

Almondridge East Stormwater Control Plan

C.3 Report

Subdivision 8880

APN: 051-200-053 & 051-200-015

October 3, 2005

**Prepared for:
City of Antioch**

**Owner/Developer/Contractor:
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Stormwater Control Plan – Almondridge East

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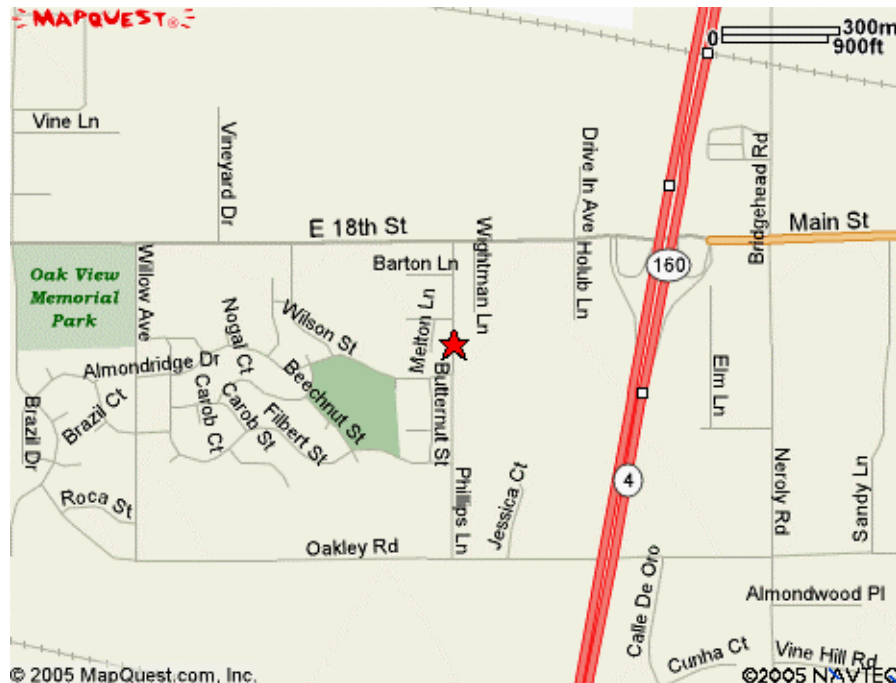
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Stormwater Control Plan – Almondridge East

I. Project Setting

a. Project Location and Description

Almondridge East will be 81 lot single-family homes on approximately 22 acres. The project is located on the east side of Phillips Lane, south of East 18th Street in Antioch, California. The project site is bounded by single-family residential properties to the north, south, and west, and by a vacant field and Highway 4 to the east.



b. Existing Site Features and Conditions

The site terrain is relatively gentle varying from twelve feet (12-ft) below Phillips Lane on the southwestern corner of the site to approximately level with Phillips Lane on the northwestern corner. Elevations range between 40 and 70 feet above mean sea level (MSL). There are cut slopes on the southern half of the site which are ten feet (10-ft) or less in height. These slopes have gradients ranging between 3:1 and 5:1 (horizontal:vertical).

The site is currently undeveloped and is covered with loose surficial sand and a sparse coverage of seasonal grasses and brush. There is a small almond orchard in the northeastern corner of the site with small stockpiles of imported soil.

The site has been rezoned PD (planned development) with 6,000 square foot minimum lot size. The average lot size is approximately 8,078 square foot.

A geotechnical exploration of the site was performed by ENGEO and summarized in their report dated December 15, 2004 (project number 1482.4.102.01). The site is located in an area of moderate seismicity. No faults, active or otherwise, are known to come to the surface within or very close to the project site. In addition, no portion of the site is mapped within a Seismic Special Study Zone. The closest active strike-slip fault with surface expression is the Greenville fault located approximately 9 miles to the west.

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The site soils encountered and detailed by ENGEO generally consist of 25-ft of silty sands and sandy silts underlain by primarily silty clays and clayey silt. Groundwater was not encountered during drilling. Fluctuations in groundwater levels are expected to occur seasonally in response to changes in precipitation, irrigation, and other factors. Bedrock was not encountered in the 12 borings (4 in October 2004, and 8 in December 1993). The soils across the site are highly permeable (NRCS Hydrologic Soil Group "A").

