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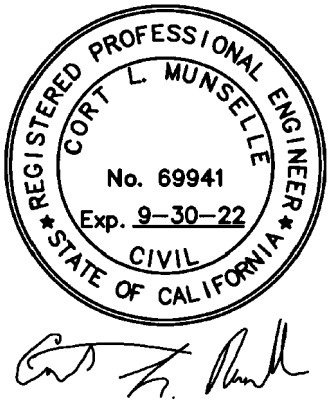
INITIAL SWLID REPORT

For

CROIX ESTATE WINERY

1406 Wood Road
Fulton, CA
APN 034-030-032



Prepared for:
Croix Estate
Jason Williams
4708 Silverado Trail
Calistoga, CA 94515
(707) 942-9100

Prepared under the supervision of:
Cort L. Munselle
RCE #69941
License Expires 9/30/22

Report Date: March 22, 2018
Revised: January 14, 2020
Revised: February 2, 2022

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Project Name: Croix Estate Winery

Date: 02/02/2022

Storm Water Low Impact Development Submittal Coversheet

To be submitted with all SW LID submittals

1. **Submittal Information:**

Submittal Date: 02/02/2022

Initial SW LIDS ☑ **Final SW LIDS** ☐

Design Manual Used for design:

- ☐ 2005 Standard Urban Storm Water Mitigation Plan
- ☐ 2011 Storm Water Low Impact Development Technical Design Manual
- ☑ 2017 Storm Water Low Impact Development Technical Design Manual

2. **Applicant Information:**

Applicant Name (Owner or Developer): Jason Williams

Mailing Address: 4708 Silverado Trail

City/State/Zip: Calistoga, CA 94515

Phone/Email/Fax: (707) 942-9100

Project Name: Croix Estate Winery

Date: 02/02/2022

City of Santa Rosa

Storm Water Low Impact Development Submittal Coversheet

To be submitted with all SW LID submittals

3. Project Information:

Project Name: Croix Estate Winery

Site Address: 1406 Wood Road

City/State/Zip: Fulton, CA 95439

APN (s): 034-030-032

Permit # (s): UPE17-0049

Subdivision	☐	Grading Permit	☐	Building Permit	☐	Design Review	☐
Use Permit	☑	Hillside Development	☐	Encroachment	☐	Time Extension	☐

Other:

Project Name: Croix Estate Winery

Date: 02/02/2022

City of Santa Rosa

Storm Water Low Impact Development Submittal Coversheet

To be submitted with all SW LID submittals

4. Design Information:

Narrative:

Project Description

- [x] Description of proposed project type, size, location, and any specific uses or features.
- [x] Description of any sensitive features (creeks, wetlands, trees, etc.) and whether they are going to be preserved, removed or altered.
- [x] Description of the existing site.
- [x] Description of how this project triggers these requirements (impervious area, CALGreen, 401 Permit, etc.).
- N/A [ ] Describe any "on-site offset" used.

Pollution Prevention and Runoff Reduction Measures

- [x] Description of all proposed pollution prevention measures (street sweeping, covered trash enclosures, indoor uses, etc).
- [x] Description of all Runoff Reduction Measures (Interceptor Trees, Impervious Area Disconnection, and/or Alternative Driveway Design).

Type of BMPs Proposed

- [x] Description of the types of BMPs selected including priority group that each is in.
- [x] Description of level of treatment and volume capture achieved for each BMP.

Maintence

- [x] Description of maintenance for each type of BMP.
- [x] Description of funding mechanism.
- [x] Designation of Responsible Party.

Project Name: Croix Estate Winery

Date: 02/02/2022

City of Santa Rosa

Storm Water Low Impact Development Submittal Coversheet

To be submitted with all SW LID submittals

Exhibits:

Proposed SW LID Exhibit:

- [x] Exhibit should include: street names, property lines, strom drainage system, waterways, title block, scale and north arrow.
- [x] Tributary areas shown for all inlets (including off-site drainage areas).
- [x] C value for each tributary area.
- [x] Soil Type of existing site.
- [x] New or replaced impervious area shown.
- [x] All inlets and BMP, shown (including unique identifier).
- N/A [ ] All interceptor trees shown.
- [x] All proposed BMPs shown including dimensions.

Existing Condition Exhibit

- [x] Exhibit should include: street names, property lines, proposed storm drainage system, waterways, title block, scale, and north arrow.
- [x] Soil Type of existing site.
- [x] Proposed tributary areas shown for all proposed inlets (including offsite drainage areas). Existing impervious areas.
- [x] Existing impervious area.

BMP Details:

- [x] Detail for each type of BMP selected- provide a preliminary 8.5”x11” detail for each BMP type or include on submitted drawings. These can be taken straight from the Fact Sheets if no significant changes are proposed.

On Plans:

- [x] Show all applicable elements of the selected BMPs on the appropriate plan sheets.

Calculations:

- [x] Calculations, for each inlet, and summary sheet using the Storm Water Calculator found at *www.srcity.org/stormwaterLID*
- [x] Supplemental or supporting calculation if applicable.

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Project Description:

Project Type and Location

The subject parcel is approximately 10 acres and is located just west of Fulton Road on the south side of Wood Road. The property is zoned DA-B6-10, SR VOH (Diverse Agricultural and Scenic Resources Combining District, 10-acre minimum lot size) and has a Diverse Agricultural (DA) land use designation.

Existing Conditions

The current site contains a single-family residence, a gravel driveway with a connecting paved parking lot per GRD17-0079, a winery barn, a bocce ball court, and two buildings used for storage. The remainder of the site is primarily vineyard. The surrounding properties are mostly vineyard or other agricultural uses, some with single-family residences.

The site is extremely flat, overall sloping slightly from the southwest to the northeast. The soil is identified as Huichica Loam (hydrologic group C) by the NRCS Web Soil Survey. No sensitive water features are in the vicinity of the proposed project area and therefore will not affect any water features.

Existing Drainage Conditions

The majority of runoff from impervious areas in the existing condition is directed towards vegetated/vineyard areas, and allowed ample opportunity to infiltrate due to the flatness of the site. Four general LOAs for the project area have been identified (refer to the Hydrology Maps) – LOA 1 at the north property end, where runoff is collected by the existing roadside swale along Wood Road. Runoff from the impervious areas such as the existing gravel driveway and paths is able to flow across the existing vineyard and non-vineyard vegetated area prior to reaching the roadside swale. LOA 2 is the retention trench per GRD17-0079, where runoff across the asphalt parking area per GRD17-0079 is conveyed. LOA 3 is the east property edge for the project area – the area identified as Tributary 3 slopes towards a natural low point along this east property edge. LOA 4 is a natural low point before the property edge.

Environmentally Sensitive Features

No environmentally sensitive features are in the vicinity of the proposed project area.

Proposed Conditions

The proposed project plans to replace two existing buildings with two new buildings – a proposed tasting building and barrel storage building – along with associated alterations and additions to the driveway/parking/path areas. The proposed tasting building will replace one existing building in approximately the same location. The proposed barrel storage building that will replace the

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second of the existing buildings to be removed will be a significant expansion to the south, in comparison to the existing building, and will replace existing vineyard. The proposed barrel storage building and associated extension of the driveway/parking areas around it constitute the majority of the proposed new impervious area, replacing primarily vineyard area. The proposed driveway/parking/path areas are all proposed to be crushed gravel. Refer to the Post Construction Hydrology Map.

A SWLID (Storm Water Low Impact Development) report is required for this project because the amount of new/replaced impervious surface area is greater than 10,000 square feet. Refer to the tables and hatching on the Hydrology Maps and the corresponding Composite Runoff Coefficient and Curve Number Calculations for more detailed information on the pre-project and post-project impervious areas.

Proposed Drainage Conditions

The four LOAs for the project area have been maintained with the proposed drainage conditions (refer to the Hydrology Maps) – LOA 1 at the north property end, where runoff will still be collected by the existing roadside swale along Wood Road. The proposed alteration of the driveway and path areas is very slight; no significant changes are proposed that would affect runoff. Runoff from the impervious areas such as the replaced crushed gravel driveway and paths is still directed to flow across the existing vineyard and non-vineyard vegetated area, which provides opportunity for infiltration and treatment, prior to reaching the roadside swale. LOA 2 is the retention trench per GRD17-0079, where runoff across the asphalt parking area per GRD17-0079 is conveyed. Only minor areas within Tributary 2 are proposed to be altered – a portion of the replaced crushed gravel driveway is within the Tributary 2 limits. As the Composite Runoff Coefficient and Curve Number Calculations demonstrate, the post-project composite runoff coefficients and curve numbers for Tributary 1 and 2 are actually lower than the pre-project composite runoff coefficients and curve numbers; this is due to some areas being changed from impervious concrete or gravel in the existing condition to to planter/vegetated areas in the proposed condition. No volume retention is required for Tributaries 1 and 2, due to the post-project coefficient and curve numbers being lower than the pre-project coefficient and curve numbers. In addition, the area within Tributary 2 was already analyzed and retention was already provided as part of the GRD17-0079 permit.

LOAs 3 and 4 are also maintained; the overall drainage patterns remain in the proposed condition. The runoff from the proposed barrel storage building's roof will be conveyed to the vegetated area (see the Post Construction Hydrology Map), for roof disconnection directed across landscape of a minimum of 15'-19' width. Besides the proposed roof, the majority of the

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proposed new and replaced impervious area within Tributaries 3 and 4 is the crushed gravel driveway/parking areas/paths. The crushed gravel is best represented out of the available paved area disconnection options by permeable pavement; crushed gravel was chosen to the maximum extent possible, as a more permeable option in comparison to concrete or asphalt, and due to the flatness of the site. The majority of the runoff within Tributaries 3 and 4 is first conveyed to the proposed retention trenches along the low points / edges of the crushed gravel, and a portion of the runoff within Tributary 3 from the proposed barrel storage roof and existing concrete areas to remain is conveyed to the vegetated buffer within Tributary 3, so all runoff is given ample opportunity for infiltration and treatment prior to passing the analyzed LOAs. The retention trenches are proposed to match the design of the retention trench per GRD17-0079, refer to the detail included in Appendix B and to the locations and dimensions called out on the Post Construction Hydrology Map.

Level of Treatment and Volume Capture:

As shown on the Hydrology Maps and in the Composite Runoff Coefficient and Curve Number Calculations, the amount of impervious area and the composite runoff coefficient and curve numbers do not increase in the post-project condition for Tributaries 1 and 2, but rather actually decrease. Therefore, no volume capture or treatment is required for those tributaries. In addition, the area within Tributary 2 was already analyzed and retention was already provided as part of the GRD17-0079 permit.

