Sediment Load Analysis Report
Cottonwood Sand Mine
Jamacha, California

Submitted to

Helix Environmental Planning
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Certification

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1. Sediment Erosion Modeling

Sediment erosion analysis was conducted with the Water Erosion Prediction Project (WEPP) model. WEPP was created to replace the Universal Soil Loss Equation (USLE) and it has been continuously improved upon since its release in 1995. WEPP has been shown to provide sufficient accuracy at predicting total soil erosion and sediment load leaving a hillslope (Saghafian et. al. 2015; Pandey et al. 2008). WEPP considers climate, topography, soil, and land use data and generates soil detachment, deposition, total sediment exiting in runoff, and the size distribution of the exiting sediment.

1.1 Planned Stormwater Pollution Prevention Measures

A Storm Water Pollution Prevention Plan (SWPPP) will be prepared and submitted to the State Water Resources Control Board (SWRCB) prior to construction in accordance with the Industrial General Permit Order 2014-0057-DWQ, effective July 1, 2015. The SWPPP and erosion control plan will define best management practices (BMPs) to prevent erosion and the discharge of sediment to surface waters.

During mining, the Project site will establish temporary de-siltation basins that will be utilized to capture runoff from existing culverts within Willow Glen Drive and to prevent sediment from leaving the site while allowing water to pass through to existing drainage features. Mining and reclamation grading will direct runoff from the disturbed areas towards the basins, as necessary, to allow for desiltation and infiltration. Typical soil stabilization BMPs include preservation of existing vegetation, mulch, hydroseeding, soil binders, geotextiles, lining of drainage ditches, and/or velocity control structures if needed. Erosion and sedimentation control measures, at a minimum, will be designed for the 20-year, 1-hour storm event in accordance with Surface Mining and Reclamation Act (SMARA) guidelines. Silt fences will be installed five feet from the outer edge of each side of the existing Sweetwater River channel and may be installed in other areas. Other erosion control measures in accordance with set criteria to reduce on- and off-site erosion will include monitoring soil movement, arresting gullies or rills using straw mulch and hay bales, compacting soils with equipment, and re-grading as necessary. Vehicle track out and dust related BMPs may include paved or stabilized roadway surfaces, tire washes, use of grates at vehicle entrances or exits, soil stabilizers, and water spray. Temporary erosion control measures will be retained until vegetation becomes sufficiently established to serve as an effective erosion control measure. Recommended erosion and sedimentation control measures will be described in detail in the Project SWPPP.

1.2 Erosion Modeling Methodology

WEPP was run in a two-dimensional mode based on available hillslope data for the current and proposed Project conditions. Total soil erosion was estimated by extrapolating results for representative hillslope profiles to the surrounding Project acreage. Chang (2021) completed a hydraulic analysis for the Cottonwood sand mining project in which HEC-RAS models were created of the current 100-year floodplain and of the Proposed project condition. Six representative cross sections used in the HEC-RAS model were selected for the purpose of sediment erosion modeling. Selected cross-section locations are shown on Figure 1. These cross sections (six section locations considering pre and post-mining project conditions, for twelve sections in total) were then digitized for input into the erosion modeling software. WEPP is not capable of simulating erosion on uphill slopes (cross-sections must be downhill or flat). Therefore, the cross sections were broken into segments where necessary and uphill sections were assumed to be flat. Hillslope profiles used in WEPP modeling are presented in Appendix A.

The Cottonwood Sand Mining Project has plans to implement various BMPs to ensure no significant mining impacts on water transfers during extraction activities as described above. The presence of these BMPs was not accounted for in WEPP modeling, and therefore simulation results represent a conservative “worst-case” erosion estimate.

Soil properties were generated for WEPP model runs based on sediment gradation curves presented in Geocon (2017); and assumed 7% clay, 7% silt (14% fines total) and 86% sand. A fraction organic matter of 0.001 was assumed. Sediment size fractions were determined based on the average gradation results presented in Geocon (2017) for samples taken within the top 6 feet. A sensitivity test was conducted and the model was not sensitive to changes in the percent of silt and clay within the range of the measured samples.

Land use management type was assigned as “grass-lawn” for the current condition and “fallow” for the proposed Project condition. This simplification ignores the heterogeneity of vegetation on the current Cottonwood site, but because the WEPP model isn’t capable of representing numerous land uses on a single hillslope, it was decided this simplification was appropriate and conservative for modeling purposes.

Erosion was simulated for a 10 year period using Cligen generated climate data (USDA, 2016). Cligen is a stochastic weather generator that produces daily estimates of precipitation, temperature, dewpoint, wind, and solar radiation for a single geographic point, using monthly parameters derived from historical measurements. Unlike other climate generators, it produces individual storm parameter estimates, including time to peak, peak intensity, and storm duration, which are required to run the WEPP soil erosion models.

1.3 Erosion Modeling Results

WEPP modeling results are summarized in Table 1 through Table 5. Table 1 and Table 2 provide a summary of simulated erosion for each cross-section for the current and proposed project conditions, respectively. Table 3 provides simulated erosion broken down by WEPP particle class (clay, silt, sand, small aggregates and large aggregates). Table 4 summarizes the size fraction composition of the exiting sediment (percent sand, silt, clay and total mass of each). Table 5 summarizes the tons of sediment exiting the project for each individual Phase (Phase 1 through Phase 3).

WEPP modeling indicates that under the current condition there is approximately an average of 2.2 tons of sediment exiting the Cottonwood golf course per year (Table 1). Under the proposed Project condition, WEPP modeling indicates (Table 5):

- Phase 1 area: Erosion increases from 0.71 tons/year to 25 tons/year
- Phase 2 area: Erosion increases from 1 ton/year to 1.9 ton/year
- Phase 3 area: Erosion increases from 0.48 to 1.6 tons/year.

It is assumed that the project will proceed to each individual Phase at one time and then start reclamation immediately as they move to the next Phase. Therefore, increased potential erosion will depend on which Phase of the project is ongoing. As indicated above increased erosion is primarily estimated to occur during Phase 1, with a net increase of 24.3 tons/year (assuming the conservative worst-case scenario modeled of no BMPs). For context, 24.3 tons/year averaged over the area of Phase 1 (115 acres) is estimated to be about 0.03 mm/year of sediment erosion. Given this minor amount of increased erosion averaged over the Phase 1 area even under very conservative assumptions of no BMPs this is considered to be less than significant.

WEPP simulates five different particle types in exiting flow: clay, silt, small aggregates, large aggregates, and sand (Table 4). Sediment exiting the hillslope profiles is estimated to consist of 21% clay, 12% silt (33% total fines), and 67% sand. Although the simulated hillslope profiles were assigned 14% fines, the amount of fines exiting the profiles is relatively enriched due to preferential erosion of fine sediments compared to coarse sediments (Flanagan and Nearing, 2000).

2. Sediment Transport Analysis

Sediment eroded from the Project footprint that exits the hillslope profiles is assumed to be loaded to Sweetwater River. Standard methods were used to evaluate the fraction of sediment capable of being transported by the river downstream and the fraction that is estimated to deposit on the riverbed prior to Sweetwater reservoir. Sediment can be transported as suspended sediment in the water column ("suspended load"), or in direct contact with the riverbed via saltation and rolling ("bed load"). Suspended load consists of the finer-grained sediments (clay, silt, fine sands), whereas bed-load consists of coarser-grained sediments. The largest-grained sediment fractions that cannot be transported by suspension, saltation or rolling are deposited on the riverbed.

Sediment transport for each grain-size fraction was evaluated based on properties of the river (i.e., slope and water depth) and sediment grain-size diameter (Southard, 2006; Crone, 2004). Shields stress (τ_o) is used to estimate transport stages (no movement, suspension, saltation and rolling):

$$\tau_o = \frac{\tau}{g\,(\rho_p - \rho_f)D} \qquad \text{[Eq-1]}$$

where τ is the shear stress, g is the acceleration due to gravity, ρ_p is the particle density (assumed 2.65 g/cm^3), ρ_f is water density, and *D* is particle diameter. Shear stress (τ) is given by (Crone, 2004):

$$\tau = \rho_f u_*^2 \qquad \text{[Eq-2]}$$

where u_* is the characteristic velocity scale within turbulent flow, given by:

$$u_* = \sqrt{ghS} \qquad \text{[Eq-3]}$$

where *h* is river depth and *S* is river slope.

As displayed on Figure 2, the Sweetwater River was delineated between the Project and Sweetwater Reservoir based on review of aerial imagery, 1-meter resolution digital elevation data (USGS, 2017), and the National Hydrography Dataset (USGS, 2019). River slope was estimated for two sections, from the Project to 1.5 miles downstream within the San Diego National Wildlife Refuge, and from 1.5 miles to the location of what appears to be a sedimentation pond located above Jeep Trail (3.5 miles downstream from the Project). Slope from the Project to 1.5 miles downstream is estimated to be 0.0029, and from 1.5 miles downstream to the sedimentation pond to be 0.0069.

River depth was assumed to be 3.5 feet, which is within the upper range of values within the Project footprint given by Chang (2020) during reservoir transfers. Downstream of the Project, Sweetwater River appears to form a braided river channel, and flow depths may decrease in certain reaches. For this reason, a river depth of 1-ft was also considered.

Figure 3 displays the various transport stages (no movement, saltation, rolling and suspension) as a function of the Shields stress, river slope and particle diameter (Southard, 2006). The fine sediment fractions (clays, silts; 33% of total eroded sediments as discussed above), are estimated to remain suspended and be transported in the river under flow conditions of 1 ft and 3.5 ft. For the sand fraction:

- From the Project to 1.5 miles downstream (river slope of 0.0029) under 3.5-ft of flow sand greater than 0.6 mm will be deposited (not transported), which is about 25 to 50% of the sediment sand fraction based on gradation analysis of Project sediments (Geocon, 2017). If the river widens and depth decreases to 1 ft, sand greater than 0.3 mm will be deposited, about 45 to 70% of the sand based on the gradation analysis.
- The remaining reach to Jeep Trail has a steeper slope (0.0069) so any sediment remaining at that point will be carried to the sedimentation pond.

At the sedimentation pond at Jeep Trail the river widens from about 15-ft to 350 ft (Figure 2). It is expected that much of the remaining coarse-grained sediment would be deposited in this pond and not reach the main reservoir.

3. Pollutant Loading Analysis

Chemicals bound to eroded soils may be transported into Sweetwater Reservoir. As discussed above, it is assumed that fines (33% of eroded sediments) may be transported to the reservoir, whereas sands and coarser sediments would be deposited prior to reaching Sweetwater Reservoir. As much as 70% of sands may be deposited in the reach south of the Project due to relatively low river slope and a braided river channel, and the remaining sand fraction likely would deposit in the sedimentation pond located at Jeep Trail.

Estimated incremental pollutant loading into the reservoir was estimated assuming a conservative scenario that the annual loading occurred during a single storm event, and therefore all fine sediments (clays and silts) estimated for an entire year (and bound contaminants) were transported into the reservoir at once. Phase I estimated loading for each compound was estimated from:

$$L_c = C_s L_s \qquad \text{[Eq-4]}$$

where L_c is the chemical loading (mg/yr), C_s is the average soil-concentration of the chemical (mg/kg), and L_s is the incremental mass of fine sediments loaded during Phase 1 (8.02 tons/yr, or 7,272 kg/yr).

Table 6 presents resulting incremental added contaminant concentrations in the reservoir for Project Phase 1, assuming a reservoir volume of 6,000 acre-feet (approximately 20% of reservoir capacity; Sweetwater Authority, 2020), and complete mixing of eroded sediments within the reservoir. Assumed soil pollutant soil concentrations are based on the average of Site sampling results. Resulting incremental added contaminant concentrations within the reservoir are at least two orders-of-magnitude less than applicable water quality criteria where listed, and in most cases several orders-of-magnitude less. Importantly, these estimated concentrations represent total water concentrations (dissolved and suspended), and sediment-bound contaminants would not be observed in dissolved-phase water sampling results (i.e., water samples filtered prior to analysis). Pollutant loading from Project Phases 2 and 3 would be less than Phase 1, due to less erosion compared to Phase 1 (Table 5).

Over time, sediments and sediment-bound contaminants would settle to the bottom of the reservoir and water-column concentrations would decrease. Given the area of the reservoir (approximately 640 acres), the incremental added sediment thickness at the bottom of the reservoir from erosion at the Project is de minimis (i.e., much less than 1 mm over the 10-year period of the project).

4. Conclusions

Conclusions from this analysis are:

- Erosion modeling indicates that, as a worst-case, the project condition will result in increased erosion of approximately 24 tons/year during Phase 1, with lower increased erosion during other project phases. This level of erosion is equivalent to 0.03 mm/year averaged over the area of Phase 1.