Existing surface drainage enters the site from almost all directions as the site is in depression. The overall area drainage is directed from southwest to northeast.

c. Opportunities and Constraints for Stormwater Control

Constraints include flat general topographic relief and no planned park or field area which could serve for combined use as cleanwater and recreational facility. While the single-family residential project is low-density, some of the City and geotechnical requirements pose challenges. Specifically, the City requires that access walkways be provided for each on-street parking space. With the addition of driveways, curb ramps and utility boxes it is a challenge to provide sufficient square footage for vegetated "dry" swales, also known as bio-swales.

The site will be moderately graded to create access, building pads and site drainage while minimizing import material and impacts to adjacent properties.

There is an opportunity for deep infiltration on this site due to the high soil permeability. The project design attempts to capitalize on the permeability to the fullest extent without jeopardizing structural integrity and long term maintenance capability.

The elevation differential provides sufficient hydraulic head for vegetated "dry" swales without resulting in inappropriate velocities. The area between back of curb and sidewalks accommodate space for swales as soil-filtration BMPs.

II. Measures to Limit Imperviousness

a. Measures to Cluster Development and Protect Natural Resources

Where possible, driveways will be grouped to maximize pervious areas. Home sites are separated sufficiently to allow vegetated areas and pervious areas between the impervious areas.

b. Measures Used to Limit Directly Connected Impervious Area

The impervious areas (roofs, driveways, paths, and roads) are disconnected from the drainage system. Additionally, the impervious areas are separated consistent with single-family detached homes in order that pervious areas separate the impervious areas.

As mentioned above, the sidewalk has been separated from the roadway curb and gutter to further limit directly connected impervious areas and provide an area for a "dry" swale.

Conventional concrete and conventional asphalt are used throughout the site. Permeable pavements are impractical due to the maintenance expense required. Permeable pavement is a viable alternative for isolated pavement areas.

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c. Summary of Pervious and Self-Retaining Areas

The perimeter of each lot will be landscaped and remain pervious. However, due to the structural considerations outlined in the geotechnical report, it is not possible to make these areas self-retaining. It may be possible for rear yards to be self-retaining – however, this solution may potentially pose maintenance and management issues. For the purpose of this report, we anticipate that local drainage systems are created for each lot resulting in non-self-retaining pervious areas.

The swales receiving runoff have been sized to take into account the impervious area of the roofs, driveways, roadway, and sidewalk. The swales will receive runoff via overland flow. Where the swale intersects driveways, surface water (anticipated only during large storm events) will proceed through the trench drain at the sidewalk/driveway apron intersection. The area of the trench drain is not included in the “dry” swale treatment area.

To reduce the amount and velocity of runoff, and to protect down-slope areas and swales from siltation, exposed slopes will be limited in height and steepness wherever possible. Exposed slopes will be stabilized and vegetated.

III. Selection and Preliminary Design of Stormwater Treatment BMPs

Requirements to manage increases in runoff peak flows and durations (hydrograph modification management), will not apply, as those requirements have not yet been placed in effect by the County.

Treatment facilities are designed to accommodate runoff from the specified design storm intensity of 0.2 inches per hour (as recommended on page 50 in the Contra Costa Clean Water Program Stormwater C.3 Guidebook, Second Edition).

The Stormwater Control Plan Exhibit shows the BMPs and the corresponding areas of the site that drain to each swale. The site has been divided into 24 drainage areas. The sizes of the areas are shown on Table 2 of Attachment A. The location of the areas are shown on the exhibit and the corresponding BMPs are shown in Table 2 of Attachment A.

Runoff from the areas is managed by routing to a “dry” swale sized to treat runoff for these project areas. The roadways will drain toward the swale with curb openings designed to accommodate the overland flow. Drainage from driveways and sidewalks will overland flow into the swale. Area drains from roof downspouts will drain toward the swale via area drain piping with outlet directly into the swale. All portions of the swale are located adjacent to public streets in order to have suitable access for inspection and maintenance. The swale is intended to meander in the 4.5-foot landscape area (AKA planter strip) between the back of curb and sidewalk in order to provide a natural appearance while maximizing access and maintenance ease.

Runoff from all impervious areas will be treated as mentioned above.

a. General Treatment BMP Characteristics

Runoff from roofs, walkways, and driveways for the 81 lots, as well as the access roadways, will be collected and conveyed to treatment BMPs – a swale running along both sides of all in-tract streets.