The amount of impervious are and the composite runoff coefficient and curve numbers do increase in the post-project condition for Tributaries 3 and 4. 100% volume capture and treatment is required for Tributary 3, as most of the proposed/replaced impervious area is within Tributary 3, and the delta volume capture and treatment is required for Tributary 4. Tributaries 3 and 4 were analyzed separately, to conservatively provide more volume retention and treatment due to the greater difference in composite curve numbers when analyzed separately, in contrast to the only slight difference in composite curve numbers for the total. Refer to the Composite Runoff Coefficient and Curve Number Calculations; the compose curve number is 83 in the pre-project condition and 88 in the post-project condition, for Tributary 3, and is 82 in the pre-project condition and 89 in the post-project condition, for Tributary 4, which is the case of the maximum difference. In contrast, the total pre-project curve number is 84 and the total post-project curve number is 86, only a slight difference. Tributaries 3 and 4 were also analyzed separately to better provide the appropriate retention and treatment at each LOA, to better

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ensure no negative effects to neighboring properties and potential downstream off-site drainage features. Refer to the results from the Santa Rosa Stormwater Calculator and the Volume Retention Calculations provided in Appendices D and E, respectively.

Selected BMPs:

Priority-1 retention trenches (infiltration trenches) have been chosen to both retain volume and provide treatment, for both Tributaries 3 and 4. This option has been chosen due to the available length along the impervious areas, the flatness of the site, and matching the previous design with the retention trench per GRD17-0079. Over 100% of the required retention per the City of Santa Rosa Stormwater Calculator is provided for both tributaries; two retention trenches (1A and 1B) together provide the 100% volume capture and treatment for Tributary 3 (provide 809.55 cf, 101.34% of the required 798.87 cf per the City of Santa Rosa Stormwater Calculator), and one retention trench (2) provides the delta volume capture and treatment for Tributary 4 (provides 60 cf, 115.12% of the required 52.12 cf per the City of Santa Rosa Stormwater Calculator). Refer to the results from the Santa Rosa Stormwater Calculator and the Volume Retention Calculations provided in Appendices D and E, respectively.

Pollution Prevention Measures:

No additions or changes to the existing pollution prevention measures are proposed, as the site will remain in the same type of use; there will be no significant changes from the pre-project to post-project condition. The choice of crushed gravel rather than a more impervious surface, the proposed retention trenches, the existing retention trench per GRD17-0079, and the existing and proposed vegetated areas all assist in allowing runoff the opportunity for infiltration and treatment, prior to crossing the analyzed LOAs and leaving the project site.

Runoff Reduction Measures:

Tree Canopy

There are a few existing trees on the project site, and the landscaping design will likely include proposed trees, but no interceptor trees were taken as credit at this time in order to conservatively ensure the volume retention and

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treatment provided is sufficiently preventing any potential negative effects to neighboring properties and/or downstream off-site drainage features.

Buffer Strips & Bovine Terraces

For Tributary 3, a small area of existing concrete to remain was used as a buffer strip reduction credit, as runoff from it is directed to a vegetated area providing a vegetated buffer strip exceeding the minimum 15' requirement – refer to the Post Construction Hydrology Map.

Disconnection Roof Drains

For Tributary 3, the proposed barrel storage building roof was used as a disconnected roof drain reduction credit, as runoff from it will be directed to the vegetated area – refer to the Post Construction Hydrology Map.

Paved Area Disconnection

For Tributaries 3 and 4, the proposed crushed gravel was used as paved area disconnection reduction credit, as the choice of crushed gravel would be best represented out of the available options by permeable pavement, as it is a more permeable option in comparison to concrete or asphalt. Refer to the Post Construction Hydrology Map.

The maximum possible reduction credit was achieved (for both Tributaries 3 and 4) from only part of the reduction credits that could be claimed; the full amounts are entered into the City of Storm Water Calculator in order to correspond correctly with the areas as shown on the Post Construction Hydrology Map, but as the results show, not all is actually claimed, as it would exceed the maximum reduction credit possible which is limited to 50% of the total tributary area.

Conclusions:

The proposed project has been designed to follow the goals of the SWLID, in order to ensure no negative impacts to neighboring properties or downstream drainage features, and will:

- mimic the existing drainage patterns,
- maintain or decrease runoff volume (maintain in Tributaries 3 and 4 by retaining the difference in runoff volume within the proposed retention trenches and decrease in Tributaries 1 and 2 due to proposed reductions in composite curve numbers), and

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- maintain stormwater runoff quality (via directing runoff to the proposed retention trenches and to existing/proposed vegetated areas to provide treatment).

Maintenance and Funding Mechanism:

BMPs will be inspected and maintained as described in the BMP Inspection and Maintenance Checklist provided in the Storm Water Low Impact Development Technical Design Manual for the BMP(s) selected for implementation on the lot. Inspection and Maintenance of all BMPs located on private property, including the funding source, shall be the sole responsibility of the owner. The maintenance declaration and record keeping documents are included in Appendix F.

At a minimum, inspection and maintenance of the proposed retention trenches shall include the following:

- Inspect twice annually for ponded water.
    - If ponded water is observed, the top layer of pea gravel, or approved equivalent, will need to be replaced.
    - If ponded water remains, further grading and replacement may be necessary to prevent mosquito breeding.
- Pesticides and fertilizers shall not be used in vegetated areas draining to the infiltration trench.
- Remove any accumulated sediment and/or trash.

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APPENDIX A

FOR OFFICE USE ONLY:
Does this project require permanent storm water BMP's?

☐ Y ☐ N

Date Submitted: _____

Print Form

File No:	Quadrant
Related Files:	
Set:	
Department Use Only	

2017 Storm Water LID Determination Worksheet

PURPOSE AND APPLICABILITY: This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

Part 1: Project Information

Croix Estate Winery	Jason Williams
Project Name	Applicant (owner or developer) Name
1406 Wood Road	4708 Silverado Trail
Project Site Address	Applicant Mailing Address
Fulton, CA 95439	Calistoga, CA 94515
Project City/State/Zip	Applicant City/State/Zip
UPE17-0049	(707) 942-9100
Permit Number(s) - (if applicable)	Applicant Phone/Email/Fax
Munselle Civil Engineering	513 Center Street
Designer Name	Designer Mailing Address
Healdsburg, CA	(707) 395-0968
Designer City/State/Zip	Designer Phone/Email

Type of Application/Project:

☐ Subdivison ☐ Grading Permit ☐ Building Permit ☐ Hillside Development

☐ DesignReview ☑ Use Permit ☐ Encroachment ☐ Time Extensions ☐ Other :_____

PART 2: Project Exemptions

1. Is this a project that creates or replaces *less than* 10,000 square feet of impervious surface[1], including all project phases and off-site improvements?

   ☐ Yes ☑ No

1 Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.

2. Is this project a routine maintenance activity[2] that is being conducted to maintain original line and grade, hydraulic capacity, and original purpose of facility such as resurfacing existing roads and parking lots?

☐ Yes ☑ No

3. Is this project a stand alone pedestrian pathway, trail or off-street bike lane?

☐ Yes ☑ No

4. **Did you answer "YES" to any of the questions in Part 2?**

☐ **YES:** This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete the "Exemption Signature Section" on Page 4.**

☑ **NO:** Please complete the remainder of this worksheet.

Part 3: Project Triggers

Projects that Trigger Requirements:
Please answer the following questions to determine whether this project requires permanent Storm Water BMP's and the submittal of a SW LIDs as required by the NPDES MS4 Permit order No. R1-2015-0030.

1. Does this project create or replace a combined total of 10,000 square feet or more of impervious surface[1] including all project phases and off-site improvements?

☑ Yes ☐ No

2. Does this project create or replace a combined total or 10,000 square feet or more of impervious streets, roads, highways, or freeway construction or reconstruction[3]? ☐ Yes ☑ No

3. Does this project create or replace a combined total of 1.0 acre or more of impervious surface[1] including all project phases and off-site improvements? ☑ Yes ☐ No

4. **Did you answer "YES" to any of the above questions in Part 3?**

☑ **YES:** This project will need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete remainder of worksheet and sign the "Acknowledgement Signature Section" on Page 4.**

☐ **NO:** This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 permit. **Please complete the "Exemption Signature Section" on Page 4.**

---

1 Imprevious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintence activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacint, trenching and patching are defined as maintenance activities per section VI.D.2.b.

2 "Rountine Maintenance Activity" includes activities such as overlays and/or resurfacing of existing roads or parking lots as well as trenching and patching activities and reroofing activities per section VI.D.2.b.

3 "Reconstruction" is defined as work that extends into the subgrade of a pavement per section VI.D.2.b.

Part 4: Project Description

1. Total Project area: 3.02 ○ square feet ◉ acres

2. Existing land use(s): (check all that apply)

☐ Commercial ☐ Industrial ☑ Residential ☐ Public ☑ Other

Description of buildings, significant site features (creeks, wetlands, heritage trees), etc.:

The existing site contains a residence, storage buildings for winery/vineyard, driveway/parking and vineyard.

3. Existing impervious surface area: 45,426 ◉ square feet ○ acres

4. Proposed Land Use(s): (check all that apply)

☐ Commercial ☐ Industrial ☑ Residential ☐ Public ☑ Other

Description of buildings, significant site features (creeks, wetlands, heritage trees), etc.:

The proposed post-project condition would include reuse of current residence, reconstruction of current storage buildings (removal of two existing buildings and replacing them with one tasting building and one barrel storage building), and alterations/additions to existing driveway/parking/path areas.

5. Proposed impervious surface area: 68,970 ◉ square feet ○ acres

Acknowledgment Signature Section:

As the property owner or developer, I understand that this project is required to implement permanent Storm Water Best Management Practices and provide a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit Order No. R1-2015-0030. *Any unknown responses must be resolved to determine if the project is subject to these requirements.

_____ 02/02/2022 _____

Applicant Signature | Date

Exemption Signature Section:

As the property owner or developer, I understand that this project as currently designed does not require permanent Storm Water BMP's nor the submittal of a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit*. I understand that redesign may require submittal of a new Determination Worksheet and may require permanent Storm Water BMP's.

_____ _____

Applicant Signature | Date

*** This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.**

_____

Implementation Requirements: *All calculations shall be completed using the "Storm Water Calculator" available at: www.srcity.org/stormwaterLID*

Hydromodification Control/100% Volume Capture: Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

***Treatment Requirement*:** Treatment of 100% of the flow calculated using the modified Rational Method and a known intensity of 0.20 inches per hour.