- Modeling does not account for the construction of berms that will be used to prevent impacts to the river and reduce erosion where present (Chang, 2021).
- Eroded sediment is estimated to be 33% fines, which represents an enrichment compared to the hillslope soil properties because fine sediments are preferentially eroded.
- Sediment transport analysis indicates that under typical reservoir transfer operations and major storms, fines (clays and silts) will be transported by Sweetwater River. A significant amount of the sand fraction (between 25 to 70%) will be deposited within the river reach south of the Project based on variations in water depth (the river becomes braided in this area), slope, and particle size. The remaining sand fraction will be transported by the river downstream.
- An apparent sedimentation pond is present at Jeep Trail prior to the Sweetwater Reservoir. At the sedimentation pond the river widens from about 15-ft to 350 ft (Figure 2). It is expected that much of the remaining coarse-grained sediment would be deposited in this pond and not reach the main reservoir.
- Under a conservative scenario that all sediments estimated for an entire year during Phase 1 reach Sweetwater Reservoir in a single storm event, resulting additional water-column pollutant concentrations are expected to be much less than applicable water quality criteria.
- Incremental added sediment thickness at the bottom of the reservoir from erosion at the Project is de minimis.
- Given the minor amount of increased erosion, sediment loading to the reservoir, and impact on reservoir water quality even under very conservative assumptions of no BMPs, this is considered to be less than significant.

5. References

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Figures

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Explanation

HEC-RAS Polygons

HEC-RAS Cross Sections

N

0 600 1200 Feet

2018 Google Earth Imagery

COTTONWOOD MINE

Cross-Sections used in WEPP Modeling

Figure 1

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COTTONWOOD MINE

Sweetwater River between Project and Sweetwater Reservoir

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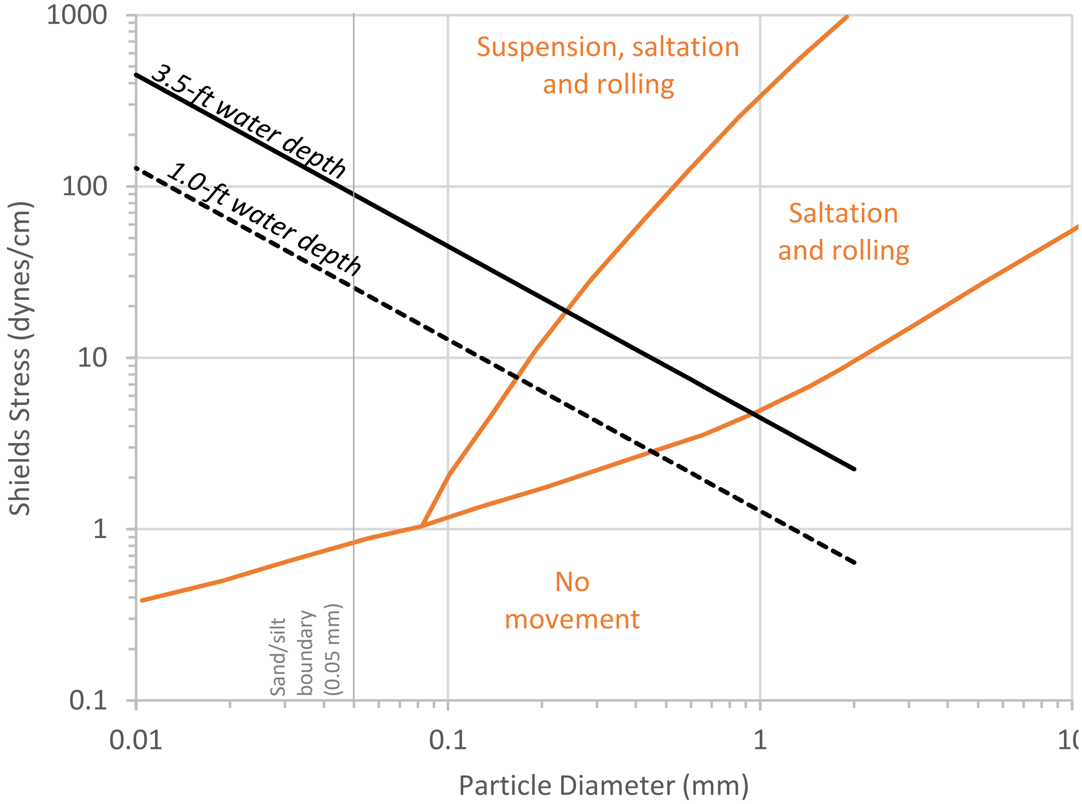
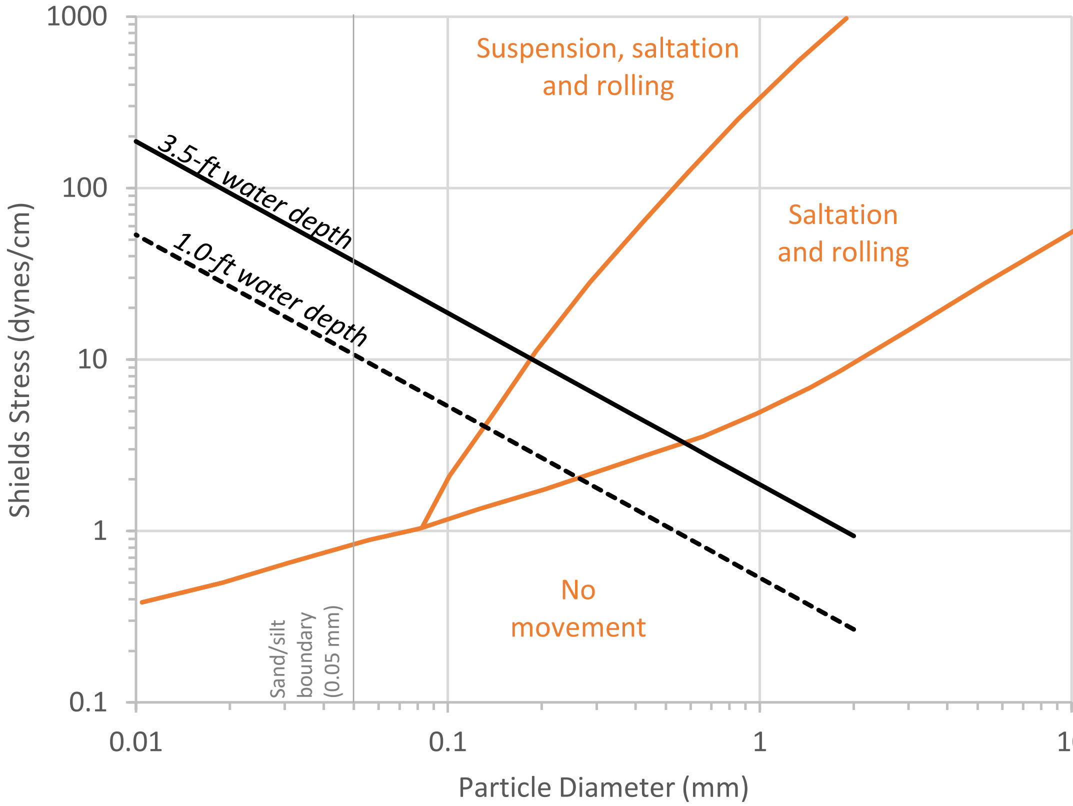
Figure 2



(a) River Slope = 0.0069



(b) River Slope = 0.0029

COTTONWOOD MINE

Critical Shields Stress Diagram

Figure 3

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Tables

Table 1. Annual sediment leaving hillslopes under Current conditions.

Section	Size in acres	Current Slopes	Segment length ft	% of Total cross section length	Acres attributed to each hillslope	tons/acre Exiting per year	Tons of Soil Exiting per year
50	71.5	50-2	343	23%	16.3	3.0E-04	4.9E-03
50	71.5	50-11	1161	77%	55.2	2.0E-04	1.1E-02
100	43.7	100-2	124	12%	5.3	1.7E-02	9.1E-02
100	43.7	100-11	248	24%	10.6	1.5E-02	1.5E-01
100	43.7	100-111	533	52%	22.8	1.2E-02	2.7E-01
100	43.7	100-22	115	11%	4.9	3.7E-02	1.8E-01
150	34.5	150-1	307	49%	17.0	1.7E-02	2.9E-01
150	34.5	150-2	317	51%	17.5	1.8E-02	3.2E-01
180	58.5	180-1	556.8	40%	23.4	1.1E-02	2.6E-01
180	58.5	180-2	83	6%	3.5	3.8E-02	1.3E-01
260	39.6	260-1	111.3	12%	4.8	1.0E-03	4.8E-03
260	39.6	260-2	248	16%	6.3	3.7E-02	2.4E-01
280	32.8	280-1	64	7%	2.3	7.1E-02	1.6E-01
280	32.8	280-2	67	7%	2.3	3.5E-02	8.0E-02
						Total	2.2E+00

Table 2. Annual sediment leaving hillslopes under Proposed conditions.

Section	Size in acres	Proposed Slopes	Segment length ft	% of Total cross section length	Acres attributed to each hillslope	tons/acre Exiting per year	Tons of Soil Exiting per year
50	71.5	50-3	961	71%	51.0	9.9E-02	5.1E+00
50	71.5	50-4	200	15%	10.6	9.7E-01	1.0E+01
50	71.5	50-31	186	14%	9.9	5.5E-01	5.5E+00
100	43.7	100-3	528	61%	26.9	4.5E-02	1.2E+00
100	43.7	100-4	331	39%	16.8	1.6E-01	2.7E+00
150	34.5	150-3	357	36%	12.4	1.1E-02	1.3E-01
150	34.5	150-4	636	64%	22.1	3.3E-02	7.2E-01
180	58.5	180-3	603	42%	24.5	2.9E-03	7.1E-02
180	58.5	180-4	835	58%	34.0	3.0E-02	1.0E+00
260	39.6	260-3	409.9	39%	15.3	4.4E-02	6.8E-01
260	39.6	260-4	649	61%	24.3	1.4E-02	3.5E-01
280	32.8	280-3	402	30%	9.9	5.7E-03	5.7E-02
280	32.8	280-4	928	70%	22.9	2.3E-02	5.3E-01

Table 3. Distribution of sediment exiting based on grain size

Class	Diameter (mm)	%Sand	%Silt	%Clay	Current tons exiting of each class	Proposed Tons exiting of each class
1 (clay)	0.002	0%	0%	100%	5.1E-02	3.0E+00
2 (silt)	0.01	0%	100%	0%	3.5E-05	3.2E-03
3 (aggregate 1)	0.03	0%	50%	50%	1.6E-01	4.6E+00
4 (aggregate 2)	0.3	84%	11%	5%	6.9E-01	1.1E+01
5 (sand)	0.2	100%	0%	0%	1.3E+00	1.0E+01

Table 4. Composition of sediment exiting

Sediment type	Current Tons exiting of each sediment type/yr	Current % of total exiting tons	Proposed Tons exiting of each sediment type/yr	Proposed % of total exiting tons
Clay	1.7E-01	8%	5.9E+00	21%
Silt	1.6E-01	7%	3.5E+00	12%
Sand	1.9E+00	85%	1.9E+01	67%

Table 5. Total tons exiting per phase of the project.

