

# **U.C. COOPERATIVE EXTENSION**

## **~ CENTRAL COAST CONSERVATION PRACTICES ~**

### **ESTIMATED COSTS & POTENTIAL BENEFITS FOR AN UNDERGROUND OUTLET 2003**

#### **PREPARED BY**

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#### **INTRODUCTION & GENERAL DESCRIPTION**

This study is intended as an estimate or guide, which can be helpful in evaluating management decisions related to the installation, operation and maintenance of underground outlets. Underground outlets are pipelines installed beneath the surface of the ground. As a conservation practice, underground outlets are used to collect excess surface water and convey it to a suitable location for release. Underground outlets are often used to mitigate areas of potential erosion or gully formation. Underground outlets differ by design and capacity and are commonly used in combination with other on-farm conservation practices such as sediment basins, grassed farm roads, filter strips and grassed waterways.

Costs for the installation and annual operation and maintenance for the underground outlet in this study are estimated for low, representative and high cost scenarios in Table 1. More detailed information for the representative cost scenario is included in Table 2 (installation, operation and maintenance) and Table 3 (materials). In-kind contributions from federal and other local assistance programs may be available to offset direct expenses borne by the farmers and ranchers adopting this conservation practice. Land ownership and rental rates are specific to each operation and therefore are not included in the analysis. Estimated costs given for labor, materials, and custom or contract services are based on current figures. The costs and practices contained in this study may not be applicable to all situations or used every year. Individual farmers and ranchers should therefore use this study as a template and make adjustments to more accurately reflect their own situations. The use of trade names does not constitute an endorsement or a recommendation by the University of California nor is criticism of similar products implied.

The following is a description of general assumptions pertaining to the conservation practice analyzed in this study. The operations are those currently used by farmers and ranchers within six counties on the Central Coast of California: San Mateo, Santa Cruz, Santa Clara, San Benito, Monterey and San Luis Obispo.

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## PRACTICE COSTS

**Installation.** Costs for constructing the 400 linear foot underground outlet assumed in this study include charges for excavation of trenches, pipeline materials (e.g., pipes and inlets), labor to install the pipeline, and charges for operations to cover the pipeline with soil as well as re-compact the area. Associated costs are located on Tables 1, 2, and 3.

**Annual Operation & Maintenance.** Each year operation and maintenance costs are incurred as a part of this conservation practice. For the representative scenario studied here, operation and maintenance costs include uncovering pipe inlets in the fall before rains and constructing berms so that excess surface water runoff can be channeled into the inlets during the rainy season. After the rainy season is over, farmers generally recap pipe inlets and regrade or smooth the area above the underground outlet. Farmers also use sandbags to help channel water to the inlets. Associated costs are included on Tables 1, 2, and 3. Alternatively, farmers may seed grasses or lay straw mulch over the pipeline to further minimize erosion. Costs will vary accordingly.

**Additional Fees & Expenses.** When using conservation practices additional fees and expenses are sometimes incurred for consultants, permits or other charges that are specific to a particular practice. For the underground outlet installed in this study, no specialized fees or costs are assumed. If consultants are used or construction permits are required, charges will be incurred and should be included as a cost.

## POTENTIAL BENEFITS & DRAWBACKS OF PRACTICE

Farmers, ranchers and landowners should evaluate each conservation practice for potential benefits and drawbacks with respect to their overall operation. This may include risk and any effects on equipment, labor and capital.

**Benefits.** Farmers report that underground outlets are effective in channeling runoff, thus reducing the potential for crop and road damage associated with erosion and gully formation. For the representative scenario growers report a savings in labor and equipment use with a decrease in flood and other erosion control measures. These savings are considered short-term benefits, which are estimated at \$650 and shown on Table 1. Growers also report the potential for yield improvement through reduced loss of plants when using underground outlets. Using strawberries as an example, and assuming a yield improvement of 200 trays total, with a price of \$7.04 per tray, additional income is estimated at \$1,408 and shown on Table 1 (<http://coststudies.ucdavis.edu>). Potential long-term benefits include a reduction in the loss of productive topsoil if adjacent fields are eroded. Because of the difficulty in measuring, thus valuing such losses, no cash savings for long-term benefits are included in this study. In addition, preventing or minimizing downstream impacts and/or property damage may reduce conflicts with neighbors and exposure to legal and regulatory actions.

