Single Axis Tracker Grading and Steel Design: PV Tune, A Kimley-Horn Solar Analysis Solution.

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Introduction

Traditional civil and structural solar analysis tools in the market have a "grading-first" focus, limiting design constraints and driving large earthwork and steel costs during construction. Kimley-Horn's proprietary tool, PV Tune, takes an innovative approach to optimize grading *and* pile heights – equipping developers and EPCs with the most accurate data to increase efficient decision making and decrease construction costs. Using PV Tune, this study analyzed reveal and volume scenarios for an example site ("Site X"), across multiple tracker types, grading constraints, and pile height ranges. Researchers explored results' implications for earthwork, steel, and environmental impacts as well as direct benefits to key stakeholders.

Method

- Using PV Tune, researchers conducted a 2x3 analysis comparing straight and terrain-following tracker types across three reveal ranges: 1', 2', and 3'.
- Researchers employed a reveal analysis to calculate percent of failing piles, failing trackers, and quantity of minimized steel piles across all six groups.
- Researchers then calculated volume analyses to determine approximate grading area and volume of earthwork across the six tracker types and reveal range groups. This was used to determine level of site disturbance.
- Researchers conducted multiple iterations of these calculations to ensure grading procedures kept pile heights in tolerance to optimize the site's earthwork and steel needs.
- Once civil design was completed for Site X, researchers re-ran grading and pile analyses in PV Tune to finalize the most efficient pile design and mapping plan.

Results

- *Table 1* shows a full breakdown of PV Tune reveal and volume analyses across tracker type and reveal range.
- Straight trackers resulted in the most failing piles (*Range* = 7.74-40.25%) and trackers (*Range* = 28.33-80.95%), while terrain-following trackers displayed the least failing piles (*Range* = 2.03-6.31%) and trackers (*Range* = 11.67-28.33%)
- Terrain-following trackers displayed the lowest grading constraints (*Range* = 5.92-15.62 AC) and earthwork volumes (*Range* = 18,000-31,000 CY)
- Terrain-following trackers at a 3' reveal range minimized failing piles and trackers, graded area, and earthwork volume.

Discussion

- Utilizing PV Tune provided researchers deeper site analyses across multiple tracker types and reveal ranges.
- Results indicated increased cost savings from minimized earthwork and steel construction costs, and from associated stormwater regulations.
- Results indicated positive environmental impacts including soil retention, revegetation growth, and minimized overall site disturbance.
- PV Tune optimized site grading and pile design, which resulted in a more efficient project at all stages (see *Figure 1*).
- PV Tune provided stakeholders clear insights to make confident, data-informed decisions for Site X.

Tables & Figures

Tracker Type	Reveal Range (FT)	Failing Piles (%)	Failing Trackers (%)	Steel Piles Less than 4'-3" (QTY)	Approx. Graded Area (AC)	Approx. Earthwork Volume (CY)
Straight	1'	40.25%	80.95%	3108	70.97	180,000
Straight	2'	16.63%	48.54%	2237	33.02	76,000
Straight	3'	7.74%	28.33%	1953	16.69	45,000
Terrain	1'	6.31%	28.33%	6075	15.62	31,000
Terrain	2'	3.51%	18.81%	5990	11.36	30,000
Terrain	3'	2.03%	11.67%	5941	5.92	18,000

Table 1. PV Tune reveal and volume analyses for Site X.

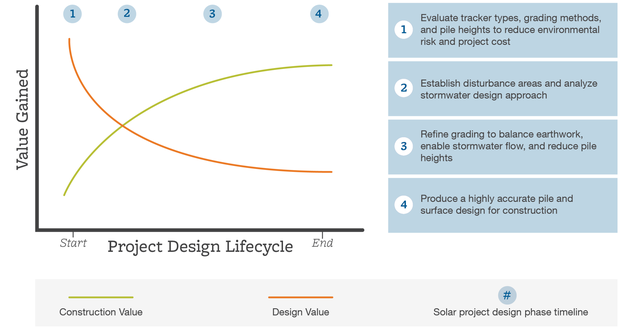
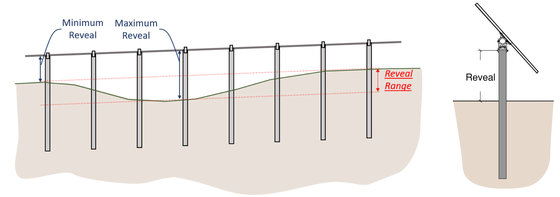


Figure 1. PV Tune value-add throughout the project lifecycle.



Figures 2 and 3. Visuals of reveal heights and ranges.

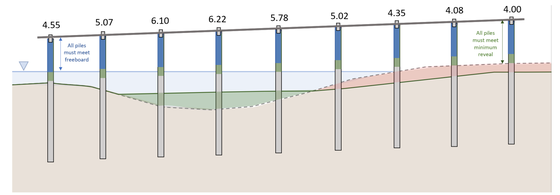


Figure 4. Visual of a pile plan analysis.

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