Delta Volume Capture Requirement: Capture (infiltration and/or reuse) of the increase in volume of storm water due to development generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

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APPENDIX B

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in priority selected?	Yes	No	Explanation of selection	Other notes:
Universal LID Features- to be considered on all projects.	Living Roof	N/A	N/A		x	x	x		x	x				X	Existing vegetated areas serving as buffer strips to remain.	
	Rainwater Harvesting	N/A	N/A		x	x	x			x				X		
	Interceptor Trees	N/A	N/A		x	x	x				x			X		
	Vegetated Buffer Strip	UN-01	Vegetated Buffer Strip								x		X			
	Bovine Terrace	UN-02	Bovine Terrace		x						x			X		
	Impervious Area Disconnection	N/A	N/A		x	x	x				x			X		

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 1 and 1A BMPs- to be installed with no underdrains or liners. Must drain all stading water within 72 hours.	Rain Garden	P1-01	Rain Garden						x	x				X	Existing retention trench per GRD17-0079 to remain and additional retention trenches proposed.	
	Roadside Bioretention	P1-02	Roadside Bioretention - no C & G						x	x				X		
	Vegetated Swale-with Bioretention	P1-06	Swale with Bioretention						x	x				X		
	Constructed Wetlands	N/A	N/A						x	x				X		
	Infiltration Trench	P1-07	Infiltration Trench						x	x			X			

BMP Selection Table

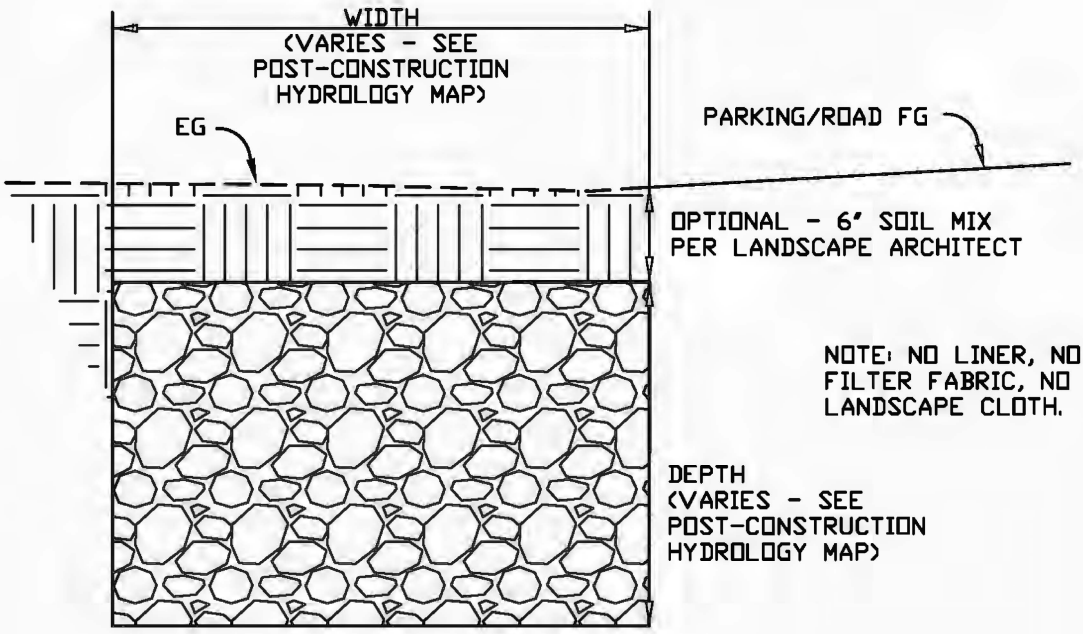
	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 2 BMPs- with subsurface drains installed above the capture volume.	Rain Garden	P2-01	Rain Garden						x	x				X		
	Roadside Bioretention	P2-02	Roadside Bioretinton - Flush Design Roadside						x	x				X		
		P2-03	Roadside Bioretenion- Contiguous SW						x	x				X		
		P2-04	Roadside Bioretenion- Curb Opening						x	x				X		
		P2-05	Roadside Bioretenion- No C & G						x	x				X		
	Pervious Pavement	P2-06	Vegetated Buffer Strip						x	x				X		
	Constructed Wetlands	N/A	N/A						x	x				X		

BMP Selection Table

	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 3 BMPs- installed with subdrains and/or impermeable liner. Does not achieve volume capture and must be used as part of a treatment train.	Rain Garden	P3-01	Rain Garden		x	x	x		x					X		
	Bioretention	P3-02	Roadside Bioretinton - Flush Design Roadside		x	x	x		x					X		
		P3-03	Roadside Bioretenion- Contiguous SW		x	x	x		x					X		
		P3-04	Roadside Bioretenion- Curb Opening		x	x	x		x					X		
		P3-05	Roadside Bioretenion- No C & G		x	x	x		x	x				X		
	Flow Through Planters													X		
	Pervious Pavement	P1-04	Vegetated Buffer Strip		x	x	x		x	x				X		
	Vegetated Swale	P3-07	Vegetated Swale		x	x	x		x	x				X		

BMP Selection Table

	Best Management Practice (BMP)	Can be used with...	High Ground Water	Contamination	Slope Constraints	Achieves...	Treatment	Volume Capture	Pollution Prevention Credit	BMP in this priority selected?	Yes	No	Explanation of selection	Other notes:
Priority 4 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Tree Filter Unit		x	x	x		x					X		
	Modular Bioretention		x	x	x		x					X		
Priority 5 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Chambered Separator Units		x	x	x		x					X		
	Centrifugal Separator Units		x	x	x		x					X		
	Trash Excluders		x	x	x		x					X		
	Filter Inserts		x	x	x		x					X		
Priority 6 BMPs-	Offset Program						N/A	N/A	N/A			X		
Other	Detention		x									X		



RETENTION TRENCH DETAIL

NOT TO SCALE

DATE: FEB 2022

JOB NO. 137-16

SHEET 1 OF 1

CROIX ESTATE WINERY
RETENTION TRENCH DETAIL
APN 034-030-032
1406 WOOD RD
FULTON, CA

MUNSELLE CIVIL ENGINEERING
CIVIL ENGINEERING ◆ SURVEYING ◆
◆ PLANNING ◆ CONST. MANAGEMENT ◆
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APPENDIX C

Composite Runoff Coefficients and Curve Numbers
Croix Winery Use Permit
1406 Wood Road, Fulton
2/2/2022

Average Annual Precipitation: 33"		k factor: 1.1
Surface Description	**C-Value, 85th Percentile** (Based on City of Santa Rosa Storm Water Calculator Table 6-1)	**CN-Value** (Based on TR-55 Table 2-2, Hydrologic Soil Group C)
Concrete/Roof	0.8	98
Asphalt	0.7	92
Gravel	0.6	89
Vineyard	0.1	82
Pervious/Vegetated (non-vineyard)	0.1	74

Pre-Development

Trib / LOA ID	Concrete/ Roof Area (sf)	Asphalt Area (sf)	Gravel Area (sf)	Vineyard Area (sf)	Vegetated/ Pervious (non-vineyard) Area (sf)	Total Tributary Area (sf)	Total Tributary Area (ac.)	Composite C-Value, 85th Percentile	Composite Curve Number
1	3345	352	4248	22983	12301	43229	0.99	0.21	82
2	1256	7268	6871	5121	0	20516	0.47	0.52	89
3	7355	0	14731	22038	17279	61403	1.41	0.30	83
4	0	0	0	6423	0	6423	0.15	0.10	82
TOTAL	**11956**	**7620**	**25850**	**56565**	**29580**	**131571**	**3.02**	**0.30**	**84**

Post-Development

Trib / LOA ID	Concrete/ Roof Area (sf)	Asphalt Area (sf)	Gravel Area (sf)	Vineyard Area (sf)	Vegetated/ Pervious (non-vineyard) Area (sf)	Total Tributary Area (sf)	Total Tributary Area (ac.)	Composite C-Value, 85th Percentile	Composite Curve Number
1	1817	352	5502	22983	12575	43229	0.99	0.20	81
2	1255	7268	3365	5121	3507	20516	0.47	0.44	86
3	19102	0	24931	5341	12029	61403	1.41	0.52	88
4	792	0	4586	1045	0	6423	0.15	0.54	89
TOTAL	**22966**	**7620**	**38384**	**34490**	**28111**	**131571**	**3.02**	**0.40**	**86**

Composite Runoff Coefficient Equation:

$$C_T = C_V \frac{A_V}{A_T} + C_P \frac{A_P}{A_T}$$

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APPENDIX D

LID BMP Summary Page & Site Global Values

Welcome to the City of Santa Rosa Storm Water BMP Calculator. This calculator and it's worksheets are required to be submitted with all projects containing LID features.

NOTE: In order for this calculator to function properly, macros must be enabled.

Go to www.srcity.org/stormwaterlid for the latest version of this calculator.

Rev. 8.11.0 11212019

Project Information: (Required Information)

Project Name:	CROIX WINERY USE PERMIT - TRIB 3
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	2/2/2022

Site Information:

Mean Seasonal Precipitation (MSP) of Project Site:	33.00	(inches)
K=MSP/30 K=	1.10	
Impervious area - Pre Project:	22,086	ft^2
New or replaced impervious area - Post Project:	44,033	ft^2

Click on Button to begin Calculations:

BMP Data Input

Based upon the pre and post development impervious area or special condition*, the design requirement is:

100% Capture & Treatment

*** Treatment Only Special Condition**

Check this box only if it has been determined by the North Coast Regional Water Quality Control Board that infiltration will not be required on this project. Documentation of NCRWQCB approval MUST be provided. ☐

Cell Color Key:

Yellow Cells	- Data Input. Require information. User input or pick from drop down list.
Blue Cells	- Calculated results by worksheet.
Green Cells	- Drop Down Value, Values/results from other worksheets.

Function Buttons Select a BMP ID (Green Heading below) and then choose function:

Retrieve BMP Saved Data — Retrieves the saved selected BMP data and loads into Input BMP Data worksheet(s). **Will overwrite existing unsaved data in worksheets!**

Delete Selected BMP — Will Delete the selected BMP and it's saved data. **Data Can Not be recovered!**

Print Selected BMP / **Print All** — Prints this page (Summary) and the **saved data** of the selected BMP ID or ALL BMPs listed. "Print Selected BMP" and "Print All BMPs" will not overwrite existing data in the worksheets.