Trench drains are intended in locations where driveways cross the bio-swale in order to convey surface water. Walkways serving the on-street parking are anticipated to bridge the swale to allow treatment and drainage to proceed unobstructed. Since the walkways

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will have only pedestrian loading, the structural section and depth of the walkway is not anticipated to interfere with bio-swale treatment or drainage.

The BMPs are located to accommodate individual drainage areas, site topography, while allowing maintenance access from public right of way. Each length of the BMP has adequate hydraulic head to allow drainage into, through, and away from the BMP without the need for pumps.

Small utility boxes and meters will be installed with vapor barriers within the planter strip. Large transformer boxes and vaults will be located in a public utility easement (PUE) adjacent to the roadway right of way. Attachment C-1-7 (page 1) of the Contra Costa Clean Water Program Stormwater C.3 Guidebook, (Second Edition) states that *“perforated pipe underdrain is incorporated into the design where native soils are clayey (hydrologic soil groups “C” and “D”) or when infiltration is not desired.”* Since infiltration is desired for this project, underdrains are not proposed for the bio-swales.

Attachment C-1-7 (page 1) of the Contra Costa Clean Water Program Stormwater C.3 Guidebook also indicates that *“multiple inlets may be located along the length of the swale.”* Therefore, intermediate field inlets for surface collection – for large storm events – are included within Area SW09.

The industry standard has been to provide a sandy loam as backfill material within the bio-swale. However, since the native soil has an infiltration rate faster than 5-inches per hour, bio-swales will consist of native soil material.

b. Specific Characteristics

i. Area Characteristics

Area SW01: Totaling 12,375 square feet of impervious area includes roof and driveway area for lot 1. In addition to the home site, the area also includes a portion of the sidewalk and Filbert Street as shown on the exhibit. The swale is 315 linear feet by 4.5-ft wide, totaling 1,417.5 square feet.

Area SW02: Totaling 9,417 square feet of impervious area includes the sidewalk and half of Filbert Street as shown on the exhibit. The swale is 282 linear feet by 4.5-ft wide, totaling 1,269 square feet.

Area SW03: Totaling 7,688 square feet of impervious area includes the sidewalk and half of Filbert Street as shown on the exhibit. The swale is 302 linear feet by 4.5-ft wide, totaling 1,359 square feet.

Area SW04: Totaling 7,554 square feet of impervious area includes the sidewalk and half of Filbert Street as shown on the exhibit. The swale is 254 linear feet by 4.5-ft wide, totaling 1,143 square feet.

Area SW05: Totaling 5,251 square feet of impervious area includes a portion of the roof area from lot 2 and the sidewalk and half of “A” Street as shown on the exhibit. The swale is 80 linear feet by 4.5-ft wide, totaling 360 square feet.

Area SW06: Totaling 5,188 square feet of impervious area includes a portion of the roof area from lot 64 and the sidewalk and half of “A” Street as shown on the exhibit. The swale is 80 linear feet by 4.5-ft wide, totaling 360 square feet.

Area SW07: Totaling 10,426 square feet of impervious area includes the entire roof and driveway area for lot 3, the driveway for lots 2 and 4 and a portion of the

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roof area for lots 2 and 4. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Street adjacent to the lots as shown on the exhibit. The swale is 106 linear feet by 4.5-ft wide, totaling 477 square feet.

Area SW08: Totaling 8,287 square feet of impervious area includes roof and driveway areas lots 66, the entire driveway for lot 65 and a portion of the roof for lot 65. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Street adjacent to the lots as shown on the exhibit. The swale is 150 linear feet by 4.5-ft wide, totaling 675 square feet.

Area SW09: Totaling 112,830 square feet of impervious area includes roofs and driveways for 42 through 64. In addition to the home sites, the area also includes a portion of the sidewalk and “C” Street adjacent to the lots as shown on the exhibit. The swale is 1,242 linear feet by 4.5-ft wide, totaling 5,589 square feet.

Area SW10: Totaling 15,511 square feet of impervious area includes roofs and driveways for lots 67, 68 and a portion of the roof area from lot 69. In addition to the home sites, the area also includes a portion of the sidewalk and “C” Street adjacent to the lots as shown on the exhibit. The swale is 279 linear feet by 4.5-ft wide, totaling 1,255.5 square feet.

Area SW11: Totaling 14,018 square feet of impervious area includes roofs and driveways for lots 5, 6 and 7 and a portion of the roof area from lot 4. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Street adjacent to the lots as shown on the exhibit. The swale is 127 linear feet by 4.5-ft wide, totaling 571.5 square feet.