Phase	Sections	Total acreage	Current tons exiting annually	Proposed tons exiting annually	Difference
1	50 and 100	115.2	7.1E-01	2.5E+01	24.29
2	150 and 180	93	1.0E+00	1.9E+00	0.9
3	260 and 280	72.4	4.8E-01	1.6E+00	1.12

ft = Feet
mm = Millimeters
yr = Year

Table 6 - Pollutant Loading Estimate

Analyte	Average Soil Concentration (mg/kg)	Surface Water Water Quality Criteria (mg/L)	Water Quality Criteria Source	Phase 1 Estimated Loading (mg/yr)	Estimated Incremental Additional Total Reservoir Concentration (mg/L)[a]
General Chemistry					
Nitrate as N	1.97	10	1	14301	1.9E-06
Total Kjeldahl Nitrogen	196.67	NV	1	1430105	1.9E-04
Total Nitrogen	200.00	0.25	3	1454345	2.0E-04
Total Organic Carbon	2978.57	NV	1	21659346	2.9E-03
Total Phosphorus	313.33	0.025	3	2278473	3.1E-04
Metals					
Antimony	NC	0.006	1	NC	NC
Arsenic	0.60	0.01	1	4387	5.9E-07
Barium	45.67	1	1	332075	4.5E-05
Beryllium	0.08	0.004	1	582	7.9E-08
Cadmium	NC	0.005	1	NC	NC
Chromium	7.80	0.05	1	56719	7.7E-06
Cobalt	2.83	NV	1	20603	2.8E-06
Copper	6.23	1.3	1	45327	6.1E-06
Iron	10333.33	0.3	1	75141136	1.0E-02
Lead	3.59	0.015	1	26105	3.5E-06
Magnesium	1733.33	NA	NA	12604320	1.7E-03
Mercury	NC	0.002	1	NC	NC
Molybdenum	0.16	NV	1	1178	1.6E-07
Nickel	3.03	0.1	1	22058	3.0E-06
Selenium	NC	0.05	1	NC	NC
Silver	NC	0.1	1	NC	NC
Thallium	0.09	0.002	1	684	9.2E-08
Vanadium	26.33	NV	1	191489	2.6E-05
Zinc	16.03	5	1	116590	1.6E-05
Chlorinated Herbicides (mg/kg) : ND					
Organochlorine Pesticides					
4,4'-DDD	0.00	1.20E-07	2	2.7	3.6E-10
4,4'-DDE	0.0006	1.80E-08	2	4.1	5.5E-10
4,4'-DDT	0.0004	3.00E-08	2	3.1	4.2E-10
Petroleum Hydrocarbons					
Oil and Grease	16	NA	NA	116347.5649	1.6E-05
SVOC (mg/kg) : ND					
VOC (mg/kg) : ND					

Sources

1: Table 3.0 - Water Quality Comparison - Surface Water

2: National Recommended Water Quality Criteria - Human Health Criteria Table; Human Health for the consumption of Water + Organism (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)

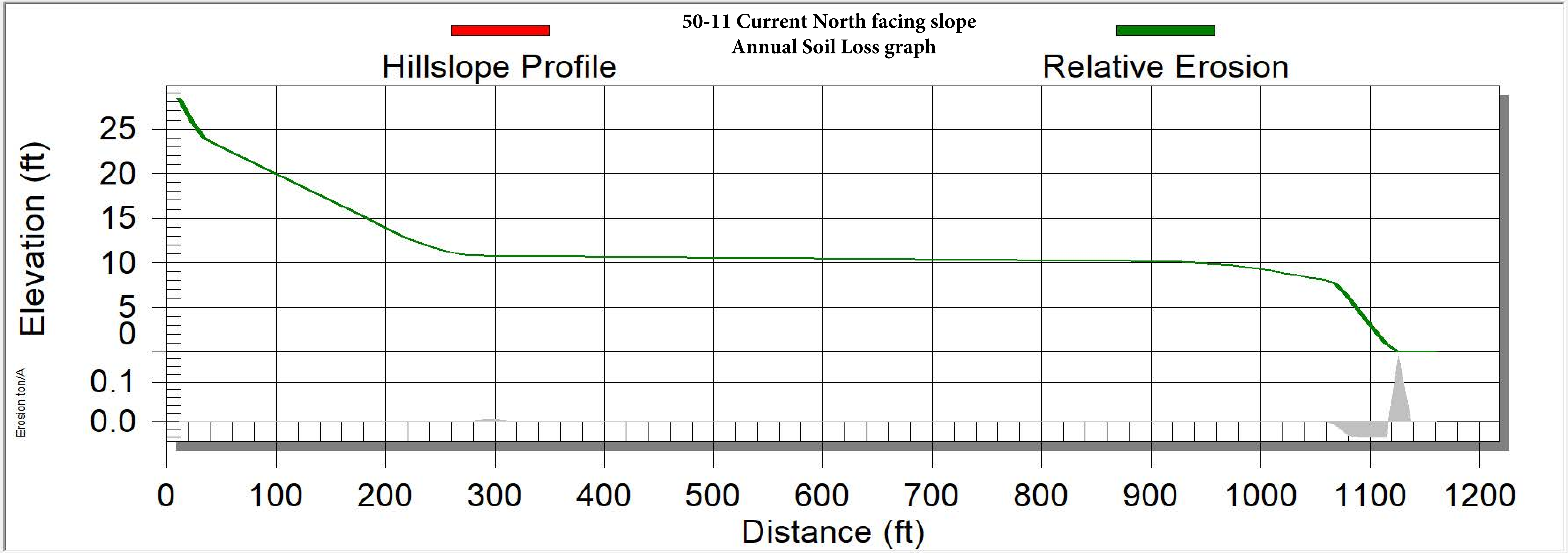
3: Water Quality Control Plan for the San Diego Basin - California Regional Water Quality Control Board, San Diego Region.

a: Assumes all loading occurs within a single event and complete mixing within the reservoir

Appendix A

WEPP Hillslope Profiles

50-11 Current North facing slope
Annual Soil Loss graph

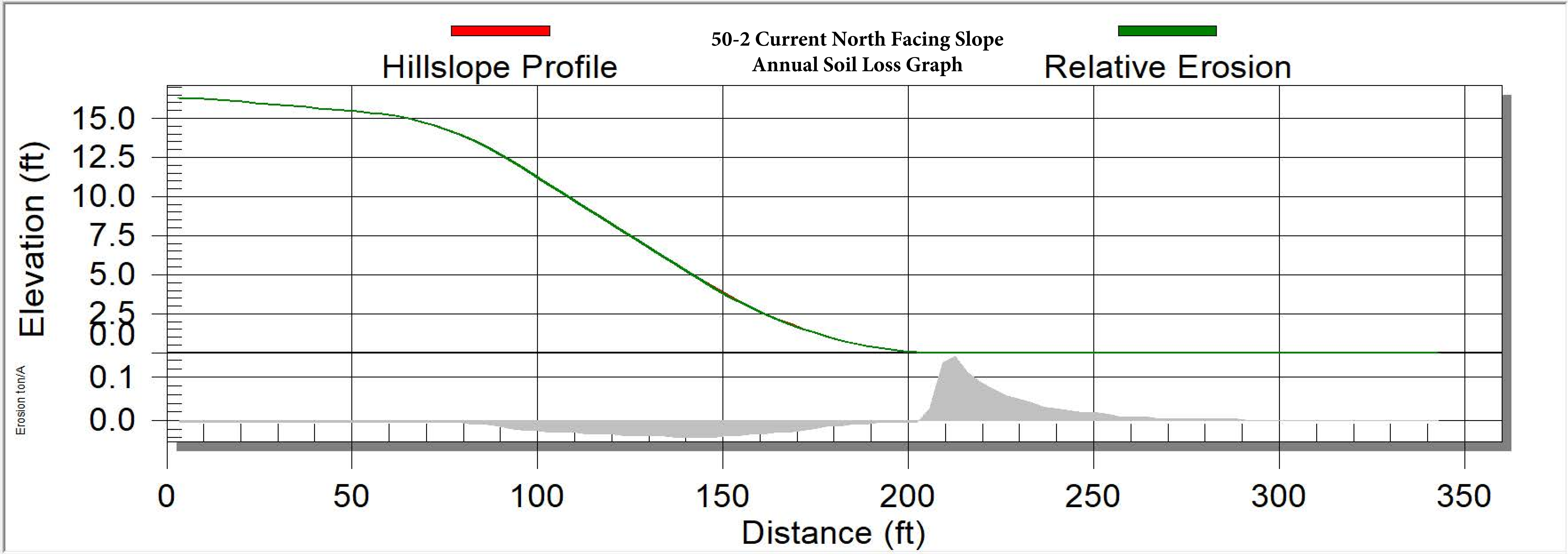


Maximum Detachment: 0.0401 ton/A at 1.09e Maximum Deposition: 0.165 ton/A at 1.13e- Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		1161.0	0.00	1126.2	0.00	1091.3

Soil Name		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		1161.0	0.00	1126.2	0.00	1091.3



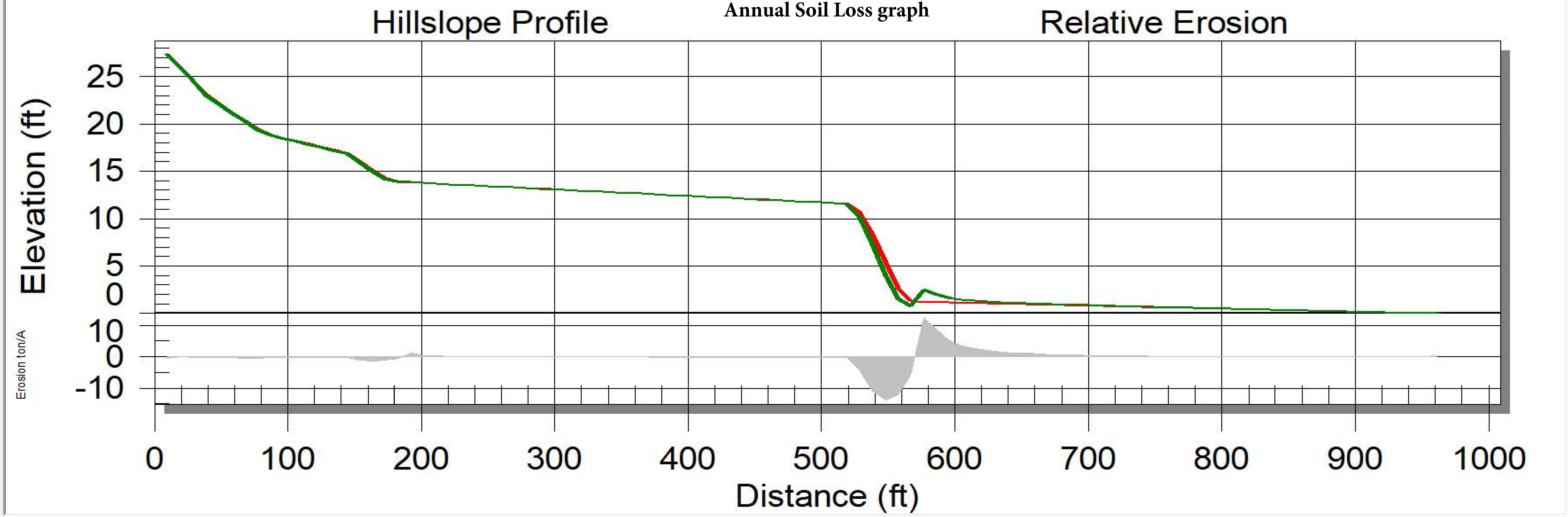
Maximum Detachment: 0.0401 ton/A at 137 f Maximum Deposition: 0.147 ton/A at 213 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		343.0	0.01	257.2	0.02	140.6

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		343.0	0.01	257.2	0.02	140.6

50-3 Proposed South facing slope
Annual Soil Loss graph

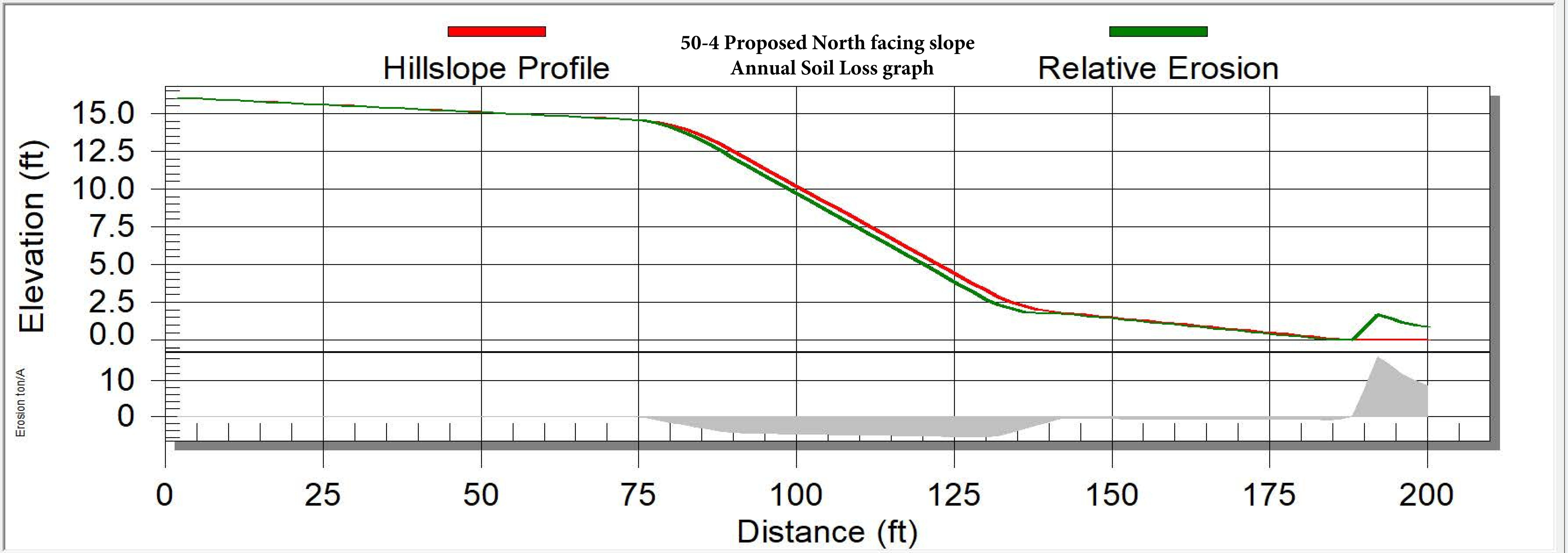


Maximum Detachment: 13.7 ton/A at 548 ft Maximum Deposition: 12.5 ton/A at 577 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		961.0	0.91	595.8	1.21	365.2