**Drawbacks.** Farmers generally install underground outlets beneath existing farm access roads to avoid taking additional land out of production. In this case, loss of revenue or income would be avoided. If land is taken out of production, however, a loss of income will apply. For the representative scenario studied here .1 acre is assumed to be taken out of production. Using strawberries as an example, and assuming a yield of 5,500 trays per acre with price of \$7.04 per tray, per acre returns above total costs to strawberry farmers are estimated at \$5,701 per acre (<http://coststudies.ucdavis.edu>). Therefore, reduced returns are estimated at \$570 (.1 x \$5,701) and shown on Table 1. To incorporate this system into a farming

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operation, farmers must be willing to install and maintain a permanent road and underground outlet structure.

Loss in income will vary depending on the amount of land taken out of production, crop grown, and yield and price per acre. Individual growers may refer to the website shown above to view cost of production studies and calculate potential revenue losses associated with various crops. Alternatively, contact your local UCCE office for assistance with this information.

### ACKNOWLEDGEMENTS

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### ADDITIONAL INFORMATION

For additional information about the calculations used in this report, call Laura Tourte, UCCE Santa Cruz County (831) 763-8040. Additional information about the practice itself may be accessed via the internet through UCCE at <http://waterquality.ucanr.org> and NRCS at <http://www.nrcs.usda.gov/technical>.

Copies of this study may be requested through local UCCE, NRCS, and Resource Conservation District (RCD) offices in the six counties listed above. Additional publications with estimated costs and potential benefits for various other conservation practices are also available through Central Coast UCCE, NRCS, and RCD offices. They may also be accessed on the Internet at <http://cesantacruz.ucdavis.edu>.

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Table 1. Underground Outlet (400 Linear Feet) - Partial Budget - Central Coast - 2003

ESTIMATED COSTS				POTENTIAL BENEFITS			
COSTS PER UNIT*	LOW	REP**	HIGH	ADDITIONAL RETURNS PER UNIT	LOW	REP	HIGH
<i>Installation (Year 1):</i>				Strawberry Yield Improvement (Loss of Plants Reduced)	\$0	\$1,408	\$2,112
Layout & Mark Site	\$41	\$138	\$94				
Trench (Backhoe)	\$220	\$440	\$660				
Install Pipeline	\$4,128	\$4,337	\$4,377				
Fill In & Compact Site	\$122	\$245	\$306				
<i>(1a) Installation - Subtotal</i>	<i>\$4,511</i>	<i>\$5,160</i>	<i>\$5,437</i>				
<i>Annual Operation &amp; Maint. (Years 2-5):</i>							
Uncover to Check & Re-Cover	\$27	\$107	\$188				
Channel/Check Water - Sandbags	\$21	\$21	\$21				
Clean Downspout Inlets	\$28	\$28	\$28				
<i>(1b) Ann. Oper. &amp; Maint. Costs - Subtotal</i>	<i>\$76</i>	<i>\$156</i>	<i>\$237</i>				
<i>Interest on Operating Capital @ 7.4%</i>	<i>\$28</i>	<i>\$32</i>	<i>\$35</i>				
<i>(1c) Costs - Subtotal</i>	<i>\$4,615</i>	<i>\$5,348</i>	<i>\$5,709</i>	<i>(5) Additional Returns - Subtotal</i>	<i>\$0</i>	<i>\$1,408</i>	<i>\$2,112</i>
<b>REDUCED RETURNS PER UNIT</b>	<b>LOW</b>	<b>REP</b>	<b>HIGH</b>	<b>REDUCED COSTS PER UNIT</b>	<b>LOW</b>	<b>REP</b>	<b>HIGH</b>
Strawberry Acreage Removed (.1 Ac)	\$15	\$570	\$1,125	Labor & Equip. Use for Prevention & Repairs (Associated with Flood Control & Storm Events)	\$0	\$650	\$1,950
<i>(2) Reduced Returns - Subtotal</i>	<i>\$15</i>	<i>\$570</i>	<i>\$1,125</i>	<i>(6) Reduced Costs - Subtotal</i>	<i>\$0</i>	<i>\$650</i>	<i>\$1,950</i>
<b>COSTS &amp; REDUCED RETURNS</b>	<b>LOW</b>	<b>REP</b>	<b>HIGH</b>	<b>ADD. RETURNS &amp; REDUCED COSTS</b>	<b>LOW</b>	<b>REP</b>	<b>HIGH</b>
<i>(3) Total Per Unit Year 1 (1c+2)</i>	<i>\$4,630</i>	<i>\$5,918</i>	<i>\$6,834</i>	<i>(7) Total Per Unit Year 1 (5+6)</i>	<i>\$0</i>	<i>\$2,058</i>	<i>\$4,062</i>
<i>(4) Total Per Unit Per Year - Years 2-5 (1b+2)</i>	<i>\$91</i>	<i>\$726</i>	<i>\$1,362</i>	<i>(8) Total Per Unit Per Year - Years 2-5 (5+6)</i>	<i>\$0</i>	<i>\$2,058</i>	<i>\$4,062</i>
<b>NET CHANGE IN INCOME PER UNIT (400 Linear Feet) YEAR 1 (7-3)</b>					-\$4,630	-\$3,860	-\$2,772
<b>NET CHANGE IN INCOME PER UNIT (400 Linear Feet) PER YEAR - YEARS 2-5 (8-4)</b>					-\$91	\$1,332	\$2,700
<b>NET CHANGE IN INCOME PER LINEAR FOOT YEAR 1</b>					-\$12	-\$10	-\$7
<b>NET CHANGE IN INCOME PER LINEAR FOOT YEARS 2-5</b>					***	\$3	\$7

