USLE LAYOUT AND PRACTICE ALTERNATIVES

FOR:	Lands of Butler	Precipitation (inches)		1.95	(2)		
Block:	1 (Area A)	(Existing)		2.2	acres		
USER:	Omar Reveles	Latitude:		38.316623	degrees		
DATE:	1/8/2021	Longitude:		-122.17044	degrees		
Soil Type	Hambright Loam						
T	Natural Soil Loss Factor (tons/acre)	1	(1)	1	(1)	1	(1)
K	Soil Erodibilty Factor	0.20	(1)	0.20	(1)	0.20	(1)
Transect		1	(site plan)	2	(site plan)	3	(site plan)
FACTOR:	DESCRIPTION						
R	Rainfall and Runoff Factor	70.0	(3)	70.0	(3)	70.0	(3)
	Slope length (ft)	186	(site plan)	265	(site plan)	386	(site plan)
S	Slope Gradient (%)	26	(site plan)	20	(site plan)	19	(site plan)
LS	Calculated LS	6.68		5.66		6.38	
C	Crop/Vegetation Management Factor	0.038	(4)	0.038	(4)	0.038	(4)
P	Support Practice Factor	1	(5)	1	(5)	1	(5)
							Average
A	Soil loss, tons/acre	3.55		3.01		3.40	**3.32**
	Soil loss, tons	7.82		6.63		7.47	**7.30**

Equations:
Universal Soil Loss Equation (USLE)

$A = R \times K \times LS \times C \times P$

A = Average annual soil loss (tons per acre)
R = Rainfall and Runoff Factor
K = Soil Erodibility Factor
LS = Slope Length-Gradient Factor
C = Crop/Vegetation and Management Factor
P = Support Practice Factor

for slopes of 9% or flatter
$LS = ((L/72.6 \times cos(arctan(s))^m) \times ((65.41 \times (sin(arctan(s)))^2) + 4.56 \times sin(arctan(s)) + 0.065)$
where: L = length in feet along slope
s = slope gradient in %/100
m= slope exponent

m = 0.2	for s<1%
m = 0.3	for 1%<s<3.5%
m = 0.4	for 3.6%<s<4.5%
m = 0.5	for s>4.5%

for slopes steeper than 9%
$LS = ((L/72.6 \times cos(arctan(s)))^{.5}) \times ((sin(arctan(s))/(sin5.143radians))^{1.4}$
where: L = length in feet along slope
s = slope gradient in %/100

References:
1) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
2) NOAA Atlas 14, Volume 6, Version 2 Isopluvials for 2yr - 6hr storm event
3) Table A-1 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1996, pg. A-3
4) Table 10: "Predicting Rainfall Erosion Losses", USDA Handbook No. 537. (No Appreciable Canopy, 75% Grass/Weeds Cover).
5) Table 4: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991 pg. 11. (Up/Down Hill).

USLE LAYOUT AND PRACTICE ALTERNATIVES							
FOR:	Lands of Butler	Precipitation (inches)		1.95	(2)		
Block:	1 (Area A)	(Temporary)		2.2	acres		
USER:	Omar Reveles	Latitude:		38.316623	degrees		
DATE:	1/8/2021	Longitude:		-122.17044	degrees		
Soil Type	Hambright Loam						
T	Natural Soil Loss Factor (tons/acre)	1	(1)	1	(1)	1	(1)
K	Soil Erodibilty Factor	0.20	(1)	0.20	(1)	0.20	(1)
Transect		1	(site plan)	2	(site plan)	3	(site plan)
FACTOR:	DESCRIPTION						
R	Rainfall and Runoff Factor	70.0	(3)	70.0	(3)	70.0	(3)
	Slope length (ft)	93	(6)	156	(6)	146	(6)
S	Slope Gradient (%)	26	(site plan)	20	(site plan)	19	(site plan)
LS	Calculated LS	4.72		4.34		3.92	
C	Crop/Vegetation Management Factor	0.043	(4)	0.034	(4)	0.043	(4)
P	Support Practice Factor	1	(5)	1	(5)	1	(5)
							Average
A	Soil loss, tons/acre	2.84		2.07		2.36	**2.42**
	Soil loss, tons	6.26		4.55		5.20	**5.33**

Equations:
Universal Soil Loss Equation (USLE)