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		961.0	0.91	595.8	1.21	365.2

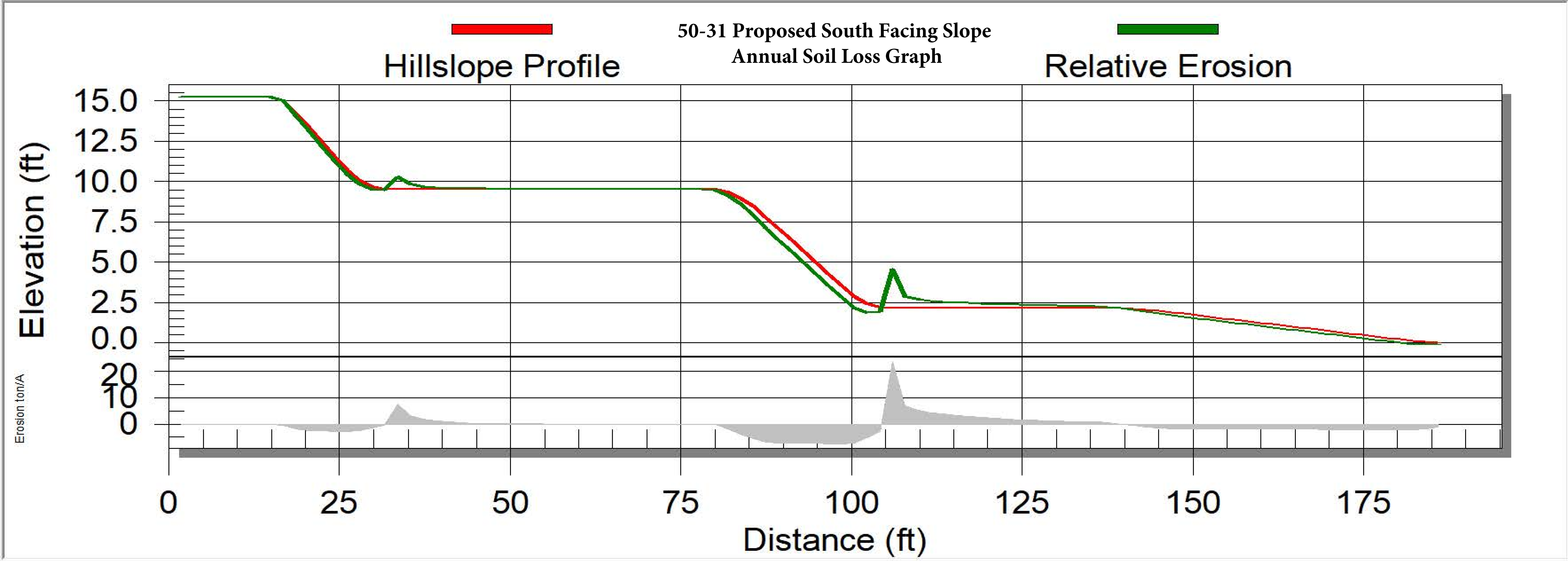


Maximum Detachment: 5.83 ton/A at 130 ft Maximum Deposition: 16.7 ton/A at 192 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		200.0	1.76	188.0	11.47	12.0

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		200.0	1.76	188.0	11.47	12.0



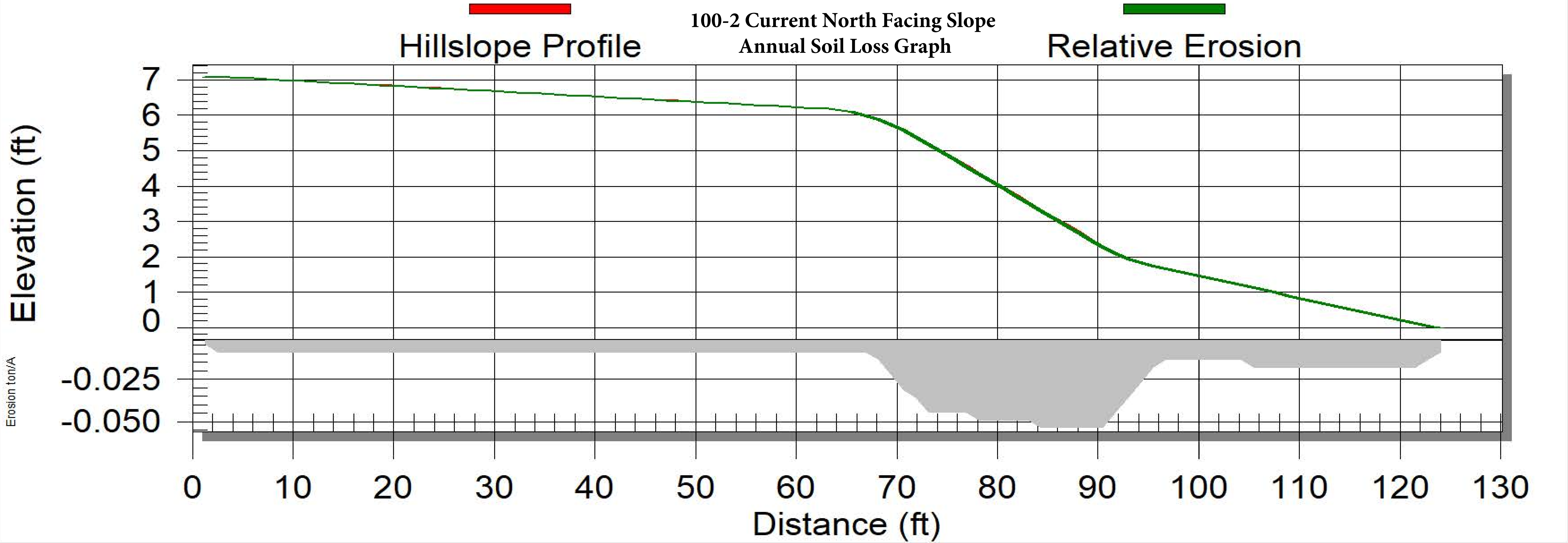
Maximum Detachment: 7.55 ton/A at 98.6 ft Maximum Deposition: 23.9 ton/A at 106 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		186.0	2.43	106.0	1.94	80.0

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		186.0	2.43	106.0	1.94	80.0

100-2 Current North Facing Slope
Annual Soil Loss Graph



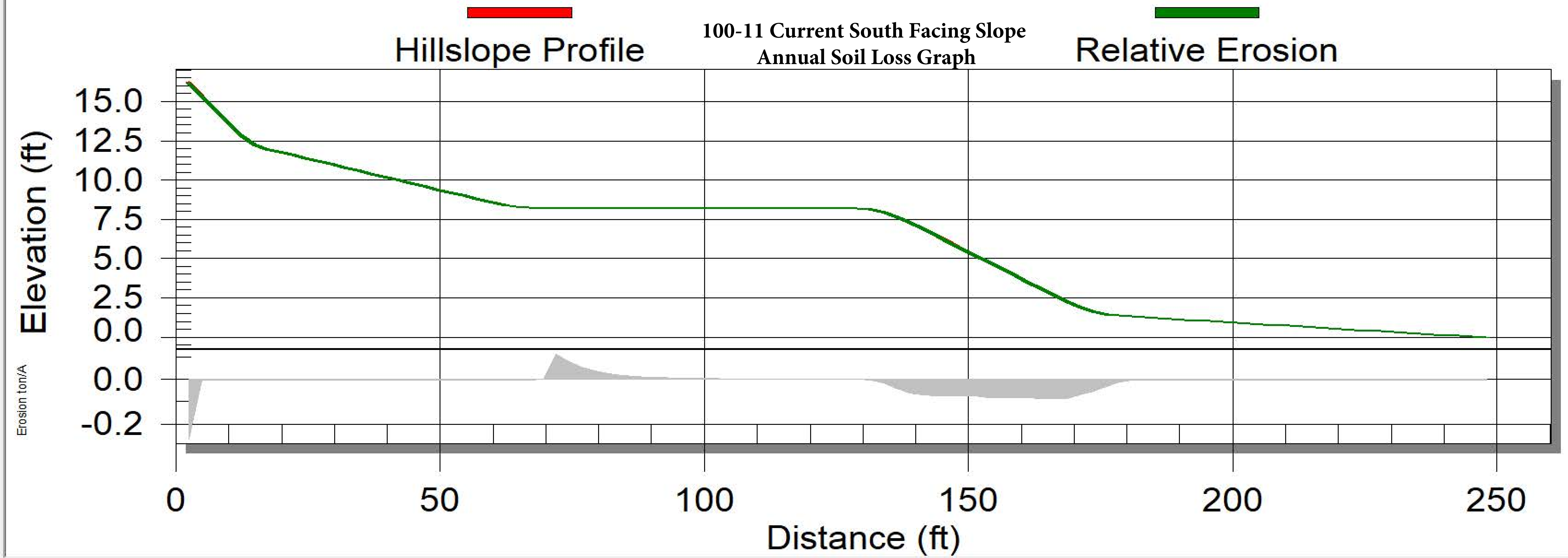
Maximum Detachment: 0.0535 ton/A at 84.3 Maximum Deposition: Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		124.0	0.02	124.0	0.00	0.0

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		124.0	0.02	124.0	0.00	0.0

100-11 Current South Facing Slope Annual Soil Loss Graph

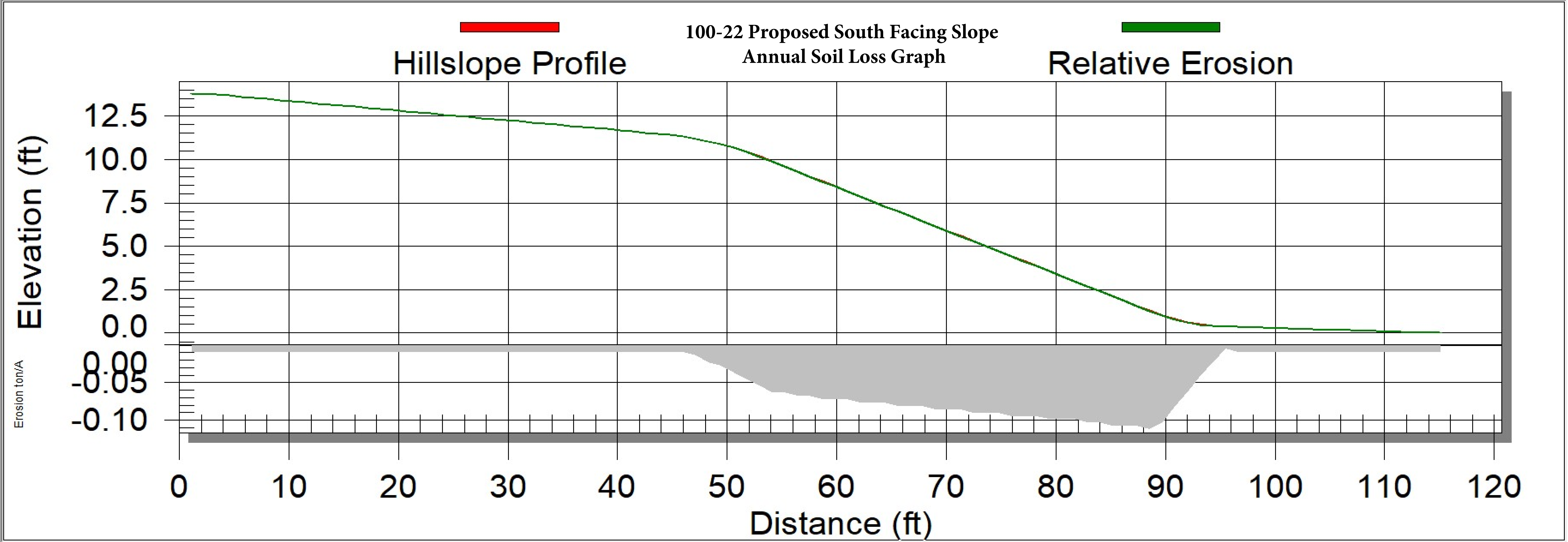


Maximum Detachment: 0.268 ton/A at 2.48 ft Maximum Deposition: 0.112 ton/A at 71.9 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		248.0	0.02	215.7	0.01	62.0