Area SW12: Totaling 8,459 square feet of impervious area includes a portion of roof area from lots 65 and 72 and a portion of the sidewalk and “B” Street as shown on the exhibit. The swale is 151 linear feet by 4.5-ft wide, totaling 679.5 square feet.

Area SW13: Totaling 16,519 square feet of impervious area includes driveways for lots 69, 70, 71, and 72, the entire roof on lots 70 and 71 and a portion of the roof at lots 69 and 72. In addition to the home sites, the area also includes a portion of the sidewalk and “D” Street adjacent to the lots as shown on the exhibit. The swale is 205 linear feet by 4.5-ft wide, totaling 922.5 square feet.

Area SW14: Totaling 15,969 square feet of impervious area includes driveways for lots 74, 75 and 76, roofs for lots 74 and 75 and a portion of the roof from lot 76. In addition to the home sites, the area also includes half the roadway and sidewalk at “D” Street adjacent to the lots as shown on the exhibit. The swale is 221 linear feet by 4.5-ft wide, totaling 994.5 square feet.

Area SW15: Totaling 25,737 square feet of impervious area includes driveways for lots 8, 9, 10, 11, 12, and 13; roofs for lots 8, 9, 10, 11, 12 and a portion of lot 13. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Street adjacent to the lots as shown on the exhibit. The swale is 250 linear feet by 4.5-ft wide, totaling 1,125 square feet.

Area SW16: Totaling 15,687 square feet of impervious area includes roofs and driveways for lots 73, 80 and 81. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Street adjacent to the lots as shown on the exhibit. The swale is 178 linear feet by 4.5-ft wide, totaling 801 square feet.

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Area SW17: Totaling 9,639 square feet of impervious area includes a portion of the roofs for lots 76 and 77. In addition, the area also includes a portion of the sidewalk and “C” Street adjacent to the lots as shown on the exhibit. The swale is 160 linear feet by 4.5-ft wide, totaling 720 square feet.

Area SW18: Totaling 14,566 square feet of impervious area includes driveways for lots 77, 78, and 79, roof areas for lots 78, 79 and a portion of lot 77. In addition to the home sites, the area also includes a portion of the sidewalk and Almondridge Drive adjacent to the lots as shown on the exhibit. The swale is 199 linear feet by 4.5-ft wide, totaling 895.5 square feet.

Area SW19: Totaling 16,624 square feet of impervious area includes roofs and driveways for lots 26, 27 and 28. In addition to the home sites, the area also includes a portion of the sidewalk and Almondridge Drive adjacent to the lots as shown on the exhibit. The swale is 175 linear feet by 4.5-ft wide, totaling 787.5 square feet.

Area SW20: Totaling 7,220 square feet of impervious area includes portions of the roof for lot 13. In addition, the area also includes a portion of the sidewalk and Almondridge Drive adjacent to the lot as shown on the exhibit. The swale is 117 linear feet by 4.5-ft wide, totaling 526.5 square feet.

Area SW21: Totaling 9,860 square feet of impervious area includes roof and driveway for lot 14. In addition to the home site, the area also includes a portion of the sidewalk and Almondridge Drive adjacent to the lot as shown on the exhibit. The swale is 116 linear feet by 4.5-ft wide, totaling 522 square feet.

Area SW22: Totaling 26,549 square feet of impervious area includes roofs and driveways for lots 15, 16, 17, 18, and 19. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Court adjacent to the lots as shown on the exhibit. The swale is 299 linear feet by 4.5-ft wide, totaling 1,345.5 square feet.

Area SW23: Totaling 29,965 square feet of impervious area includes roofs and driveways for lots 20, 21, 22, 23, 24, and 25. In addition to the home sites, the area also includes a portion of the sidewalk and “B” Court adjacent to the lots as shown on the exhibit. The swale is 333 linear feet by 4.5-ft wide, totaling 1,498.5 square feet.

Area SW24: Totaling 66,850 square feet of impervious area includes roofs and driveways for lots 29 through 41. In addition to the home sites, the area also includes a portion of the sidewalk and “C” Street adjacent to the lots as shown on the exhibit. The swale is 756 linear feet by 4.5-ft wide, totaling 3,402 square feet.

ii. Bio-Swales

The bio-swales have been designed and will be constructed according to the criteria included in the [Contra Costa Clean Water Program Stormwater C.3 Guidebook, Second Edition](#) - Attachment C-1-7. The bio-swales have the following characteristics:

- 6 inch minimum depth.
- Side slope no greater than 4:1 with smooth transitions.
- Longitudinal slope between 0.2% and 6%.