A = R x K x LS x C x P

A = Average annual soil loss (tons per acre)
R = Rainfall and Runoff Factor
K = Soil Erodibility Factor
LS = Slope Length-Gradient Factor
C = Crop/Vegetation and Management Factor
P = Support Practice Factor

for slopes of 9% or flatter
LS = ((L/72.6 x cos(arctan(s))^m) x ((65.41 x (sin(arctan(s)))^2)+4.56 x sin(arctan(s))+0.065)
where: L = length in feet along slope
s = slope gradient in %/100
m= slope exponent

m = 0.2 for s<1%
m = 0.3 for 1%<s<3.5%
m = 0.4 for 3.6%<s<4.5%
m = 0.5 for s>4.5%

for slopes steeper than 9%
LS = ((L/72.6 x cos(arctan(s)))^.5) x ((sin(arctan(s))/(sin5.143radians))^1.4
where: L = length in feet along slope
s = slope gradient in %/100

References:
1) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
2) NOAA Atlas 14, Volume 6, Version 2 Isopluvials for 2yr - 6hr storm event
3) Table A-1 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1996, pg. A-3
4) Table 8: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991, pg. C-9. (75% Cover, Tilled).
5) Table 4: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991 pg. 11. (Up/Down Hill).
6) Inclusion of straw roll(s).
7) The calculated soil loss values are conservative as they don't account for upslope avenues on each transect being grassed/strawed.

USLE LAYOUT AND PRACTICE ALTERNATIVES							
FOR:	Lands of Butler	Precipitation (inches)		1.95	(2)		
Block:	1 (Area A)	(Proposed)		2.2	acres		
USER:	Omar Reveles	Latitude:		38.316623	degrees		
DATE:	1/8/2021	Longitude:		-122.17044	degrees		
Soil Type	Hambright Loam						
T	Natural Soil Loss Factor (tons/acre)	1	(1)	1	(1)	1	(1)
K	Soil Erodibilty Factor	0.20	(1)	0.20	(1)	0.20	(1)
Transect		1	(site plan)	2	(site plan)	3	(site plan)
FACTOR:	DESCRIPTION						
R	Rainfall and Runoff Factor	70.0	(3)	70.0	(3)	70.0	(3)
	Slope length (ft)	186	(site plan)	265	(site plan)	386	(site plan)
S	Slope Gradient (%)	26	(site plan)	20	(site plan)	19	(site plan)
LS	Calculated LS	6.68		5.66		6.38	
C	Crop/Vegetation Management Factor	0.034	(4)	0.034	(4)	0.034	(4)
P	Support Practice Factor	1	(5)	1	(5)	1	(5)
							Average
A	Soil loss, tons/acre	3.18		2.69		3.04	2.97
	Soil loss, tons	6.99		5.93		6.68	6.54

Equations: A = Average annual soil loss (tons per acre)
Universal Soil Loss Equation (USLE)   R = Rainfall and Runoff Factor
     K = Soil Erodibility Factor
A = R x K x LS x C x P   LS = Slope Length-Gradient Factor
     C = Crop/Vegetation and Management Factor
     P = Support Practice Factor

for slopes of 9% or flatter

$$LS = ((L/72.6 \times \cos(\arctan(s)))^m) \times ((65.41 \times (\sin(\arctan(s)))^2) + 4.56 \times \sin(\arctan(s)) + 0.065)$$

where: L = length in feet along slope
s = slope gradient in %/100
m = slope exponent   m = 0.2 for s<1%
     m = 0.3 for 1%<s<3.5%
     m = 0.4 for 3.6%<s<4.5%
     m = 0.5 for s>4.5%

for slopes steeper than 9%

$$LS = ((L/72.6 \times \cos(\arctan(s)))^{.5}) \times ((\sin(\arctan(s))/(\sin 5.143 \text{radians}))^{1.4}$$

where: L = length in feet along slope
s = slope gradient in %/100

References:
1) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
2) NOAA Atlas 14, Volume 6, Version 2 Isopluvials for 2yr - 6hr storm event
3) Table A-1 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1996, pg. A-3
4) Table 8: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991, pg. C-9. (75% Cover, No-Till).
5) Table 4: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991 pg. 11. (Up/Down Hill).
6) The calculated soil loss values are conservative as they don't account for upslope avenues on each transect being grassed/strawed.