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		248.0	0.02	215.7	0.01	62.0

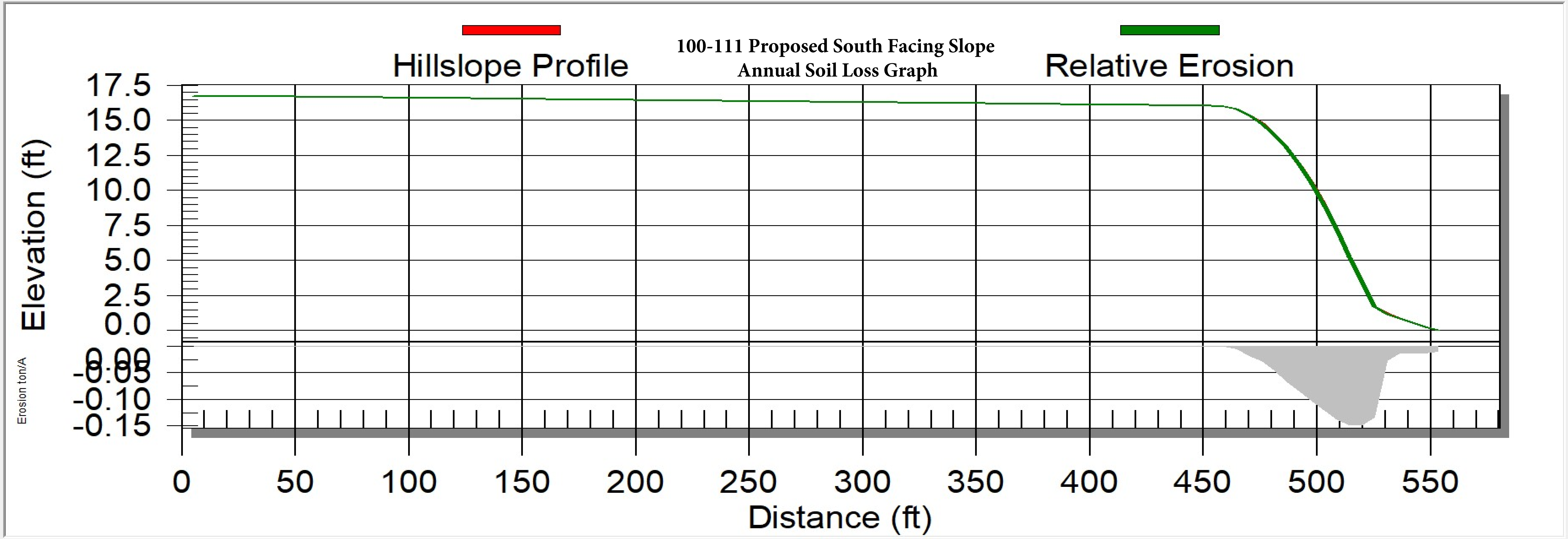


Maximum Detachment: 0.112 ton/A at 88.5 ft Maximum Deposition: Scale 1/10

OK

Management	Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn	115.0	0.04	115.0	0.00	0.0

Soil Name	Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto	115.0	0.04	115.0	0.00	0.0



Maximum Detachment: 0.147 ton/A at 514 ft Maximum Deposition: -0 ton/A at 5.53 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		553.0	0.01	553.0	-0.00	459.0

Soil Name		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		553.0	0.01	553.0	-0.00	459.0

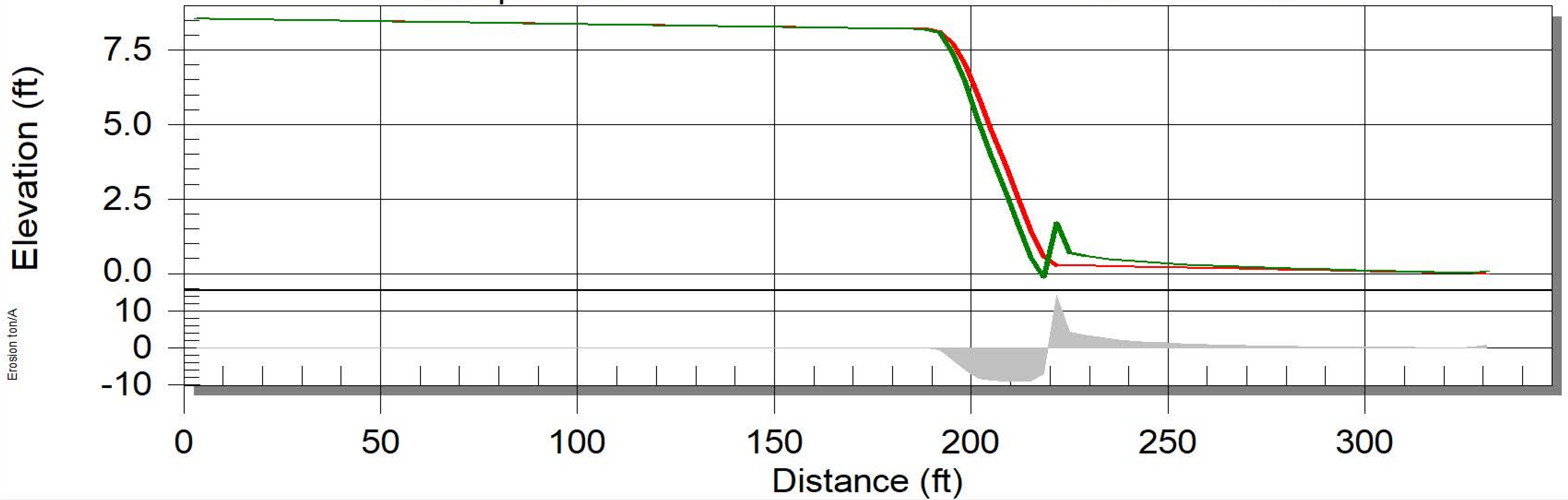
Maximum Detachment: 3.26 ton/A at 89.8 ft Maximum Deposition: 7.07 ton/A at 116 ft Scale 1/10

OK

Management		Length (ft)	Detachment	ent Length	Deposition (t/acre)	Deposition Length (ft)
fallow		528.0	0.37	380.2	0.77	153.1

Soil Name		Length (ft)	Detachment	ent Length	Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		528.0	0.37	380.2	0.77	153.1

100-4 Proposed North Facing Slope
Annual Soil Loss Graph

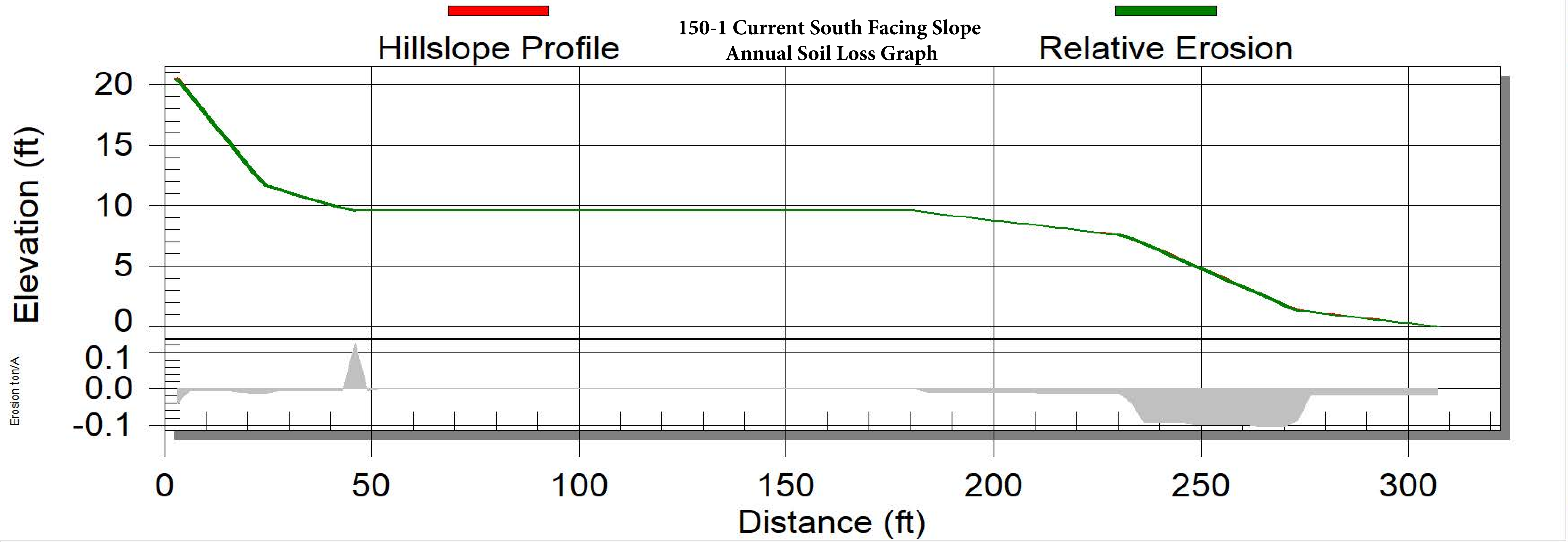


Maximum Detachment: 8.97 ton/A at 215 ft   Maximum Deposition: 14.4 ton/A at 222 ft   Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
fallow		331.0	0.94	218.5	1.37	109.2

Soil Name		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		331.0	0.94	218.5	1.37	109.2

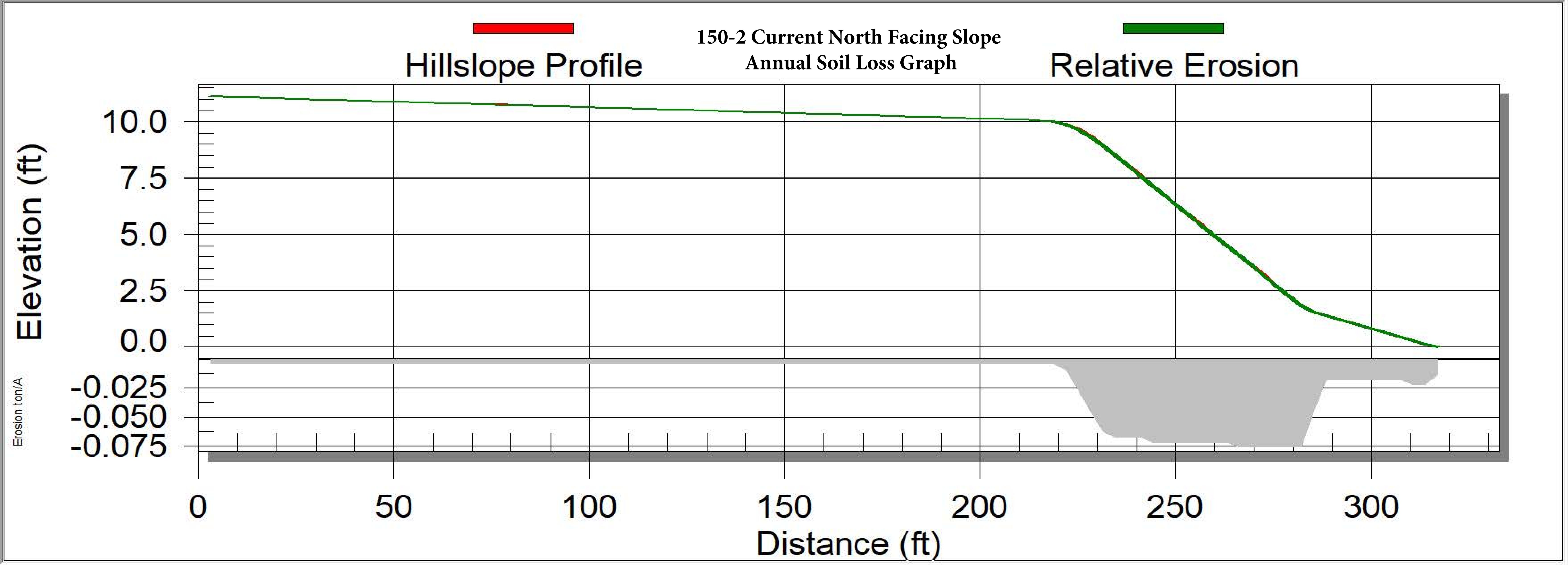


Maximum Detachment: 0.103 ton/A at 264 ft Maximum Deposition: 0.125 ton/A at 46 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Dep	Deposition Length (ft)
grass-lawn		307.0	0.02	303.9	0.00	135.1

	Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
	A soil_for_cotto		307.0	0.02	303.9	0.00	135.1

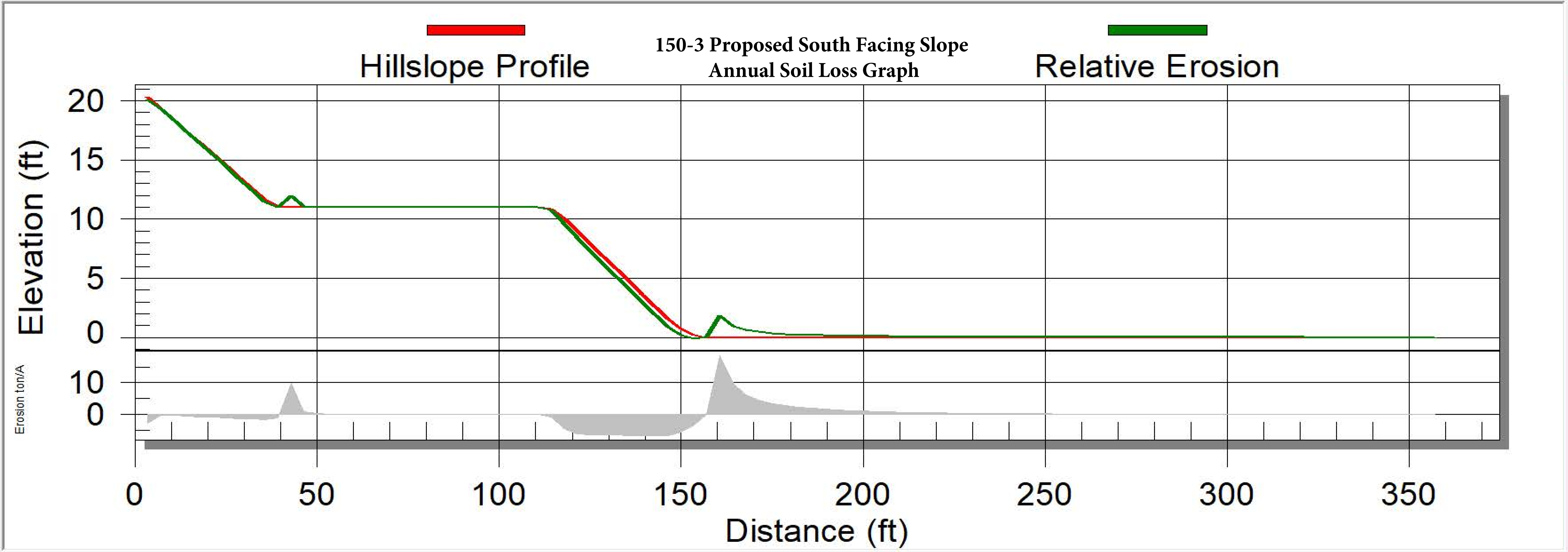


Maximum Detachment: 0.0758 ton/A at 266 f Maximum Deposition: Scale 1/10

OK

Management		Segment Length (ft)	Average Detachm ent	Detachm ent Length	Aver age Dep	Deposition Length (ft)
grass-lawn		317.0	0.02	317.0	0.00	0.0

Soil Name		Segment Length (ft)	Average Detachm ent	Detachm ent Length	Average Depositio n (t/acre)	Deposition Length (ft)
A soil_for_cotto		317.0	0.02	317.0	0.00	0.0

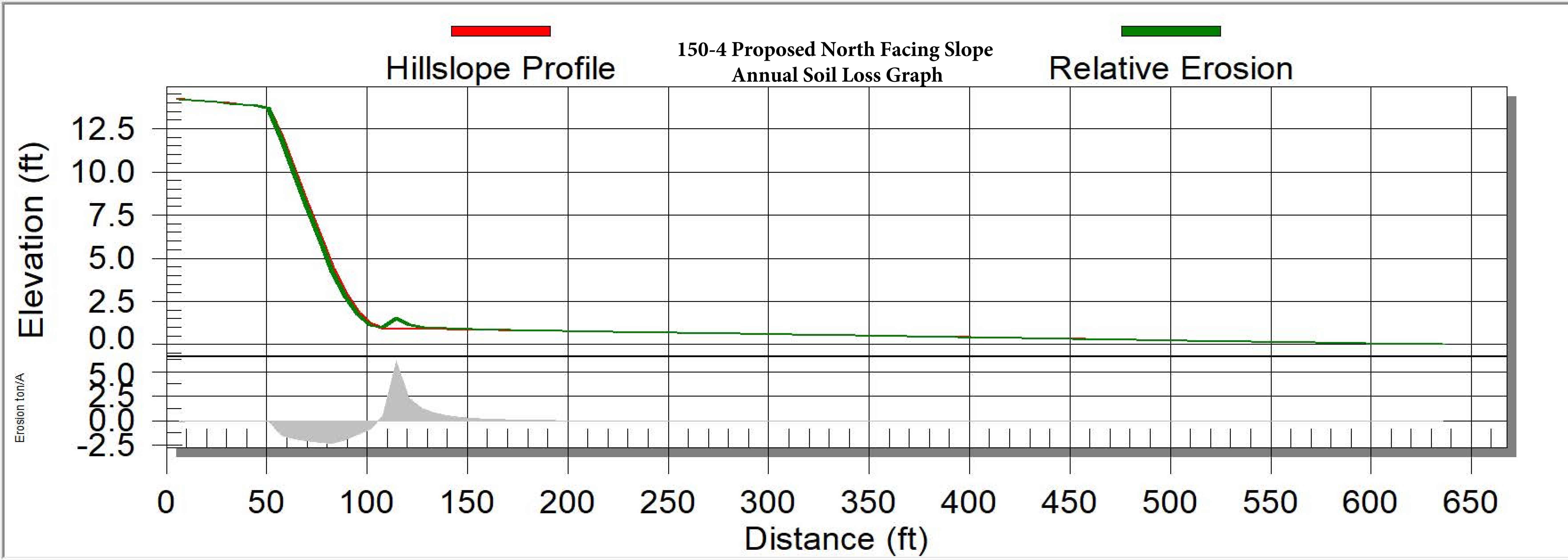


Maximum Detachment: 6.75 ton/A at 146 ft Maximum Deposition: 18.6 ton/A at 161 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		357.0	2.49	110.7	1.04	260.6

	Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
	A soil_for_cotto		357.0	2.49	110.7	1.04	260.6

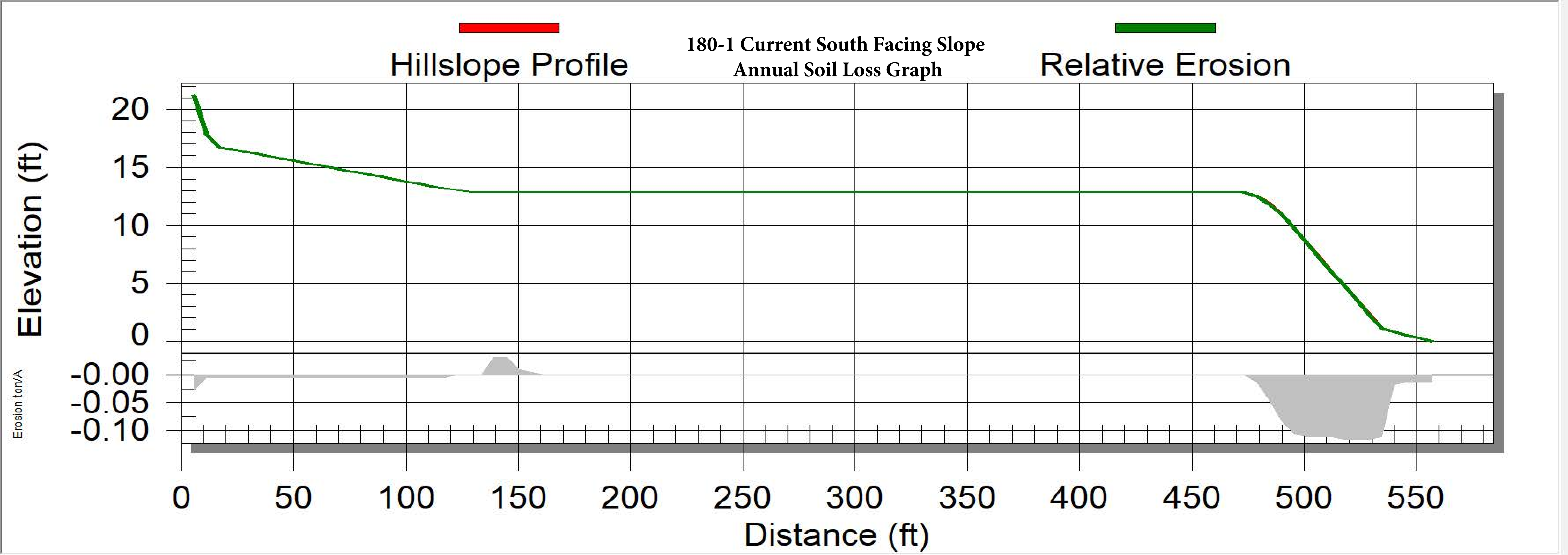


Maximum Detachment: 2.29 ton/A at 82.7 ft Maximum Deposition: 6.06 ton/A at 114 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		636.0	0.18	547.0	0.82	95.4

	Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
	A soil_for_cotto		636.0	0.18	547.0	0.82	95.4



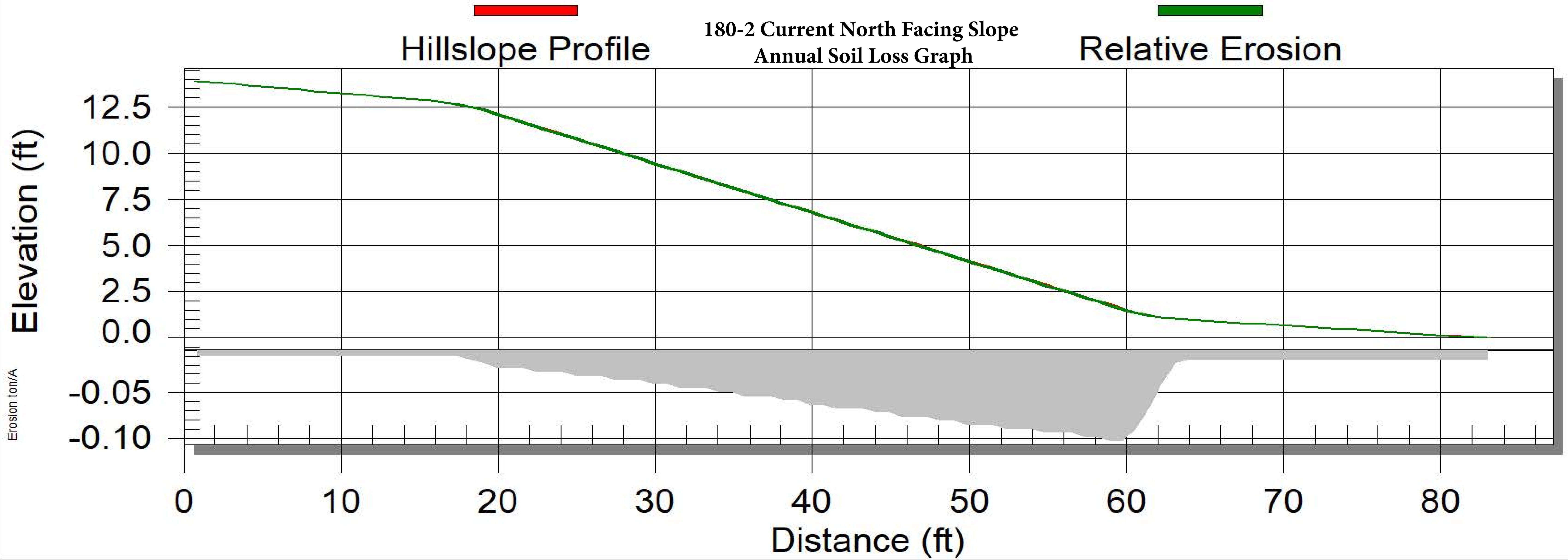
Maximum Detachment: 0.116 ton/A at 518 ft Maximum Deposition: 0.0312 ton/A at 139 f Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		556.8	0.01	534.6	0.00	356.4

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		556.8	0.01	534.6	0.00	356.4