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- Check dams, where required on steep slopes, minimum 12 inches wide.
- 12 inch minimum width of curb cut, with ½ inch drop across cut to avoid collection of debris.
- Splash blocks or cobbles at inlets and inlet pipes.
- Native soils protected against compaction during construction.
- Plant selected for viability and to minimize need for fertilizers and pesticides.

c. Sizing Calculations

Trench drains will be placed in locations where driveways cross the bio-swale in order to convey surface water. Trench drain lengths at driveways are not included in the BMP treatment area calculations.

The native soils are highly permeable; therefore, the design proposes to have the entire 4.5-ft planter strip between the back of curb and sidewalk as treatment area. Since the bio-swales are considerably oversized than what would be required, placement of service meters, small boxes, valves, hydrants, and light poles are not anticipated to significantly reduce the treatment area.

See Table 1 and Table 2 (Attachment A) for sizing calculations of pervious and impervious areas and the corresponding BMP treatment measure.

IV. Source Control Measures

The single-family residential project will create few potential sources of stormwater pollutants. Sources to be controlled include:

- Potential dumping of wash-water or other liquids into storm drain inlets.
- Need for future indoor or structural pest control.
- Fertilizers and pesticides used in park, open space, garden, and yard maintenance.
- Vehicle washing.

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Table 3. Sources and Source Control BMPs

Potential Source	Permanent Controls (BMPs)	Operational Controls (BMPs)
On-site dumping into storm drain inlets	All accessible on-site inlets will be marked with the words “No Dumping! Flows to Bay”	Markings will be periodically repainted or replaced. Inlets and pipes conveying stormwater to BMPs will be inspected and maintained as part of BMP Operation and Maintenance Plan.
Need for future indoor or structural pest control		Integrated Pest Management (IPM) information will be provided to new homeowners.
Landscape/outdoor pesticide use	Final landscape plans will: Be designed to minimize irrigation and runoff and to minimize use of fertilizers and pesticides that can contribute to stormwater pollution. Specify plantings within bioretention areas and swales that are tolerant of sandy and sandy loam soil and periodic inundation. Include pest-resistant plants. Include plantings appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency and plant interactions.	Landscape will be maintained using minimum or no pesticides. IPM information will be provided to new owners.
Vehicle washing	Driveways and parking areas drain to bioretention area or swales.	Distribute stormwater pollution prevention information to homeowners.

V. Summary of Permitting and Code Compliance Issues

There are no known conflicts between the proposed stormwater control plan and City of Antioch ordinances or policies. Any conflicts that are found will be resolved through the design review process or during subsequent permitting.

VI. BMP Operation and Maintenance

a. Means to Finance and Implement BMP Maintenance

All stormwater treatment facilities (swales) in this plan will be owned and maintained by the developer until such time that the roadway right of way is dedicated to the City of Antioch. The applicant accepts responsibility for interim operation and maintenance of the facilities until such time as this responsibility is formally transferred to the City for ownership and the Lighting and Landscape District for maintenance.

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The applicant will submit, with the application of building permits, a draft Stormwater Facilities Operation and Maintenance Plan including detailed maintenance requirements and a maintenance schedule.

b. Summary of Maintenance Requirements

Swales remove pollutants primarily by filtering runoff slowly through an active layer of soil. Routine maintenance is needed to insure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical routine maintenance consists of the following:

- Inspect inlets for channels, exposure of soils, or other evidence of erosion. Clear any obstructions and remove any accumulation of sediment. Examine rock or other material used as a splash pad and replenish if necessary.
- Inspect outlets for erosion or plugging.
- Inspect side slopes for evidence of instability or erosion and correct as necessary.
- Observe soil at the bottom of swale or filter for uniform percolation throughout. If portions of the swale or filter do not drain within 48 hours after the end of a storm, the soil should be tilled and replanted. Remove any debris or accumulations of sediment.
- Confirm that check dams and flow spreaders are in place and level and that channelization within the swale or filter is effectively prevented.
- Examine the vegetation to ensure that it is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary, remove fallen leaves and debris, prune large shrubs or trees, and mow turf areas. Confirm that irrigation is adequate and not excessive. Replace dead plants and remove invasive vegetation.
- Abate any potential vectors by filling holes in the ground, in and around the swale and by ensuring that there are no areas where water stands longer than 48 hours following a storm. If mosquito larvae are present and persistent, contact the Contra Costa County Vector Control District for information and advice. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.