Print Selected Worksheets — Prints the selected worksheet with the current data. Use the "Retrieve BMP Saved Data" to load data into worksheets.

Summary of BMPs Design: (saved data)

	Tributary Area		Requirements		Design Results						
						Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
BMP ID:	Tributary Area (ft^2)	Runoff Reduction Measures (Y/N)	Type of Requirement Met:	Type of BMP Design	Percent Achieved	Required $V_{Hydromod}$ (ft^3)	Achieved (ft^3)	Required Q Treatment (cfs)	Achieved Q Treatment (cfs)	Required Vdelta (ft^3)	Achieved Vdelta (ft^3)

STORM WATER CALCULATOR

Runoff Reduction Measures Worksheet

Project:	CROIX WINERY USE PERMIT - TRIB 3
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	February 2, 2022

Total Runoff Reduction Measures is limited to 50% of the physical tributary area.

Description: Calculates the area reduction credit for disconnected roof drains, driveways, interceptor trees (new and existing), and buffer strips and/or bovine terraces.

BMP ID: Trib/LOA 3

Reduced Physical Tributary Area: 30,702 ft²

Reduction Summary Totals: 30,702 ft²

Reduction Credits Limited to 50% of Total Tributary Area!

To Navigate back to Input BMP Data worksheet, Please use the " Return to Input BMP Data Worksheet" button.

<<< BACK to "Input BMP Data" Worksheet

Constants from Input BMP Data worksheet:

Physical Tributary Area that drains to Inlet/BMP: 61,403.00 ft²

Disconnected Roof Drains [1]

INSTRUCTIONS: Method 1: Total Rooftop square foot area that is drained by the downspouts flowing to the single Tributary Area as designated. **OR**
Methode 2: Total Rooftop precentage (%) area relating to the total physical Tributary Area as designated.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

Input:

Select disconnection condition: Runoff is directed across landscape; Width of area: 15' to 19'

Condition Factor = 0.7

Method 1: (Total Area in ft²)

Based on the total rooftop drainage area - to be used if rooftop information is known.

The total roof area (ft²) draining to the downspouts that flows directly into the BMP's Tributary Area. Can be from separate buildings.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = 12,251 ft²

Rooftop Area Factor = 0.20 Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(61,403 x 0.70 x 0.20) = 8575.70 ft² **Rooftop Drainage Area Reduction**

Method 1 >>>>>>> OR <<<<<<< Method 2

Method 2: (Total Percent of rooftop area)

Based on density (units per acre) - to be used if rooftop information is unknown.

NOTE:
Providing input for Method 1 AND Method 2 *will* cause an error.

Input:

Enter percent of rooftop area to be disconnected from downspouts: 0 %

Select Density: 1 = Units per Acre

Density Reduction Factor= 0.08

Enter the percent of the rooftop area of the building(s) that the downspouts have been disconnected.

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(61,403 x 0.70 x 0.00 x 0.08) = 0.00 ft² **Density Reduction**

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Porous Pavement

Multiplier = 1

Enter area of alternatively designed paved area: 24,931 ft²

Paved Area Disconnection Reduction = 24931.00 ft²

Interceptor Trees [2]

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

Number of new ***Evergreen Trees*** that qualify as interceptor trees= 0 **New Evergreen Trees**

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 0 **New Deciduous Trees**

Enter square footage of qualifying **existing tree canopy** = 0 **Existing Tree Canopy**

Intercepter Tree trunk must be no greater than 25 feet from impervious surface.

Area Reduction due to new Evergreen Trees= 0 ft² (200 ft²/tree)

Area Reduction due to new Deciduous Trees= 0 ft² (100 ft²/tree)

Allowed reduction credit for existing tree canopy= 0 ft² Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Interceptor Trees Area Reduction = 0 ft² = Sum of areas managed by evergreen + deciduous + existing canopy

Buffer Strips & Bovine Terraces [3]

INSTRUCTIONS: Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

Enter area draining to a Buffer Strip or Bovine Terrace = 14,265 ft²

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 9985.50 ft²

STORM WATER CALCULATOR

The Project
A Location
A Person
Some Day

Hydromodification Control Requirement

Project:	CROIX WINERY USE PERMIT - TRIB 3
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	February 2, 2022

BMP ID: Trib/LOA 3

Hydromodification Contro Results

$V_{HYDROMOD}$= 798.87 ft^3

Description: This Hydromodification Control Requiremen 100% Volume Capture is the ideal condition and if achieved satisfies all requirements so that no additional treatment is required.

To Navigate back to Input BMP Data worksheet, Please use the " Return to Input BMP Data Worksheet" button.

<<< Return to "Input BMP Data" Worksheet

Constants from Summary Page:

Reduced Physical Tributary Area that drains to Inlet/BMP: 30,702 ft^2
Seasonal Precipitation Factor: K = 1.10

Hydromodification Control Requirement: 100% Volume Capture; $V_{hydromod}$

Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by the 85th percentile 24 hour storm event.
Required for "Hydromodification Control Requirement" if the project creats or replaces 1 acre or more of imperivous surface.

NOTE:
If the Design Goal of 100% Capture is not achieved, 100% Treatment AND Volume Capture must be achieved and both pages 4 and 5 of this calculator need to be completed.

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P \times K) - (0.2 \times S)]2}{[(P \times K)+(0.8 \times S)]} \times \frac{1ft}{12"}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = 1.00
K= Seasonal Precipitation Factor [7]

Post-construction BMPs shall be sized to treat and caputure all of the runoff generated using the modified Rational Method with an intensity of 0.2 inches per hour for a one inch rain event over a 24 hour period.

$V = (Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

A_r = 30,702 ft^2
K [7] = 1.10

Input: (Pick data from drop down lists or enter calculated values)

Drop down Lists

Select post development hydrologic soil type within tributary area [8] = C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select post development ground cover description [5] = Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)

CN_{POST} =
OR: Composite post development CN [9] = 88.0

NOTE:
Entering a calculated composite CN will override selections made from the pull down menus above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Volume of storm water - Post Development

S_{POST}= 1.36 in

$$S_{POST} = \frac{1000}{88.000} - 10$$

Where:
S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02602 ft

$$Q_{POST} = \frac{[(1.00 * 1.10)-(0.2 * 1.364)]^2}{[(1.00 * 1.10)+(0.8 * 1.364)]} \times \frac{1ft}{12in}$$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

$V_{HRDROMOD}$= 798.87 ft^3

$V_{HYDROMOD} = (0.02602)(30,702)$

$V_{HYDROMOD}$= Post Development Volume of Storm Water to be Retained (ft^3)

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

Click for the PDF of the Runoff curve numbers for urban areas. Check the bottom tool bar for open PDF.

[6] Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.

[7] *From Sonoma County Water Agency Flood Control Design Criteria.*

Click for PDF of Sonoma County Mean Seasonal Precipitation Map and Graph. Check the bottom tool bar for open PDF.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

Click for PDF of TR-55 Appendix A Hydrologic Soil Groups. Check for open PDF file on bottom tool bar.

[9] *Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.*

Click for PDF of "Worksheet 2: Runoff curve number and runoff". Check for open PDF file on bottom tool bar.

STORM WATER CALCULATOR

BMP Sizing Tool: Hydromodification Control Requirement

Project:	CROIX WINERY USE PERMIT - TRIB 3
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	February 2, 2022

BMP ID: Trib/LOA 3

Percent of Goal Achieved: 101.34 %

Description: The 100% volume capture sizing tool helps the designer appropriately size a LID BMP to achieve the design goal of 100% volume capture of the post development condition.

Instructions: Enter the percent porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Goal" equals 100%.
Hint: Use the Simple Calculator to calculate an unknown dimension given two known dimension values.

Results from another Worksheet:
From 100% Volume Capture Work Sheet: $V_{HYDROMOD}$ = 798.87 ft^3

To Navigate back to Input BMP Data worksheet, Please use the " Return to Input BMP Data Worksheet" button.
<<< Return to "Input BMP Data" Worksheet

BMP Sizing Tool: Hydromodification Control Requirement; $V_{hydromod}$

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$V_{HYDRO\ BMP} = (W)(L)(D)(P)$ **or** $(BMP\ Area)(D)(P)$

$V_{PONDED} = (W_P)(L_P)(D_P)$ **or** $A_P(D_P)$

Percent of Goal Achieved =

$$\frac{[V_{PONDED} + V_{HYDRO\ BMP}]}{V_{HYDROMOD}} \times 100$$

Where:

$V_{HYDROMOD}$ = From Hydromodification Control Requirement Worksheet
$V_{HYDRO\ BMP}$ = Volume of water in soil pore space.
V_{PONDED} = Volume of Ponded Water above the treatment area surface.
P = Porosity (Drop Down List)
D = Depth of BMP (See Note) (in decimal feet)
W = Width (decimal feet)
L = Length (decimal feet)
BMP Area = Surface Area (decimal square feet)
DP = Ponded Water Depth (decimal feet)
WP = Ponded Water Width (decimal feet)
LP = Ponded Water Length (decimal feet)
AP = Ponded Water Surface Area (decimal sq. ft.)
$V_{ACHIEVED}$ = Total Volume achieved

Input:

BMP Depth:
- Measured from ground surface WITHOUT perforrated pipe.
- Measured from bottom of perforated pipe if installed.

	BMP Below Ground	
P =	0.30	
D =	3.50	ft
W =	3.00	ft
L =	257.00	ft

OR enter Area (will override L & W)

BMP Area = 0.0 ft^2

$V_{HYDRO\ BMP}$ = 809.55 ft^3

Input:

	Ponded Water Above Ground	
D_P =	0.00	ft
W_P =	0.00	ft
L_P =	0.00	ft

Pond Area (A_P) = 0.0 ft^2

V_{PONDED} = 0.00 ft^3

Solutions:

$V_{HYDRO\ BMP}$ =	809.55 ft^3	= 257.00 X 3.00 X 3.50 X 0.30
V_{PONDED} =	0.00 ft^3	= 0.00 X 0.00 X 0.00
$V_{ACHIEVED}$ =	809.55 ft^3	= 0.00 + 809.55
Percent of Goal Achieved =	101.34 %	= [(809.55 + 0.00) / 798.87] x 100

BMP Sizing Simple Caculator

Place zero in ether D, W, or L in the BMP Below Ground yellow cells:
@ 100% (given two dimensions) =

D=	3.50	ft
W=	3.00	ft
L=	257.00	ft

LID BMP Summary Page & Site Global Values

Welcome to the City of Santa Rosa Storm Water BMP Calculator. This calculator and it's worksheets are required to be submitted with all projects containing LID features.