180-2 Current North Facing Slope
Annual Soil Loss Graph



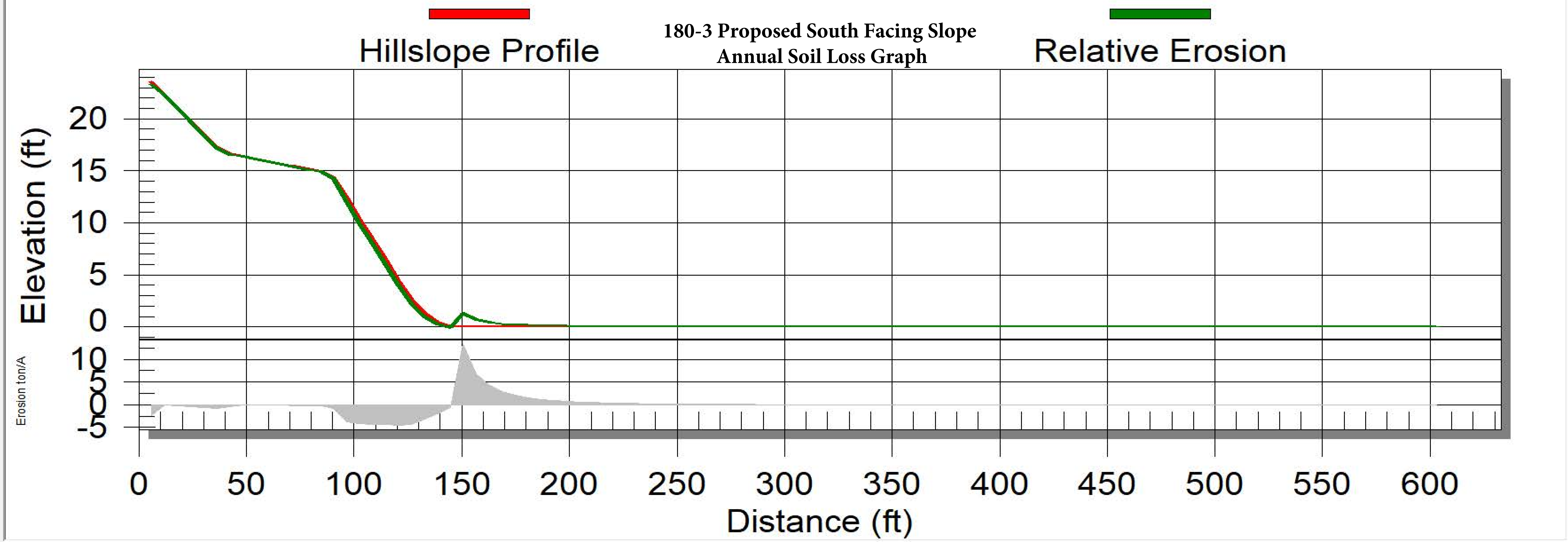
Maximum Detachment: 0.103 ton/A at 58.9 ft Maximum Deposition: Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		83.0	0.04	83.0	0.00	0.0

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		83.0	0.04	83.0	0.00	0.0

180-3 Proposed South Facing Slope Annual Soil Loss Graph



Maximum Detachment: 4.59 ton/A at 121 ft

Maximum Deposition: 13.4 ton/A at 151 ft

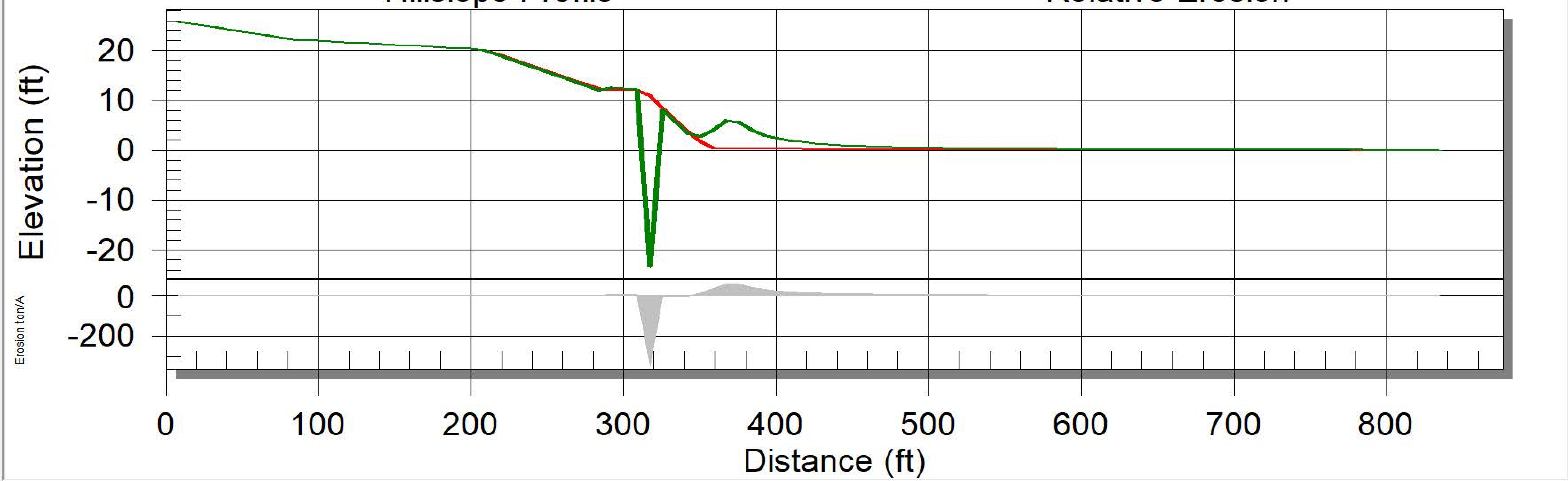
Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		603.0	0.76	301.5	0.50	458.3

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		603.0	0.76	301.5	0.50	458.3

180-4 Proposed North Facing Slope
Annual Soil Loss Graph



Maximum Detachment: 344 ton/A at 317 ft   Maximum Deposition: 58.3 ton/A at 367 ft   Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		835.0	9.94	317.3	6.04	517.7

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		835.0	9.94	317.3	6.04	517.7

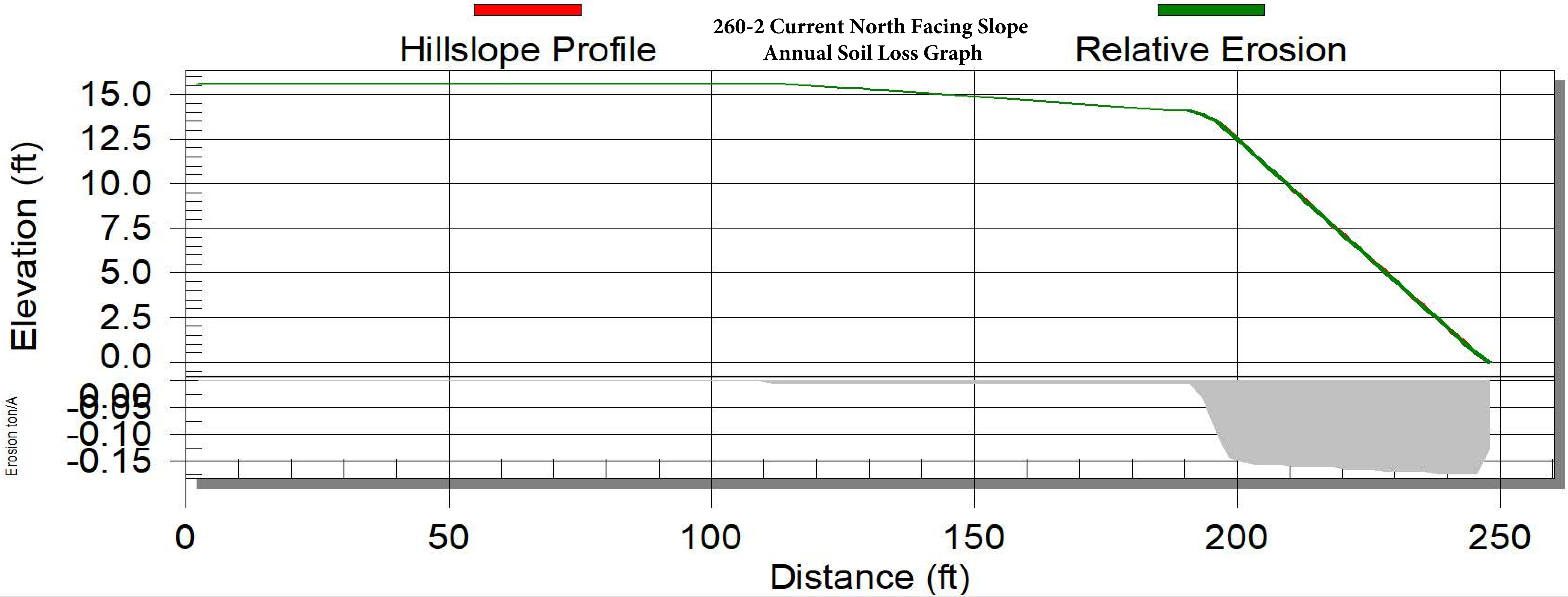
Maximum Detachment: 0.17 ton/A at 85.7 ft Maximum Deposition: 5.15 ton/A at 87.9 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		111.3	0.05	107.9	1.29	4.4

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		111.3	0.05	107.9	1.29	4.4

260-2 Current North Facing Slope Annual Soil Loss Graph



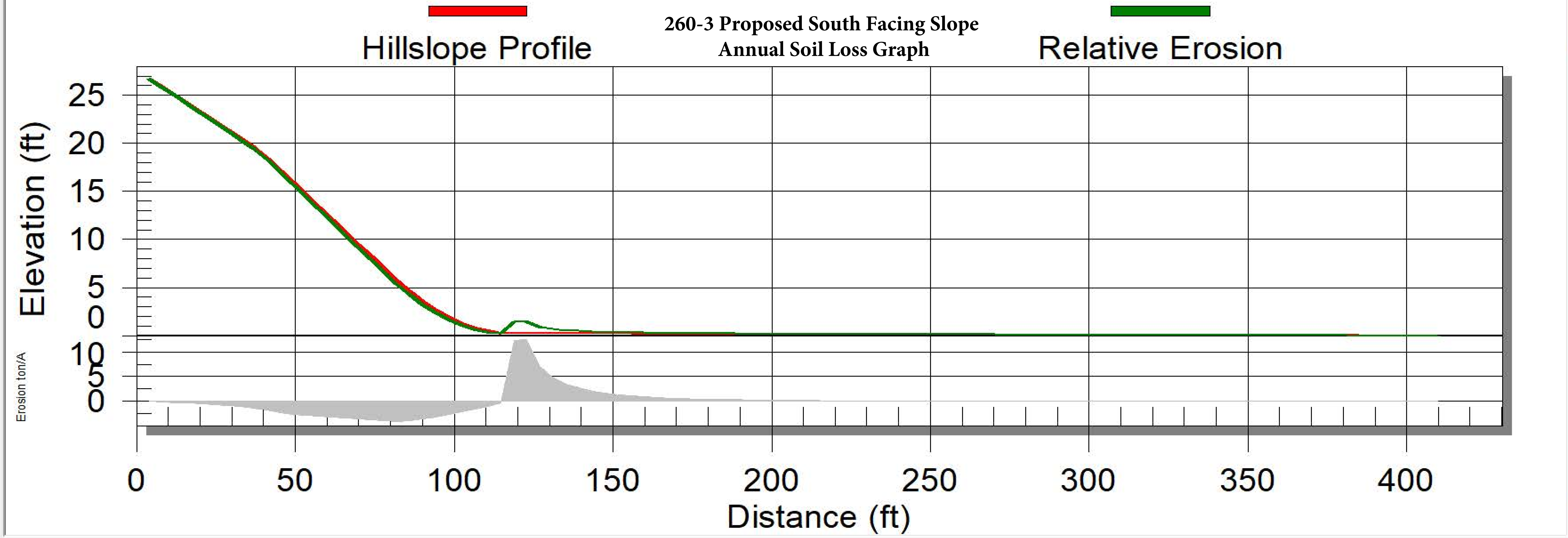
Maximum Detachment: 0.174 ton/A at 238 ft Maximum Deposition: -0 ton/A at 2.48 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		248.0	0.04	248.0	-0.00	109.1

Soil Name		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		248.0	0.04	248.0	-0.00	109.1