VII. Construction Plan C.3 Checklist

Stormwater Control Plan Reference	BMP Description	Plan Sheet Number
Section II.b, Attachment A, and Exhibit	Swales SW1 through SW24 sized as specified and designed to capture and route drainage from the areas delineated on Exhibit.	
Table 2, Section 3.b.i, Exhibit	Drainage from lot 1 and the southern portion of Filbert Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	

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Stormwater Control Plan Reference	BMP Description	Plan Sheet Number
Table 2, Section 3.b.i, Exhibit	Drainage from the northern half of Filbert Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from portion of lot 2 roof down-spouts and western half of "A" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from portion of lot 64 roof down-spouts and eastern half of "A" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from remainder of lot 2, all of lot 3, portion of lot 4, and adjacent southern half of "B" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from portion of lot 65, all of lot 66, adjacent northern half of "B" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lot 64, all of lots 42 through 63 and the eastern half of "C" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lot 69, all of lots 67, 68, the northern half of "B" Street, and western half of "C" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lot 4, all of lots 5, 6, 7 and the western half of "B" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lots 65, 72 and the eastern half of "B" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lots 69, 72, all of lots 70, 71 and the southern half of "D" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lot 76, all of lots 74, 75 and the northern half of "D" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from lots 8, 9, 10, 11, 12, a portion of 13 and the western half of "B" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from lot 73, 80, 81 and the eastern half of "B" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	

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Stormwater Control Plan Reference	BMP Description	Plan Sheet Number
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lots 76, 77 and the western half of "C" Street graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lot 77, all of lot 78, 79 and the southern half of Almondridge Drive graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from lot 26, 27, 28 and the northern half of Almondridge Drive graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from a portion of lot 13 and the southern half of Almondridge Drive graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from lot 14 and the northern half of Almondridge Drive graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from lot 15, 16, 17, 18, 19 and the western half of "B" Court graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Section 3.b.i, Exhibit	Drainage from lot 20, 21, 22, 23, 24, 25 and the eastern half of "B" Court graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection.	
Table 2, Table 2, Section 3.b.i, Exhibit	Drainage from lots 29 thru 41 and the western half of "C" Street adjacent to lots graded and paved to direct drainage to Bio Swale. Bio Swale sized and designed as stated in Section 3.b.i, 3.b.ii and including erosion protection..	
Table 3	On-site drain inlets to be marked with "no dumping" message.	
Table 3	Preservation of any native trees, shrubs, or ground cover (where possible).	
Table 3	Plant selection to minimize irrigation, minimize use of fertilizers and pesticides, and for pest resistance.	

VIII. Certification

The selection, size, and preliminary design of treatment BMPs and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order R2-2003-0022.

Attachment A

**Almondridge East
Cleanwater Control Plan**
Treatment BMP Sizing Worksheet

Project Name: Almondridge East
Address/Location: Phillips Lane/Almondridge Drive

Date: 10/3/2005
APN: 051-200-015 & 053

Total Project Area (in sq. ft.; exclude areas of site to remain undeveloped): 969,645 **Impervious:** 472,315

Pervious: **497,330**

Area ID	Surface	Self-retaining Area (sq. ft.)	Non-self retaining Area (sq. ft.)	"C" Factor	Size * C
Yards	landscaping	0	468,634	0.10	46,863
		0			0
		0			0
					0
					0
					0
Totals		0	468,634		46,863