NOTE: In order for this calculator to function properly, macros must be enabled.

Go to www.srcity.org/stormwaterlid for the latest version of this calculator.

Rev. 8.11.0 11212019

Project Information: (Required Information)

Project Name:	CROIX WINERY USE PERMIT - TRIB 4
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	2/2/2022

Site Information:

Mean Seasonal Precipitation (MSP) of Project Site:	33.00	(inches)
K=MSP/30 K=	1.10	
Impervious area - Pre Project:	-	ft^2
New or replaced impervious area - Post Project:	5,378	ft^2

Click on Button to begin Calculations:

BMP Data Input

Based upon the pre and post development impervious area or special condition*, the design requirement is:

Delta Volume & Treatment

*** Treatment Only Special Condition**

Check this box only if it has been determined by the North Coast Regional Water Quality Control Board that infiltration will not be required on this project. Documentation of NCRWQCB approval MUST be provided.

☐

Cell Color Key:

Yellow Cells	- Data Input. Require information. User input or pick from drop down list.
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Print Selected Worksheets — Prints the selected worksheet with the current data. Use the "Retrieve BMP Saved Data" to load data into worksheets.

Summary of BMPs Design: (saved data)

	Tributary Area		Requirements		Design Results						
						Hydromodification Control		Flow Base Treatment		Delta Volume Capture	
BMP ID:	Tributary Area (ft^2)	Runoff Reduction Measures (Y/N)	Type of Requirement Met:	Type of BMP Design	Percent Achieved	Required $V_{Hydromod}$ (ft^3)	Achieved (ft^3)	Required Q Treatment (cfs)	Achieved Q Treatment (cfs)	Required Vdelta (ft^3)	Achieved Vdelta (ft^3)

STORM WATER CALCULATOR

Runoff Reduction Measures Worksheet

Project:	CROIX WINERY USE PERMIT - TRIB 4
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	February 2, 2022

Total Runoff Reduction Measures is limited to 50% of the physical tributary area.

Description: Calculates the area reduction credit for disconnected roof drains, driveways, interceptor trees (new and existing), and buffer strips and/or bovine terraces.

BMP ID: Trib/LOA 4

Reduced Physical Tributary Area: 3,212 ft²

Reduction Summary Totals: 3,212 ft²

Reduction Credits Limited to 50% of Total Tributary Area!

To Navigate back to Input BMP Data worksheet, Please use the " Return to Input BMP Data Worksheet" button.

<<< BACK to "Input BMP Data" Worksheet

Constants from Input BMP Data worksheet:

Physical Tributary Area that drains to Inlet/BMP: 6,423.00 ft²

Disconnected Roof Drains [1]

INSTRUCTIONS: Method 1: Total Rooftop square foot area that is drained by the downspouts flowing to the single Tributary Area as designated. **OR**
Methode 2: Total Rooftop precentage (%) area relating to the total physical Tributary Area as designated.

[1] *See "Impervious Area Disconnection" Fact Sheet in Appendix E for further details.*

Input:

Select disconnection condition: Select disconnection condition

Condition Factor = 1

Method 1: (Total Area in ft²)

Based on the total rooftop drainage area - to be used if rooftop information is known.

The total roof area (ft²) draining to the downspouts that flows directly into the BMP's Tributary Area. Can be from separate buildings.

Input:

Enter amount of rooftop area that drain to disconnected downspouts = 0 ft²

Rooftop Area Factor = 0.00 Rooftop Area Factor= (Total Rooftop Disconnected Area/Tributary Area)

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Rooftop Area Factor)

(6,423 x 1.00 x 0.00) = 0.00 ft² **Rooftop Drainage Area Reduction**

Method 1 >>>>>>> OR <<<<<<< Method 2

Method 2: (Total Percent of rooftop area)

Based on density (units per acre) - to be used if rooftop information is unknown.

NOTE:
Providing input for Method 1 AND Method 2 *will* cause an error.

Input:

Enter percent of rooftop area to be disconnected from downspouts: 0 %

Select Density: 1 = Units per Acre

Density Reduction Factor= 0.08

Enter the percent of the rooftop area of the building(s) that the downspouts have been disconnected.

Solution:

Area reduction = (Physical Tributary Area x Conditional Factor x Percent Disconnected x Density Factor)

(6,423 x 1.00 x 0.00 x 0.08) = 0.00 ft² **Density Reduction**

Paved Area Disconnection [1]

Paved Area Type (select from drop down list): Porous Pavement

Multiplier = 1

Enter area of alternatively designed paved area: 4,586 ft²

Paved Area Disconnection Reduction = 4586.00 ft²

Interceptor Trees [2]

[2] See "Interceptor Trees" Fact Sheet in Appendix E for further details and see "Plant and Tree List" in Appendix G for approved trees.

Number of new ***Evergreen Trees*** that qualify as interceptor trees= 0 **New Evergreen Trees**

Number of new ***Deciduous Trees*** that qualify as interceptor trees= 0 **New Deciduous Trees**

Enter square footage of qualifying **existing tree canopy** = 0 **Existing Tree Canopy**

Intercepter Tree trunk must be no greater than 25 feet from impervious surface.

Area Reduction due to new Evergreen Trees= 0 ft² (200 ft²/tree)

Area Reduction due to new Deciduous Trees= 0 ft² (100 ft²/tree)

Allowed reduction credit for existing tree canopy= 0 ft² Allowed credit for existing tree canopy = 50 % of actual canopy square footage

Interceptor Trees Area Reduction = 0 ft² = Sum of areas managed by evergreen + deciduous + existing canopy

Buffer Strips & Bovine Terraces [3]

INSTRUCTIONS: Calculates the area reduction credit due to buffer strips and/or bovine terraces. Runoff Must be direct to these features as sheet flow. Enter the area draining to these features.

[3] See "Vegetated Buffer Strip" and "Bovine Terrace" Fact Sheets in Appendix E for further details.

Enter area draining to a Buffer Strip or Bovine Terrace = 0 ft²

Buffer Factor = 0.7

Solution:

Area Reduction = (Area draining to Buffer Strip or Bovine Terrace) x (Buffer Factor) =

Area Reduction = 0.00 ft²

STORM WATER CALCULATOR

Delta Volume Capture

Project:	CROIX WINERY USE PERMIT - TRIB 4
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	February 2, 2022

Description: To calculate the delta volume to be used in the Delta Capture BMP Sizing.

BMP ID: Trib/LOA 4 V_{DELTA}= 52.123 ft^3

Constants from Summary Page:

Reduced Physical Tributary Area that drains to Inlet/BMP	3,212 ft^2
Seasonal Precipitation Factor: K =	1.10

To Navigate back to Input BMP Data worksheet, Please use the " Return to Input BMP Data Worksheet" button.

<<< Return to "Input BMP Data" Worksheet

Requirement 2: Delta Volume Capture

No increase in volume of runoff leaving the site due to development for the 85th percentile 24 hour storm event.

NOTE:
If the amount of volume generated after development is less than or equal to that generated before development, Requirement 2-Volume Capture is not required.

$(C_{POST} \leq C_{PRE}$ or $CN_{POST} \leq CN_{PRE})$

Formulas:

$$S = \frac{1000}{CN} - 10$$

Where:
S= Potential maximum retention after runoff (in)[5]
CN= Curve Number [5]

$$Q = \frac{[(P \times K) - (0.2 \times S)]2}{[(P \times K) + (0.8 \times S)]} \times \frac{1ft}{12in}$$

Where:
Q= Runoff depth (ft) [6]
P= Precipitation (in) = **1.00**
K= Seasonal Precipitation Factor [7]

Post-construction BMPs shall be sized to treat and caputure all of the runoff generated using the modified Rational Method with an intensity of 0.2 inches per hour for a one inch rain event over a 24 hour period.

$V=(Q)(A_r)$

Where:
V= Volume of Storm Water to be Retained (ft^3)
A_r= Reduced Tributary Area including credit for Pollution Prevention Measures (ft^2)

Input: (Pick data from drop down lists or enter calculated values)

A_r =	3,212 ft^2
K [7] =	1.10

Drop down Lists

Select hydrologic soil type within tributary area [8] =	C: 0.05 - 0.15 in/hr infiltration (transmission) rate
Select predevelopment ground cover description [5] =	Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)
Select post development ground cover description [5] =	Brush: weed-grass mixture with brush major element - Poor (<50% ground cover)
CN_{PRE} =	
CN_{POST} =	
OR Composite Predevelopment CN [9] =	82.0
Composite Post development CN [9] =	89.0

NOTE:
Entering a calculated composite CN will override selections made from the pull down menus above. Calculation worksheet should be used for all composite calculations and included with submittal.

Solution:

Pre Development Storm Water Runoff Volume

[5] Per the "Urban Hydrology For Small Watersheds" TR-55 manual.

[6] *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

[7] From Sonoma County Water Agency Flood Control Design Criteria.

[8] Hydrologic soil type based of infiltration rate of native soil as defined by "Urban Hydrology For Small Watersheds" TR-55 Manual.

[9] Composite CN calculated per "Worksheet 2 Part 1 of the Urban Hydrology For Small Watersheds" TR-55 manual.

STORM WATER CALCULATOR

S_{PRE}= 2.20 in

$S_{PRE} = \frac{1000}{82} - 10$

Where:

S_{PRE}= Pre development potential maximum retention after runoff (in).

Q_{PRE}= 0.01269 ft

$Q_{PRE} = \frac{[(1.00*1.10)-(0.2 * 2.20)]^2}{[(1.00*1.10)+(0.8 * 2.20)]} \times \frac{1ft}{12in}$

Q_{PRE}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{PRE}= 40.75 ft^3

V_{PRE}= (0.01269)(3,212)

V_{PRE}= Pre Development Volume of Storm Water Generated (ft^3)

Post Development Storm Water Runoff Volume

S_{POST}= 1.24 in

$S_{POST} = \frac{1000}{89} - 10$

Where:

S_{POST}= Post development potential maximum retention after runoff (in).

Q_{POST}= 0.02892 ft

$Q_{POST} = \frac{[(1.00*1.10)-(0.2 * 1.24)]^2}{[(1.00*1.10)+(0.8 * 1.24)]} \times \frac{1ft}{12in}$

Q_{POST}= *Q in feet of depth as defined by the "Urban Hydrology For Small Watersheds" TR-55 Manual.*

V_{POST}= 92.88 ft^3

V_{POST}= (0.02892)(3,212)

V_{POST}= Post Development Volume of Storm Water Generated (ft^3)

Solution: Volume Capture Requirement

Increase in volume of storm water that must be retained onsite (may be infiltrated or reused).