260-3 Proposed South Facing Slope
Annual Soil Loss Graph

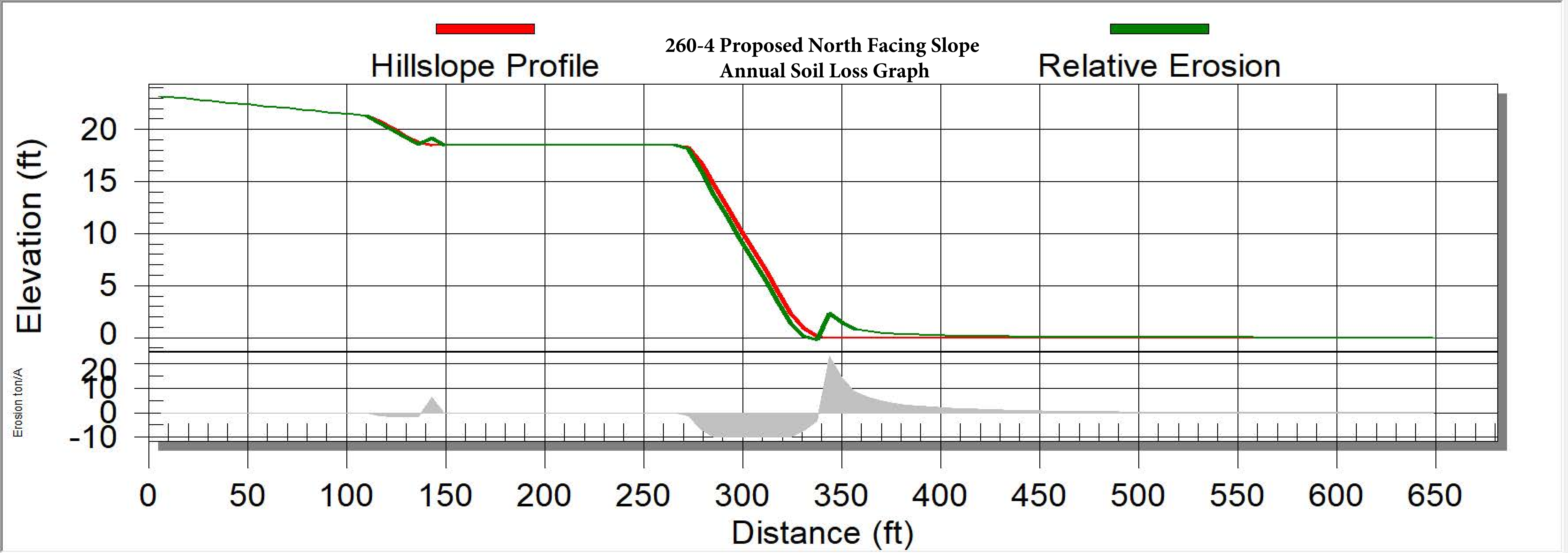


Maximum Detachment: 4.13 ton/A at 82 ft Maximum Deposition: 12.4 ton/A at 123 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
fallow		409.9	1.01	241.8	1.25	180.3

Soil Name		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		409.9	1.01	241.8	1.25	180.3



Maximum Detachment: 10.1 ton/A at 318 ft Maximum Deposition: 23.2 ton/A at 344 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		649.0	1.90	324.5	1.87	324.5

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		649.0	1.90	324.5	1.87	324.5

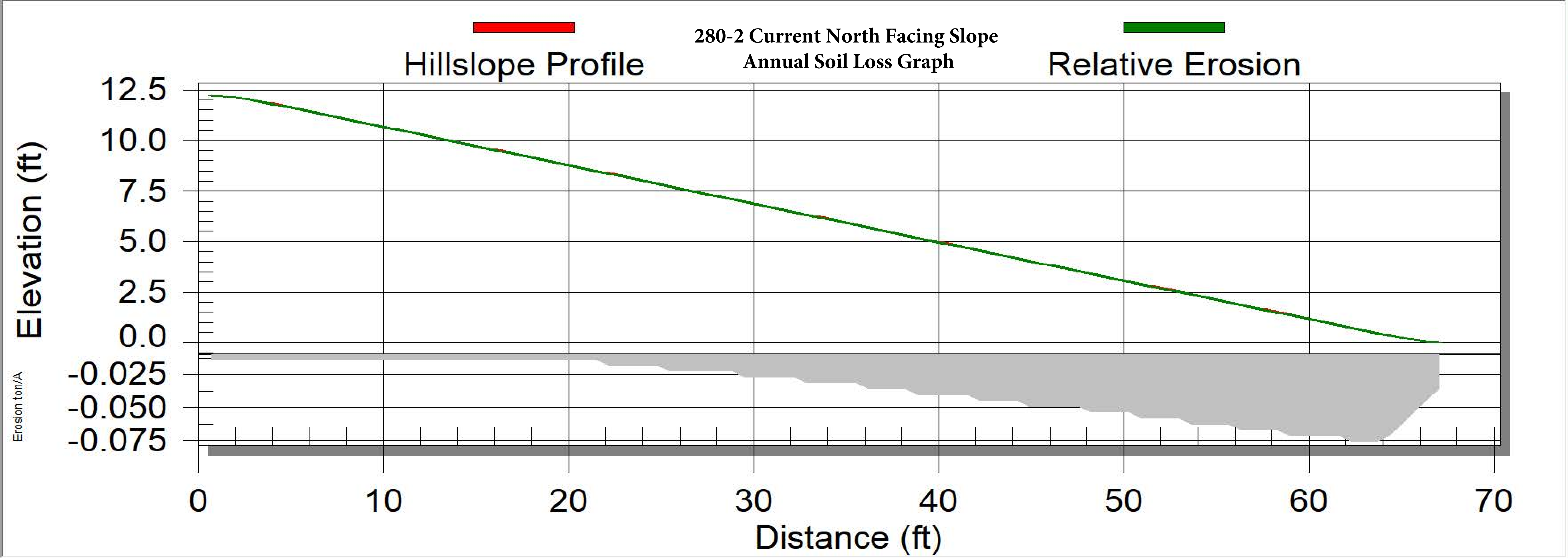
Maximum Detachment: 0.156 ton/A at 51.2 ft Maximum Deposition: Scale 1/10

OK

Management	Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn	64.0	0.07	64.0	0.00	0.0

Soil Name	Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto	64.0	0.07	64.0	0.00	0.0

280-2 Current North Facing Slope Annual Soil Loss Graph



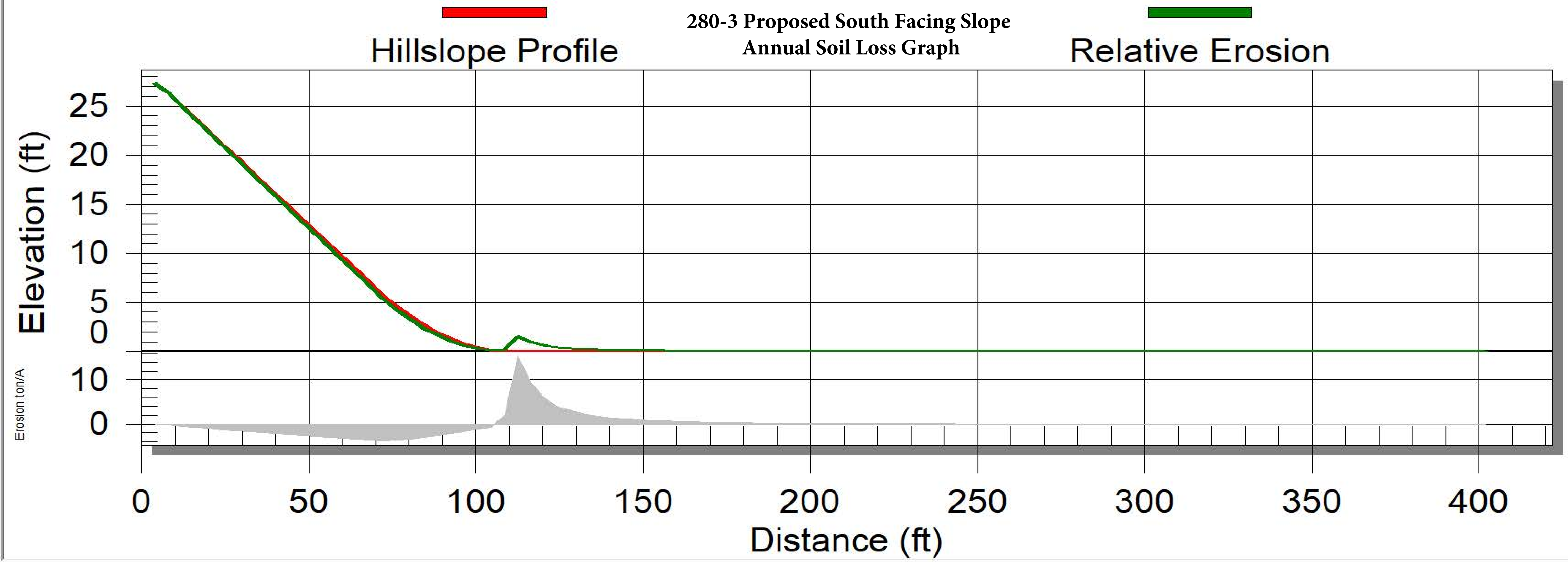
Maximum Detachment: 0.0758 ton/A at 62.3 Maximum Deposition: Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
grass-lawn		67.0	0.04	67.0	0.00	0.0

Soil Name		Segment Length (ft)	Average Detachment (t/acre)	Detachment Length (ft)	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		67.0	0.04	67.0	0.00	0.0

280-3 Proposed South Facing Slope
Annual Soil Loss Graph

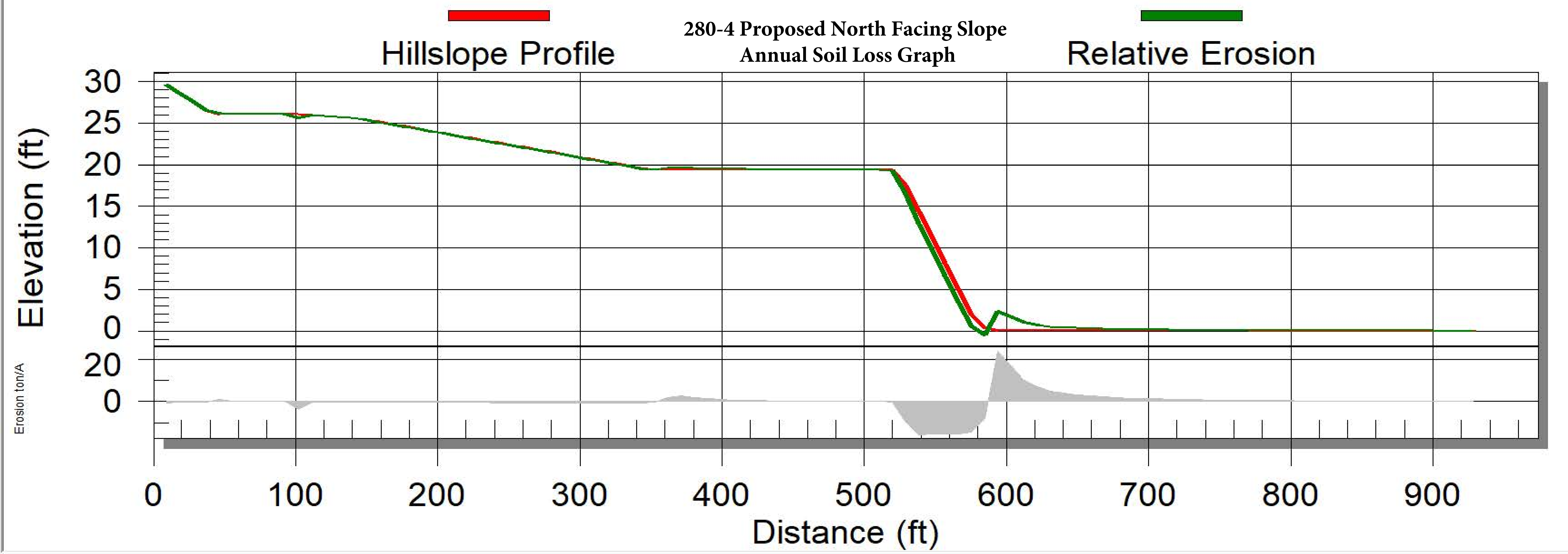


Maximum Detachment: 3.77 ton/A at 72.4 ft Maximum Deposition: 15.5 ton/A at 113 ft Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		402.0	1.31	164.8	0.73	293.5

Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
A soil_for_cotto		402.0	1.31	164.8	0.73	293.5



Maximum Detachment: 15.4 ton/A at 538 ft   Maximum Deposition: 23.7 ton/A at 594 ft   Scale 1/10

OK

Management		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
fallow		928.0	2.37	417.6	1.83	529.0

	Soil Name		Segment Length (ft)	Average Detachment	Detachment Length	Average Deposition (t/acre)	Deposition Length (ft)
	A soil_for_cotto		928.0	2.37	417.6	1.83	529.0