USLE LAYOUT AND PRACTICE ALTERNATIVES							
FOR:	Lands of Butler	Precipitation (inches)		1.95	(2)		
Block:	2 (Area B)	(Existing)		2.9	acres		
USER:	Omar Reveles	Latitude:		38.316623	degrees		
DATE:	1/8/2021	Longitude:		-122.17044	degrees		
Soil Type	Hambright Loam						
T	Natural Soil Loss Factor (tons/acre)	1	(1)	1	(1)	1	(1)
K	Soil Erodibilty Factor	0.20	(1)	0.20	(1)	0.20	(1)
Transect		1	(site plan)	2	(site plan)	3	(site plan)
FACTOR:	DESCRIPTION						
R	Rainfall and Runoff Factor	70.0	(3)	70.0	(3)	70.0	(3)
	Slope length (ft)	299	(site plan)	89	(site plan)	236	(site plan)
S	Slope Gradient (%)	21	(site plan)	13	(site plan)	19	(site plan)
LS	Calculated LS	6.41		1.83		4.99	
C	Crop/Vegetation Management Factor	0.064	(4)	0.067	(5)	0.064	(4)
P	Support Practice Factor	1	(6)	1	(6)	1	(6)
							Average
A	Soil loss, tons/acre	5.75		1.72		4.47	3.98
	Soil loss, tons	16.67		4.99		12.97	11.54

Equations:

Universal Soil Loss Equation (USLE)

A = R x K x LS x C x P

A = Average annual soil loss (tons per acre)
R = Rainfall and Runoff Factor
K = Soil Erodibility Factor
LS = Slope Length-Gradient Factor
C = Crop/Vegetation and Management Factor
P = Support Practice Factor

for slopes of 9% or flatter

LS = ((L/72.6 x cos(arctan(s))^m) x ((65.41 x (sin(arctan(s)))^2)+4.56 x sin(arctan(s))+0.065)

where: L = length in feet along slope

s = slope gradient in %/100

m= slope exponent

m = 0.2 for s<1%
m = 0.3 for 1%<s<3.5%
m = 0.4 for 3.6%<s<4.5%
m = 0.5 for s>4.5%

for slopes steeper than 9%

LS = ((L/72.6 x cos(arctan(s)))^.5) x ((sin(arctan(s))/(sin5.143radians))^1.4

where: L = length in feet along slope

s = slope gradient in %/100

References:

1) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
2) NOAA Atlas 14, Volume 6, Version 2 Isopluvials for 2yr - 6hr storm event
3) Table A-1 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1996, pg. A-3
4) Table 10: "Predicting Rainfall Erosion Losses", USDA Handbook No. 537. (50% Tree Canopy, 60% Grass/Weeds Cover).
5) Table 10: "Predicting Rainfall Erosion Losses", USDA Handbook No. 537. (No Appreciable Canopy, 60% Grass/Weeds Cover).
6) Table 4: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991 pg. 11. (Up/Down Hill).

USLE LAYOUT AND PRACTICE ALTERNATIVES							
FOR:	Lands of Butler	Precipitation (inches)		1.95	(2)		
Block:	2 (Area B)	(Temporary)		2.9	acres		
USER:	Omar Reveles	Latitude:		38.316623	degrees		
DATE:	1/8/2021	Longitude:		-122.17044	degrees		
Soil Type	Hambright Loam						
T	Natural Soil Loss Factor (tons/acre)	1	(1)	1	(1)	1	(1)
K	Soil Erodibilty Factor	0.20	(1)	0.20	(1)	0.20	(1)
Transect		1	(site plan)	2	(site plan)	3	(site plan)
FACTOR:	DESCRIPTION						
R	Rainfall and Runoff Factor	70.0	(3)	70.0	(3)	70.0	(3)
	Slope length (ft)	150	(6)	89	(site plan)	111	(6)
S	Slope Gradient (%)	21	(site plan)	13	(site plan)	19	(site plan)
LS	Calculated LS	4.54		1.83		3.42	
C	Crop/Vegetation Management Factor	0.043	(4)	0.043	(4)	0.043	(4)
P	Support Practice Factor	1	(5)	1	(5)	1	(5)
						Average	
A	Soil loss, tons/acre	2.74		1.10		2.06	**1.97**
	Soil loss, tons	7.93		3.20		5.97	**5.70**

Equations:

Universal Soil Loss Equation (USLE)

A = R x K x LS x C x P

$$A = R \times K \times LS \times C \times P$$

A = Average annual soil loss (tons per acre)
R = Rainfall and Runoff Factor
K = Soil Erodibility Factor
LS = Slope Length-Gradient Factor
C = Crop/Vegetation and Management Factor
P = Support Practice Factor

for slopes of 9% or flatter

LS = ((L/72.6 x cos(arctan(s))^m) x ((65.41 x (sin(arctan(s)))^2)+4.56 x sin(arctan(s))+0.065)

where: L = length in feet along slope

s = slope gradient in %/100

m= slope exponent

m = 0.2 for s<1%
m = 0.3 for 1%<s<3.5%
m = 0.4 for 3.6%<s<4.5%
m = 0.5 for s>4.5%

for slopes steeper than 9%

LS = ((L/72.6 x cos(arctan(s)))^.5) x ((sin(arctan(s))/(sin5.143radians))^1.4

where: L = length in feet along slope

s = slope gradient in %/100

References:

1) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
2) NOAA Atlas 14, Volume 6, Version 2 Isopluvials for 2yr - 6hr storm event
3) Table A-1 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1996, pg. A-3
4) Table 8: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991, pg. C-9. (75% Cover, Tilled).
5) Table 4: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991 pg. 11. (Up/Down Hill).
6) Inclusion of straw roll(s).
7) The calculated soil loss values are conservative as they don't account for upslope avenues on each transect being grassed/strawed.

USLE LAYOUT AND PRACTICE ALTERNATIVES							
FOR:	Lands of Butler	Precipitation (inches)		1.95	(2)		
Block:	2 (Area B)	(Proposed)		2.9	acres		
USER:	Omar Reveles	Latitude:		38.316623	degrees		
DATE:	1/8/2021	Longitude:		-122.17044	degrees		
Soil Type	Hambright Loam						
T	Natural Soil Loss Factor (tons/acre)	1	(1)	1	(1)	1	(1)
K	Soil Erodibilty Factor	0.20	(1)	0.20	(1)	0.20	(1)
Transect		1	(site plan)	2	(site plan)	3	(site plan)
FACTOR:	DESCRIPTION						
R	Rainfall and Runoff Factor	70.0	(3)	70.0	(3)	70.0	(3)
	Slope length (ft)	299	(site plan)	89	(site plan)	236	(site plan)
S	Slope Gradient (%)	21	(site plan)	13	(site plan)	19	(site plan)
LS	Calculated LS	6.41		1.83		4.99	
C	Crop/Vegetation Management Factor	0.034	(4)	0.034	(4)	0.034	(4)
P	Support Practice Factor	1	(5)	1	(5)	1	(5)
							Average
A	Soil loss, tons/acre	3.05		0.87		2.38	**2.10**
	Soil loss, tons	8.85		2.53		6.89	**6.09**

Equations:			A = Average annual soil loss (tons per acre)
Universal Soil Loss Equation (USLE)			R = Rainfall and Runoff Factor
			K = Soil Erodibility Factor
A = R x K x LS x C x P			LS = Slope Length-Gradient Factor
			C = Crop/Vegetation and Management Factor
			P = Support Practice Factor

for slopes of 9% or flatter

$LS = ((L/72.6 \times \cos(\arctan(s)))^m) \times ((65.41 \times (\sin(\arctan(s)))^2) + 4.56 \times \sin(\arctan(s)) + 0.065)$

where:	L = length in feet along slope		
s = slope gradient in %/100		m = 0.2	for s<1%
m= slope exponent		m = 0.3	for 1%<s<3.5%
		m = 0.4	for 3.6%<s<4.5%
		m = 0.5	for s>4.5%

for slopes steeper than 9%

$LS = ((L/72.6 \times \cos(\arctan(s)))^{.5}) \times ((\sin(\arctan(s))/(\sin 5.143 \text{radians}))^{1.4}$

where: L = length in feet along slope

s = slope gradient in %/100

References:
1) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)
2) NOAA Atlas 14, Volume 6, Version 2 Isopluvials for 2yr - 6hr storm event
3) Table A-1 "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1996, pg. A-3
4) Table 8: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991, pg. C-9. (75% Cover, No-Till).
5) Table 4: "Guides for Erosion and Sediment Control in California", USDA-SCS, Davis CA, 1991 pg. 11. (Up/Down Hill).
6) The calculated soil loss values are conservative as they don't account for upslope avenues on each transect being grassed/strawed.

NAPA COUNTY RESOURCE CONSERVATION DISTRICT
USLE LAYOUT AND PRACTICE ALTERNATIVES

FOR: Lands of Butler
Block: 1 and 2 (Areas A and B)
USER: Omar Reveles
DATE: 1/8/2021

Soil Loss Summary Table (based on USLE calculations)			
Block	Pre-development Soil Loss (tons)	Temporary Soil Loss (tons)	Permanent Soil Loss (tons)
1	7.30	5.33	6.54
2	11.54	5.70	6.09
Total	18.84	11.03	12.63

Anticipated post-development soil shall not exceed pre-development soil loss; therefore,