Surface	"C"
Turf	0.1
Landscape	0.1
Crushed aggregate	0.1
Pervious Asphalt	0.55

Table 2. Impervious Areas Draining to Planters, Swales, and Bioretention Areas

Area ID	Surface	Size (square feet)	Type and ID# of BMP to be used	Area Served by BMP (SF)	Sizing Factor (=0.04)	Minimum Surface Area	Surface Area as designed	swale LF	Width	SF
SW01	roof & paving	12,375	swale	13,792	0.04	495	1417.5	315	4.5	1417.5
SW02	roof & paving	9,417	swale	10,686	0.04	377	1269	282	4.5	1269
SW03	roof & paving	7,688	swale	9,047	0.04	308	1359	302	4.5	1359
SW04	roof & paving	7,554	swale	8,697	0.04	302	1143	254	4.5	1143
SW05	roof & paving	5,251	swale	5,611	0.04	210	360	80	4.5	360
SW06	roof & paving	5,188	swale	5,548	0.04	208	360	80	4.5	360
SW07	roof & paving	10,426	swale	10,903	0.04	417	477	106	4.5	477
SW08	roof & paving	8,287	swale	8,962	0.04	331	675	150	4.5	675
SW09	roof & paving	112,830	swale	118,419	0.04	4,513	5589	1242	4.5	5589
SW10	roof & paving	15,511	swale	16,766	0.04	620	1255.5	279	4.5	1255.5
SW11	roof & paving	14,018	swale	14,589	0.04	561	571.5	127	4.5	571.5
SW12	roof & paving	8,459	swale	9,138	0.04	338	679.5	151	4.5	679.5
SW13	roof & paving	16,519	swale	17,441	0.04	661	922.5	205	4.5	922.5
SW14	roof & paving	15,969	swale	16,963	0.04	639	994.5	221	4.5	994.5
SW15	roof & paving	25,737	swale	26,862	0.04	1,029	1125	250	4.5	1125
SW16	roof & paving	15,687	swale	16,488	0.04	627	801	178	4.5	801
SW17	roof & paving	9,639	swale	10,359	0.04	386	720	160	4.5	720
SW18	roof & paving	14,566	swale	15,461	0.04	583	895.5	199	4.5	895.5
SW19	roof & paving	16,624	swale	17,411	0.04	665	787.5	175	4.5	787.5
SW20	roof & paving	7,220	swale	7,746	0.04	289	526.5	117	4.5	526.5
SW21	roof & paving	9,860	swale	10,382	0.04	394	522	116	4.5	522
SW22	roof & paving	26,549	swale	27,894	0.04	1,062	1345.5	299	4.5	1345.5
SW23	roof & paving	29,965	swale	31,463	0.04	1,199	1498.5	333	4.5	1498.5
SW24	roof & paving	66,850	swale	70,252	0.04	2,674	3402	756	4.5	3402
Total		472,184		500,880	0.04	0				28696.5