Delta Volume Capture= $(V_{POST}-V_{PRE})$

Delta Volume Capture= (92.88) - (40.75)

V_{DELTA}= 52.123 ft^3

Where:

Delta Volume Capture= The increase in volume of storm water generated by the 85th percentile 24 hour storm event due to development that must be retained onsite (may be infiltrated or reused).

STORM WATER CALCULATOR

LID BMP Sizing Tool Delta Volume Capture Requirement

Project:	CROIX WINERY USE PERMIT - TRIB 4
Address/Location:	1406 WOOD RD, FULTON
Designer:	MUNSELLE CIVIL ENGINEERING
Date:	February 2, 2022

BMP ID: Trib/LOA 4

Percent of Goal Achieved: 115.11 %

Description: The Delta Volume Capture sizing tool helps the designer appropriately size a LID BMP to achieve the design requirement of the delta volume capture.
Instructions: Enter the percent of porosity of the specified soil and depth below perforated pipe (if present). The width and length entries will need to be interactively adjusted until "Percent of Requirement achieved" reaches 100%.

Results from another Worksheet:

V_{DELTA} from Delta Volume Capture Work Sheet = 52.12 ft^3

To Navigate back to Input BMP Data worksheet, Please use the " Return to Input BMP Data Worksheet" button.

<<< Return to "Input BMP Data" Worksheet

LID BMP Sizing Tool Delta Volume Capture Requirement: V_{DELTA}

NOTE:
LID Sizing Tool only applicable for volume based BMPs. Not required if site requires treatment only.

Formulas:

$$V_{LID\ DELTA} = \frac{V_{DELTA}}{P}$$

$$A_{LID\ DELTA} = (W)(L)\ \textit{or}\ \text{BMP Area}$$

$$V_{PONDED} = (W_P)(L_P)(D_P)\ \textit{or}\ AP(D_P)$$

Percent of Requirement Achieved =

$$\left(\frac{V_{PONDED}}{V_{DELTA}} + \frac{\left((D)(A_{LID\ DELTA})\right)}{V_{LID\ DELTA}}\right) \times 100$$

Where:

$V_{LID\ DELTA}$ = Required capture volume of the soil in LID BMP
$A_{LID\ DELTA}$ = Footprint of LID BMP area.
V_{PONDED} = Volume of Ponded Water above the treatment area surface.
V_{DELTA} = from Delta Volume Capture Work Sheet

Where:

P= Porosity of the material used in the BMP (Drop Down List)
D= BMP Depth (See Note) (decimal feet)
W= Width (decimal feet)
L= Length (decimal feet)

Where:

D_P = Ponded Water Depth (decimal feet)
W_P = Ponded Water Width (decimal feet)
L_P = Ponded Water Length (decimal feet)
A_P = Ponded Water Surface area (decimal square feet)

BMP Depth:
- Measured from ground surface WITHOUT perforated pipe.
- Measured from bottom of perforated pipe if installed.

Input: BMP Below Ground

P =	0.30	
D =	1.3	ft
W =	2.0	ft
L =	80.0	ft

OR enter Area (will override L & W)

BMP Area= 0.0 ft^2

BMP Total Volume Area = 200.00 ft^3

Input: Ponded Water Above Ground

D_P =	0.000	ft
W_P =	0.0	ft
L_P =	0.0	ft

Pond Area (A_P)= 0.0 ft^2

V_{PONDED} = 0.00 ft^3

BMP + Ponded Volume Total = 200.00 ft^3

Solutions:

$V_{LID\ DELTA}$ =	173.74	ft^3	= 52.12 / 0.30
$A_{LID\ DELTA}$ =	160.00	ft^2	= 2.00 x 80.00
V_{PONDED} =	0.00	ft^3	= 0.00 x 0.00 x 0.000
Percent of Requirement Achieved =	115.11	%	= [(0.000 / 52.12) + ((1.25 x 160.0) / 173.74)] x 100

Simple Calculator Results (D,W,L)
Place zero in ether D, W, or L in the BMP Below Ground yellow cells:
@ 100% (given two dimensions) =

D=	1.25 ft
W=	2.00 ft
L=	80.00 ft

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APPENDIX E

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cort@munsellecivil.com
www.munsellecivil.com

Date: Feb 2022

Volume Retention Calculations

Project: Croix Winery Use Permit Address: 1406 Wood Road, Fulton

Trib/LOA 3 Volume Retention:

BMP ID	Length (ft)	Width (ft)	Area (sf)	Depth (ft)	Porosity	Volume (cf)
1A	146.0	3.00	438.00	3.50	0.3	459.90
1B	111.0	3.00	333.00	3.50	0.3	349.65
			Total Volume Retention (cf)			**809.55**

Required Volume per City of Santa Rosa Calculator	798.87
Percent Achieved	101.34

Trib/LOA 4 Volume Retention:

BMP ID	Length (ft)	Width (ft)	Area (sf)	Depth (ft)	Porosity	Volume (cf)
2	80.0	2.00	160.00	1.25	0.3	60.00
			Total Volume Retention (cf)			**60.00**

Required Volume per City of Santa Rosa Calculator	52.12
Percent Achieved	115.12

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Map Scale: 1:2,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sonoma County, California
Survey Area Data: Version 11, Sep 21, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Nov 22, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HtA	Huichica loam, 0 to 2 percent slopes	C	9.2	100.0%
Totals for Area of Interest			**9.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

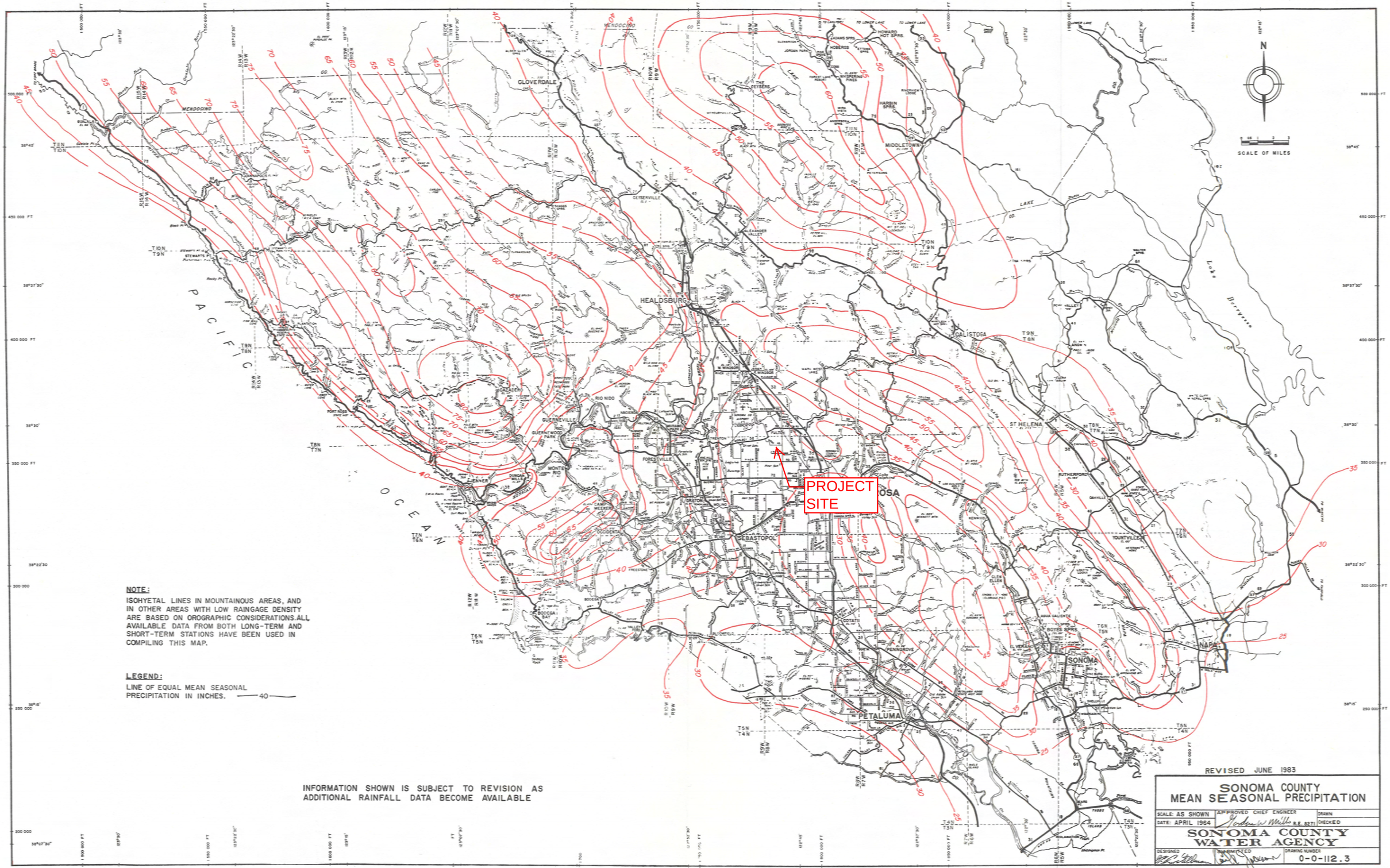
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified



NOTE:
ISOHYETAL LINES IN MOUNTAINOUS AREAS, AND IN OTHER AREAS WITH LOW RAINGAGE DENSITY ARE BASED ON OROGRAPHIC CONSIDERATIONS. ALL AVAILABLE DATA FROM BOTH LONG-TERM AND SHORT-TERM STATIONS HAVE BEEN USED IN COMPILING THIS MAP.