\* Unit = 400 linear feet.

\*\* Rep = Representative cost.

\*\*\* Net change in income is negligible when represented on a linear foot basis.

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Table 2. Detail of Representative Installation, Operation & Maintenance Costs<sup>†</sup>  
Underground Outlet (400 Linear Feet) – Central Coast 2003

Operation	Non-Mach Labor		Machine Labor		Custom Work		Material Cost (\$/400 LF) <sup>‡</sup>	Total Cost (\$/400 LF) <sup>¶</sup>	Your Cost (\$/400 LF)	
	Hrs/ 400 LF	Cost/ 400 LF	Hrs/ 400 LF	Cost/ 400 LF	Hrs/ 400 LF	Cost/ 400 LF				
<i>Installation (Year 1):</i>										
Layout & Mark Site	3.0	40					98	138		
Trench (Backhoe or Trencher)					8	440		440		
Install Pipeline	5.0	67					4,270	4,337		
Fill In & Compact Site			8.0	167			77 <sup>§</sup>	245		
<i>Subtotal</i>		<i>107</i>		<i>167</i>		<i>440</i>	<i>4,445</i>	<i>5,160</i>		
<i>Annual Operation &amp; Maint. (Years 2-5):</i>										
Uncover to Check, Berm & Re-Cover	8.0	107						107		
Channel/Check Water – Sandbags	1.00	13					8	21		
Clean Downspout Inlets					.5	28		28		
<i>Subtotal</i>		<i>120</i>				<i>28</i>	<i>8</i>	<i>156</i>		
<i>Interest on Operating Capital @ 7.4%</i>									<i>32</i>	
<i>Total Costs Per Unit – Year 1</i>							<i>4,453</i>	<i>5,348</i>		
<i>Total Costs Per Unit Per Year – Yrs 2-5</i>							<i>8</i>	<i>156</i>		
<i>Total Costs Per Linear Foot – Year 1</i>							<i>11</i>	<i>13</i>		
<i>Total Costs Per Linear Foot – Yrs 2-5</i>							<i>**</i>	<i>**</i>		

<sup>†</sup> Costs are per 400 linear feet.

<sup>‡</sup> Detail of material costs located in Table 3. Representative Material Costs.

<sup>¶</sup> May not sum due to rounding.

<sup>§</sup> Fuel, lube and repairs.

<sup>\*\*</sup> Cost is negligible when represented on a linear foot basis.

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Table 3. Detail of Representative Material Costs<sup>†</sup>  
Underground Outlet (400 Linear Feet) – Central Coast 2003

Material	Quantity/ 400 LF	Unit	Cost/ Unit	Material Cost (\$/400 LF)	Your Cost (\$/400 LF)
<i>Installation (Year 1):</i>					
Measuring Devices & Flags	1	400 LF	98.00	98	
Pipe (12" Diameter-ADS)	400	linear feet	8.40	3,360	
Inlets (12" Diameter)	5	each	182.00	910	
Fuel, Lube & Repairs	1	400 LF	77.00	77	
<i>Subtotal</i>				<b>4,445</b>	
<i>Annual Operation &amp; Maintenance (Years 2-5):</i>					
Sandbags	25	each	.30	8	
<i>Subtotal</i>				<b>8</b>	
<i>Total Material Costs Per Unit – Year 1</i>				<b>4,453</b>	
<i>Total Material Costs Per Unit Per Year – Yrs 2-5</i>				<b>8</b>	
<i>Total Material Costs Per Linear Foot – Year 1</i>				<b>11</b>	
<i>Total Material Costs Per Linear Foot – Yrs 2-5</i>				<b>**</b>	

<sup>†</sup> Costs are per 400 linear feet.

\*\* Cost is negligible when represented on a linear foot basis.