand.
- Competing vegetation will be controlled until woody plants are established.
- Irrigation provided to ensure adequate survival.

Recommendations- periodic review and adjustment

The recommendations in this report for appropriate set back and buffers should be periodically assessed as research brings new findings and considerations to light. There are additional studies that we will be following up on, such as the use in filter strips of deep-rooted perennials and winter cereal to take up nitrogen during winter rainy periods (Los Huertos, 1999 cited on p.4 in Stuart et al, 2006). If additional site-specific information becomes available, the recommendations may be adjusted. ACRCDD may work with NRCS to bring a water quality specialist out to the AgPark to evaluate the recommendations based on site conditions. Also, there may be new or different land uses that might be proposed which could necessitate review of the buffers. At some point after the buffers become fully functional it might be possible to secure a college student intern who could design and implement a runoff sampling program to test the efficiency of the buffers.

ACRCDD appreciates the opportunity to develop these recommendations, and hopes that they will be implemented successfully at the AgPark.

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Note: Appendix H. contains a full bibliography for the report

The following ACRC and NRCS staff members contributed to this report:

Amy Evans, ACRC Resource Conservationist- project coordination, research and report writing
Leslie Koenig, ACRC Project Assistant- research, editing and writing
Terry Huff, NRCS District Conservationist- technical review
Jackie Charbonneau, NRCS Ecologist- technical review
Morrie-Ann Nagata, Asian-Pacific Scholar Intern- planting design and plant research

List of Appendices (The appendix is a separate document- filename “AgPark Setback Appendix”)

- Appendix A. Sunol AgFarm airphoto/maps
- Appendix B. Diagram of Recommended AgPark Setback Area and Buffers
- Appendix C. Planting Plan for Filter Strip and Plant Chart
- Appendix D. Alameda County Ordinance- stream setback requirement
- Appendix E. High Water Quality Vulnerability Zone Map, (AWMP)
- Appendix F. NRCS Standards and Specifications for practices
- Appendix G. Supporting Documentation- setback and buffer research references
- Appendix H. Report Bibliography

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Appendix: S:\Service_Center\Shared All - NRCS RCD\AgPark- Sunol\AgPark SetbackAppendix.pdf