LEGEND:
LINE OF EQUAL MEAN SEASONAL PRECIPITATION IN INCHES. ——40——

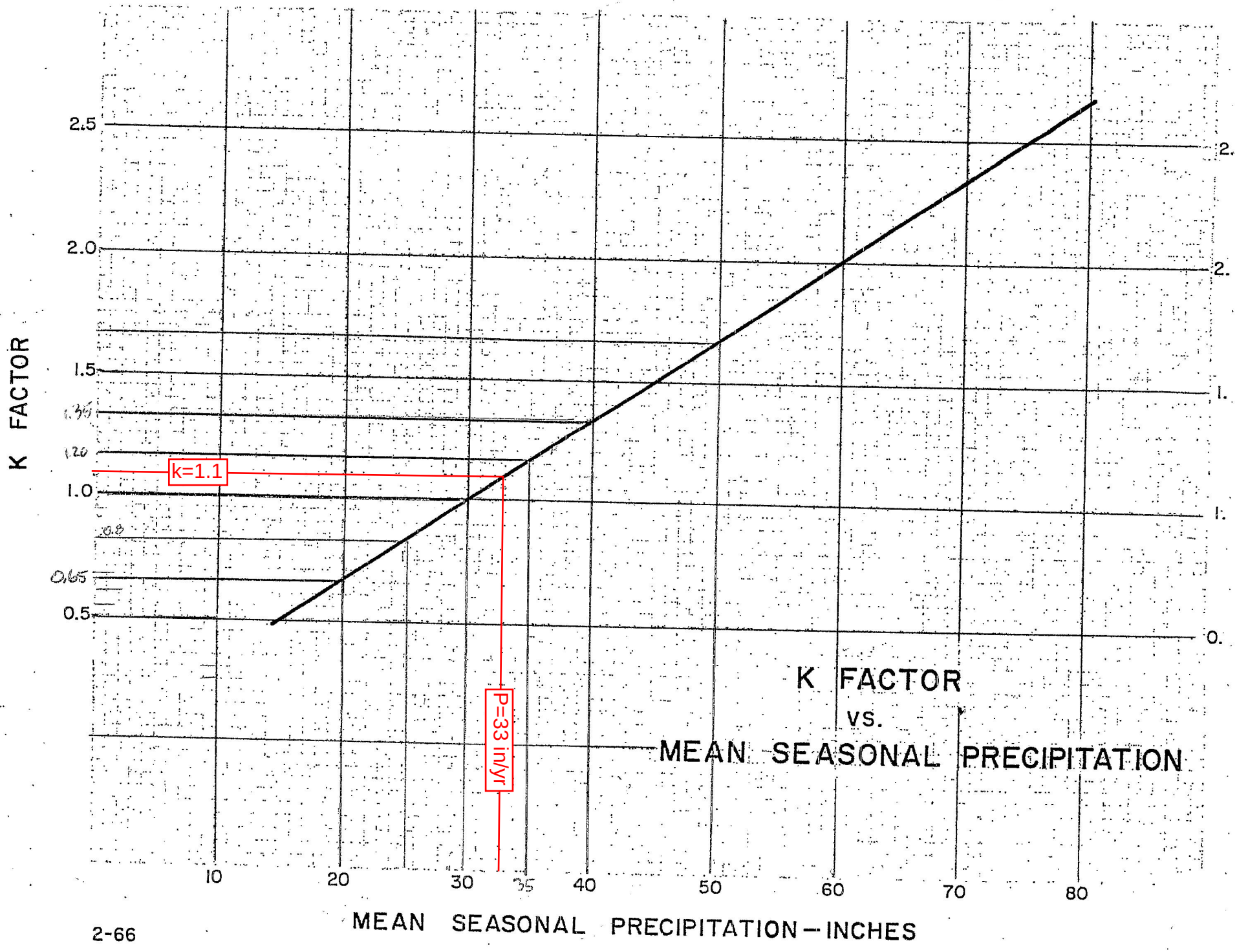
INFORMATION SHOWN IS SUBJECT TO REVISION AS ADDITIONAL RAINFALL DATA BECOME AVAILABLE

REVISED JUNE 1983

SONOMA COUNTY MEAN SEASONAL PRECIPITATION

SCALE: AS SHOWN	APPROVED CHIEF ENGINEER	DRAWN
DATE: APRIL 1964	John W Mills R.E. 8271	CHECKED
SONOMA COUNTY WATER AGENCY		
DESIGNED	SUBMITTED	DRAWING NUMBER 0-0-112.3

PLATE No. B-3



2-66

PLATE No. B-4

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2/]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts [5/]:					
1/8 acre or less (t	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

The open space for the completed project will be landscaped and vegetated, therefore, this CN value best fits the proposed open space condition.

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands [1/]

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2/]	Hydrologic condition [3/]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+ CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition, and I_a=0.2S

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

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APPENDIX G

Form A
Storm Water Quality Feature Maintenance Check List
- Standard Conditions -

Date: _____ Inspector: _____

Start Time: _____ Project: _____

Stop Time: _____ Address: _____

Inspection Status Codes:
S = Satisfactory * = Refer to Form B (Specials) and/or Form C (Notes).
D = Deficient

Are there any special conditions and/or maintenance requirements noted for BMP(s)? Y N (circle one)
If Yes, attach Form B for Project.

	Drainage				Erosion						Vegetation				General			Special Features
	Drawdown - Drainage - Vector Risk - Pump Out-Blockage				Hydraulic Function - Failure - Sediment Clogging						Excessive Mowing - Herbicide Overuse - Health of Desired Vegetation -				Trash and Debris - Improper Modifications - Damage			
Reference code	D1	D2	D3	D4	E1	E2	E3	E4	E5	E6	V1	V2	V3	V4	G1	G2	G4	S
BMP ID:	Evidence of standing or ponding of water in the BMP area after 72 hours of dry weather?	Does the high flow bypass function as designed?	Is there sediment acumination in or around BMP?	Has water been observed flowing in the pervious concrete section during a low intensity storm?	Is there under cutting or washouts along the sidewalks and/or curbs abutting the planter area?	Is there channelization (gully) forming along the length of the planter area?	Is there accumulation of sediment (sand, dirt, mud) in the planter area ?	Observed or potential transport of mulch to drainage system?	Are there voids or holes present in the BMP?	Is there evidence of animal activity?	Is the vegetation clogging the inlet or flow path?	Evidence of Excessive Mowing and/or Herbicide Overuse?	Are there dead or dry plants or excessive weeds?	Is there an absence of correct vegetation?	Is there debris/trash accumulation in the BMP or high flow by pass?	Missing or damage structural features? (Grates, pipes, walls, curbs, etc.)	Evidence of improper modifications or removal of BMP?	**See Additional Special Conditions or Features Check List Requirement Form B**

Office Use:
Complete: _____ Issues Corrective Action: _____ Re-Inspection Required: _____

Storm Water Quality Special Feature Maintenence Check List

Date: _____

Start Time: _____

Stop Time: _____

Inspector: _____

Project: _____

Address: _____

Inspection Status Codes:

S = Satisfactory * - See Notes on Form C

D = Deficient

Special Feature or Conditions

Reference code	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Additional Special Maintenance Inspection Criterial	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.
BMP ID:											

Office Use:

Complete: _____ Issues Corrective Action: _____ Re-Inspection Required: _____

Form C
Storm Water Quality Feature Maintenence Check List
- Inspection Notes -

Date: _____

Inspector: _____

Project: _____

Address: _____

BMP ID:	Reference Code	**Notes**

MUNSELLE
CIVIL ENGINEERING
CIVIL ENGINEERING LAND PLANNING

Planning
Civil Engineering
Project Management
Construction Management
Surveying
Entitlements
Concept Design
Feasibility Studies

APPENDIX H

HEALDSBURG OFFICE
513 Center St.
Healdsburg, CA 95448

Phone (707) 395-0968
cell (707) 280-0474
cort@munsellecivil.com
www.munsellecivil.com

PRE-DEVELOPMENT PERVIOUS/IMPERVIOUS AREAS			
TRIB / LOA		IMPERV. AREA (SF)	PERV. AREA (SF)
1	(EX) ASPHALT	352 SF	
	(EX) CONC/ROOF	3,345 SF	
	(EX) GRAVEL	4,248 SF	
	(EX) VINEYARD		22,983 SF
	(EX) PERVIOUS/VEG		12,301 SF
2	(EX) ASPHALT	7,268 SF	
	(EX) CONC/ROOF	1,256 SF	
	(EX) GRAVEL	6,871 SF	
	(EX) VINEYARD		5,121 SF
	(EX) PERVIOUS/VEG		0
3	(EX) ASPHALT	0	
	(EX) CONC/ROOF	7,355 SF	
	(EX) GRAVEL	14,731 SF	
	(EX) VINEYARD		22,038 SF
	(EX) PERVIOUS/VEG		17,279 SF
4	(EX) ASPHALT	0	
	(EX) CONC/ROOF	0	
	(EX) GRAVEL	0	
	(EX) VINEYARD		6,423 SF
	(EX) PERVIOUS/VEG		0
TOTAL PRE-DEVELOPMENT IMPERVIOUS AREA = 45,426 SF			
TOTAL PRE-DEVELOPMENT PERVIOUS AREA = 86,145 SF			

LOA 3
LOW POINT/
PROPERTY LINE

TRIB 3
(EX) ROOF/CONC PATHS
721 SF, 0.017 AC
CN=98, C=0.8

TRIB 3
(EX) GRAVEL
3,612 SF, 0.083 AC
CN=89, C=0.6

TRIB 1
(EX) ROOF/CONC PATHS
3,345 SF, 0.077 AC
CN=98, C=0.8

(EX) RESIDENCE

EX BUILDING

EX BOCCE COURT

(EX) TANKS

(EX) WINERY BARN

EX BUILDING

TRIB 1
(EX) PERVIOUS/
VEGETATED AREA
12,301 SF, 0.282 AC
CN=74, C=0.1

TRIB 3
(EX) ROOF/CONC
1,318 SF, 0.030 AC
CN=98, C=0.8

TRIB 3
(EX) ROOF/CONC
2,454 SF, 0.056 AC
CN=98, C=0.8

TRIB 1
(EX) ASPHALT
352 SF, 0.008 AC
CN=92, C=0.7

TRIB 1
(EX) GRAVEL
4,248 SF, 0.066 AC
CN=89, C=0.6

TRIB 2
(EX) ROOF/CONC
TO REMAIN
1,256 SF, 0.029 AC
CN=98, C=0.8

OVERLAND FLOW ROUTE (TYP)

TRIB 2
(EX) ASPHALT
PARKING AND PATH
7,268 SF, 0.167 AC
CN=92, C=0.7

WOOD RD

LOA 1
PROPERTY LINE/
ROADSIDE SWALE

(EX) ROADSIDE SWALE

TRIB 1
43,229 SF
(0.99 AC)

TRIB 2
20,516 SF
(0.47 AC)