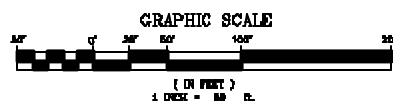
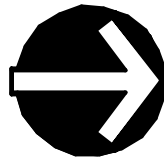
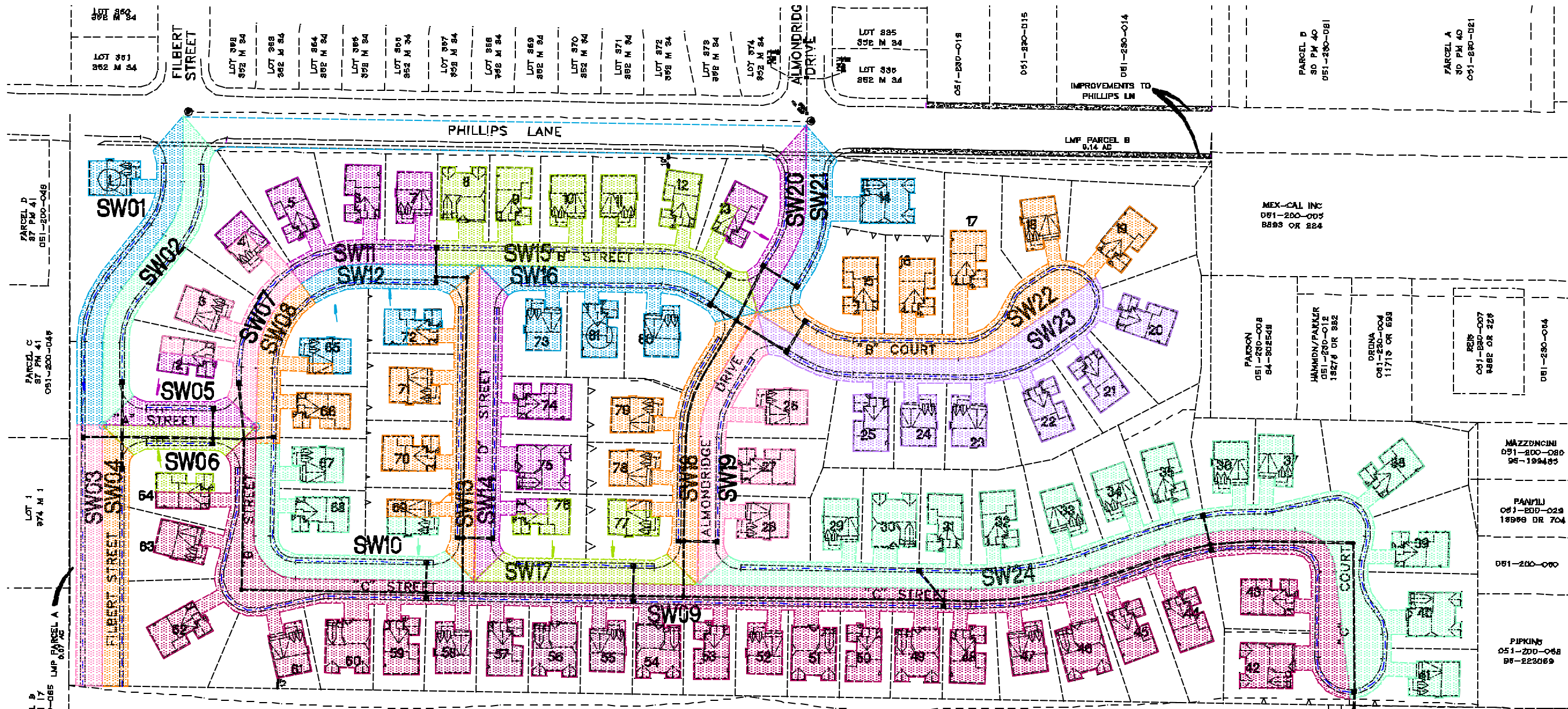
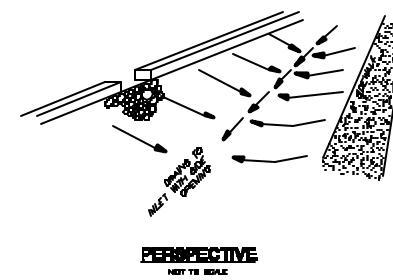
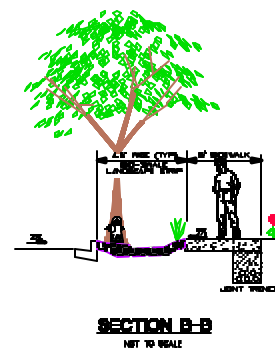
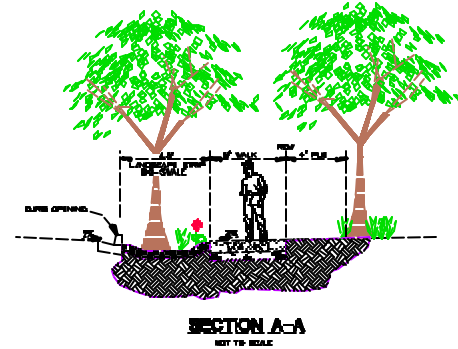
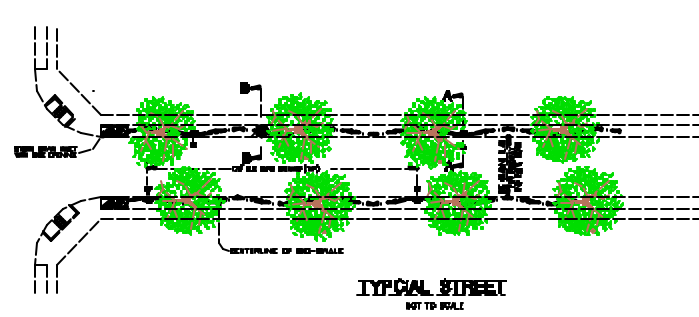
Sizing of Conventional BMPs to Serve Entire Site:

Volume-based BMPs	Table 1:	Table 2:	Table 3:	Total	Remaining impervious area	Remaining Total Area	% DCIA of remaining area	Req. Water Quality Volume
OR	0	500,880	0	500,880	0	468,765	0%	0
Flow-Based BMPs							Composite "C" Factor	Design Flow Rate (cfs)
					0	468,765	4686335%	101,703.23

ALMONDRIDGE EAST KB HOMES

C.3 EXHIBIT SUBDIVISION 8880

CITY OF ANTIOCH, CALIFORNIA
OCTOBER, 2005



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TEL: 925-709-1100 FAX: 925-709-1101
PROJECT MANAGER: LOR SCALE: 1"=60' DATE: 9/15/2005