PARKING LOT CONSTRUCTED PER GR017-0079

TRIB 1
(EX) VINEYARD
22,983 SF, 0.528 AC
CN=82, C=0.1

LOA 2
LOW POINT/
RETENTION TRENCH

TRIB 2
(EX) GRAVEL
6,636 SF, 0.066 AC
CN=89, C=0.6

TRIB 2
(EX) VINEYARD
5,121 SF, 0.118 AC
CN=82, C=0.1

TRIB 2
(EX) GRAVEL
235 SF, 0.005 AC
CN=98, C=0.9

APN
034-030-032

TRIB 3
(EX) PERVIOUS/
VEGETATED AREA
17,279 SF, 0.397 AC
CN=74, C=0.1

TRIB 3
61,403 SF
(1.41 AC)

TRIB 3
(EX) VINEYARD
22,038 SF, 0.506 AC
CN=82, C=0.1

TRIB 3
(EX) ROOF/CONC
2,862 SF, 0.066 AC
CN=98, C=0.8

TRIB 3
(EX) GRAVEL
11,419 SF, 0.255 AC
CN=89, C=0.6

TRIB 4
6423 SF
(0.15 AC)

TRIB 4
(EX) VINEYARD
6,423 SF, 0.147 AC
CN=82, C=0.1

LOA 4
LOW POINT/
PROPERTY LINE

APPROXIMATE ASSESSOR'S PARCEL LINE (TYP)

APPROXIMATE ASSESSOR'S PARCEL LINE

APPROXIMATE ASSESSOR'S PARCEL LINE (TYP)

LEGEND

TRIBUTARY AREA LIMITS

SOIL TYPE:
HtA HUICHICA LOAM, 0 TO 2 PERCENT SLOPES – TYPE C

PRE CONSTRUCTION HYDROLOGY MAP

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

N W E S

D:\MUNSELLE CIVIL DROPBOX\KELLIE FLOYD\COMPANY-DATA\MCE JOBS\2016\137-16 CROIX ESTATE WINERY\DWGS\137-16 UP SWLID HYDRO.DWG 2/3/2022 2:42 PM

REVISION	DESCRIPTION	BY	DATE

MUNSELLE CIVIL ENGINEERING
CIVIL ENGINEERING • LAND PLANNING
513 CENTER STREET
HEALDSBURG, CA 95448
(707) 395-0968

PROFESSIONAL ENGINEER • MUNSELLE • REGISTERED • No. 69941 • Exp. 3-30-22 • CIVIL • STATE OF CALIF.

CORT L MUNSELLE RCE 69941 DATE

CROIX ESTATE WINERY
PRE CONSTRUCTION HYDROLOGY MAP
APN 034-030-032
1408 WOOD ROAD
FULTON, CA

FEBRUARY 2, 2022

JOB NO.
137-16

SHEET NO.
1
OF 2 SHEETS

POST-DEVELOPMENT PERVIOUS/IMPERVIOUS AREAS			
TRIB / LOA		IMPERV. AREA (SF)	PERV. AREA (SF)
1	(EX) + (N) ASPHALT	352 SF	
	(EX) + (N) CONC/ROOF	1,817 SF	
	(EX) + (N) GRAVEL	5,502 SF	
	(EX) VINEYARD		22,983 SF
	(EX) + (N) PERVIOUS/VEG		12,575 SF
2	(EX) + (N) ASPHALT	7,268 SF	
	(EX) + (N) CONC/ROOF	1,255 SF	
	(EX) + (N) GRAVEL	3,365 SF	
	(EX) VINEYARD		5,121 SF
	(EX) + (N) PERVIOUS/VEG		3,507 SF
3	(EX) + (N) ASPHALT	0	
	(EX) + (N) CONC/ROOF	19,102 SF	
	(EX) + (N) GRAVEL	24,931 SF	
	(EX) VINEYARD		5,341 SF
	(EX) + (N) PERVIOUS/VEG		12,029 SF
4	(EX) + (N) ASPHALT	0	
	(EX) + (N) CONC/ROOF	792 SF	
	(EX) + (N) GRAVEL	4,586 SF	
	(EX) VINEYARD		1,045 SF
	(EX) + (N) PERVIOUS/VEG		0
	TOTAL POST-DEVELOPMENT IMPERVIOUS AREA = 68,970 SF		
	TOTAL POST-DEVELOPMENT PERVIOUS AREA = 62,601 SF		

LOA 3
LOW POINT/
PROPERTY LINE

TRIB 3
(N)/REPLACED CRUSHED GRAVEL ROAD AND PATHS
6,010 SF, 0.138 AC
CN=89, C=0.6

(N) RETENTION TRENCH 1B
111' LONG x 3' WIDE x 3.50' DEPTH
349.65 CF VOLUME RETENTION

15' MIN BUFFER STRIP

(EX) BUILDING TO BE REMOVED

(EX) CONC WALL, TO BE REMOVED

TRIB 3
(N) CRUSHED GRAVEL ROAD/PARKING (PAVED) AREA DISCONNECTION REDUCTION CREDIT – POROUS PAVEMENT)
18,921 SF, 0.434 AC
CN=89, C=0.6

TRIB 3
(N) CONC
2,957 SF, 0.068 AC
CN=98, C=0.8

APPROXIMATE ASSESSOR'S PARCEL LINE (TYP)

TRIB 4
(N) CRUSHED GRAVEL ROAD/PARKING (PAVED AREA DISCONNECTION REDUCTION CREDIT – POROUS PAVEMENT)
4,586 SF, 0.105 AC
CN=89, C=0.6

TRIB 3
(EX) ROOF/CONC TO REMAIN
365 SF, 0.008 AC
CN=98, C=0.8

TRIB 1
(EX) ROOF/CONC TO REMAIN
1,817 SF, 0.042 AC
CN=98, C=0.8

(EX) RESIDENCE

PROPOSED TASTING BUILDING

TRIB 3
(N) ROOF
1,515 SF, 0.035 AC
CN=98, C=0.8

(EX) BOCCE COURT, TO BE REMOVED

(N) RETENTION TRENCH 1A
146' LONG x 3' WIDE x 3.50' DEPTH
459.90 CF VOLUME RETENTION

(EX) BUILDING TO BE REMOVED

APPROX PROPOSED ROOF LEADER, TO BUBBLE-UP EMITTER

TRIB 3
(N) ROOF
(DISCONNECTION TO VEGETATED BUFFER REDUCTION CREDIT)
12,251 SF, 0.281 AC
CN=98, C=0.8

PROPOSED BARREL STORAGE BUILDING

TRIB 3
61,403 SF
(1.41 AC)

LOA 4
LOW POINT/ (N) RETENTION TRENCH 2

TRIB 4
6423 SF
(0.15 AC)

(N) RETENTION TRENCH 2
80' LONG x 2' WIDE x 1.25' DEPTH
60 CF VOLUME RETENTION

TRIB 4
(EX) VINEYARD TO REMAIN
1,045 SF, 0.024 AC
CN=82, C=0.1

TRIB 4
(N) CONC
792 SF, 0.018 AC
CN=98, C=0.8

(EX) TANKS

(EX) WINERY BARN

TRIB 3
(EX) ROOF/CONC TO REMAIN
1,602 SF, 0.037 AC
CN=98, C=0.8

TRIB 3
(EX) CONC TO REMAIN (BUFFER STRIP REDUCTION CREDIT)
412 SF, 0.009 AC
CN=98, C=0.8

TRIB 2
(EX) ROOF/CONC TO REMAIN
1,255 SF, 0.029 AC
CN=98, C=0.8

TRIB 1
(N)/REPLACED CRUSHED GRAVEL ROAD AND PATHS
5,502 SF, 0.126 AC
CN=89, C=0.6

OVERLAND FLOW ROUTE (TYP)

TRIB 2
(N)/REPLACED CRUSHED GRAVEL ROAD
3,365 SF, 0.077 AC
CN=89, C=0.6

TRIB 3
(EX)/(N) VEGETATED/ PERVIOUS AREA
12,029 SF, 0.276 AC
CN=74, C=0.1

TRIB 2
20,516 SF
(0.47 AC)

PARKING LOT CONSTRUCTED PER GRD17-0079

TRIB 2
(N) VEGETATED/PERVIOUS AREA
3,507 SF, 0.081 AC
CN=74, C=0.1

TRIB 3
(EX) VINEYARD TO REMAIN
5,341 SF, 0.123 AC
CN=82, C=0.1

TRIB 2
(EX) VINEYARD AREA TO REMAIN
5,121 SF, 0.118 AC
CN=82, C=0.1

TRIB 2
(EX) ASPHALT PARKING AND PATH TO REMAIN
7,268 SF, 0.167 AC
CN=92, C=0.7

APN
034-030-032

TRIB 2
(EX) GRAVEL TO REMAIN
235 SF, 0.005 AC
CN=89, C=0.6

LOA 2
LOW POINT/ (EX) RETENTION TRENCH

TRIB 1
43,229 SF
(0.99 AC)

TRIB 1
(EX) ASPHALT TO REMAIN
352 SF, 0.008 AC
CN=92, C=0.7

TRIB 1
(EX)/(N) VEGETATED/ PERVIOUS AREA
12,575 SF, 0.298 AC
CN=74, C=0.1

(N) WOOD DECK

TRIB 1
(EX) VINEYARD
22,983 SF, 0.528 AC
CN=82, C=0.1

LOA 1
PROPERTY LINE/
ROADSIDE SWALE

WOOD RD

(EX) ROADSIDE SWALE

APPROXIMATE ASSESSOR'S PARCEL LINE

EXTENDED CONTOURS FROM COUNTY LIDAR (TYP)

APPROXIMATE ASSESSOR'S PARCEL LINE (TYP)

LEGEND

TRIBUTARY AREA LIMITS

SOIL TYPE:
HtA HUICHICA LOAM, 0 TO 2 PERCENT SLOPES – TYPE C

POST CONSTRUCTION HYDROLOGY MAP

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

N E S W

D:\MUNSELLE CIVIL DROPBOX\KELLIE FLOYD\COMPANY-DATA\MCE JOBS\2016\137-16 CROIX ESTATE WINERY\DWGS\137-16 UP SWLID HYDRO.DWG 2/3/2022 2:42 PM

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REGISTERED PROFESSIONAL ENGINEER • CIVIL • STATE OF CALIFORNIA • COURT L. MUNSELLE • No. 69941 • Exp. 3-30-22

COURT L. MUNSELLE DATE
RCE 69941

CROIX ESTATE WINERY
POST CONSTRUCTION HYDROLOGY MAP
APN 034-030-032
1406 WOOD ROAD
FULTON, CA

FEBRUARY 2, 2022

JOB NO.
137-16

SHEET NO.
2
OF 2 SHEETS