

Natural Erosion Control Stairs

Designed for Baltimore Department of Recreation and Parks by the Civil and Systems Engineering Department

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Challenge

We have been tasked by Baltimore City Rec and Parks (BCRP) as well as Audubon Society to design a set of stairs to increase accessibility to a new trail they will be creating in Lakeland Park. This trail is part of a newer trail system which BCRP wants to design for this park. In a forested area of this park, where this trail system is going to reside, there exists a steep slope where steps will need to be made. These steps should connect the bottom part of the trail to the top, making it more accessible. While accessibility and safety are two essential factors, it is also important that the natural aesthetic of the trail is maintained.

Objectives and Constraints

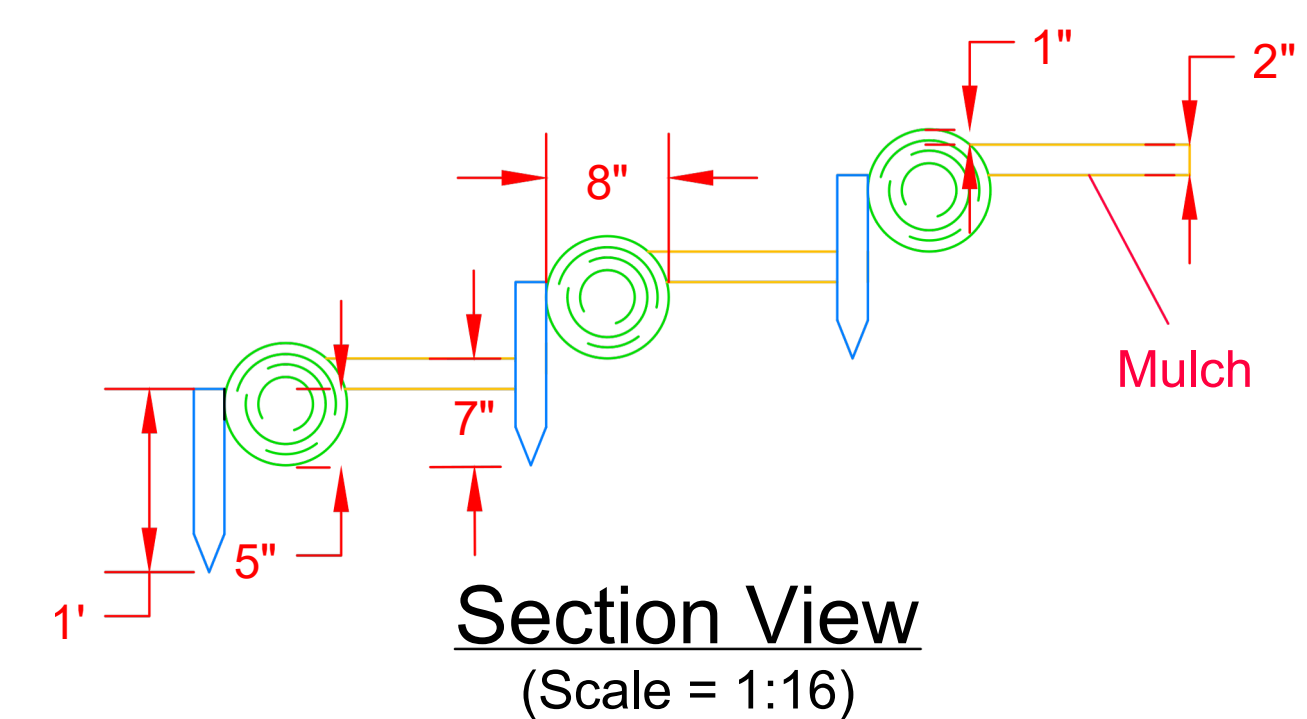
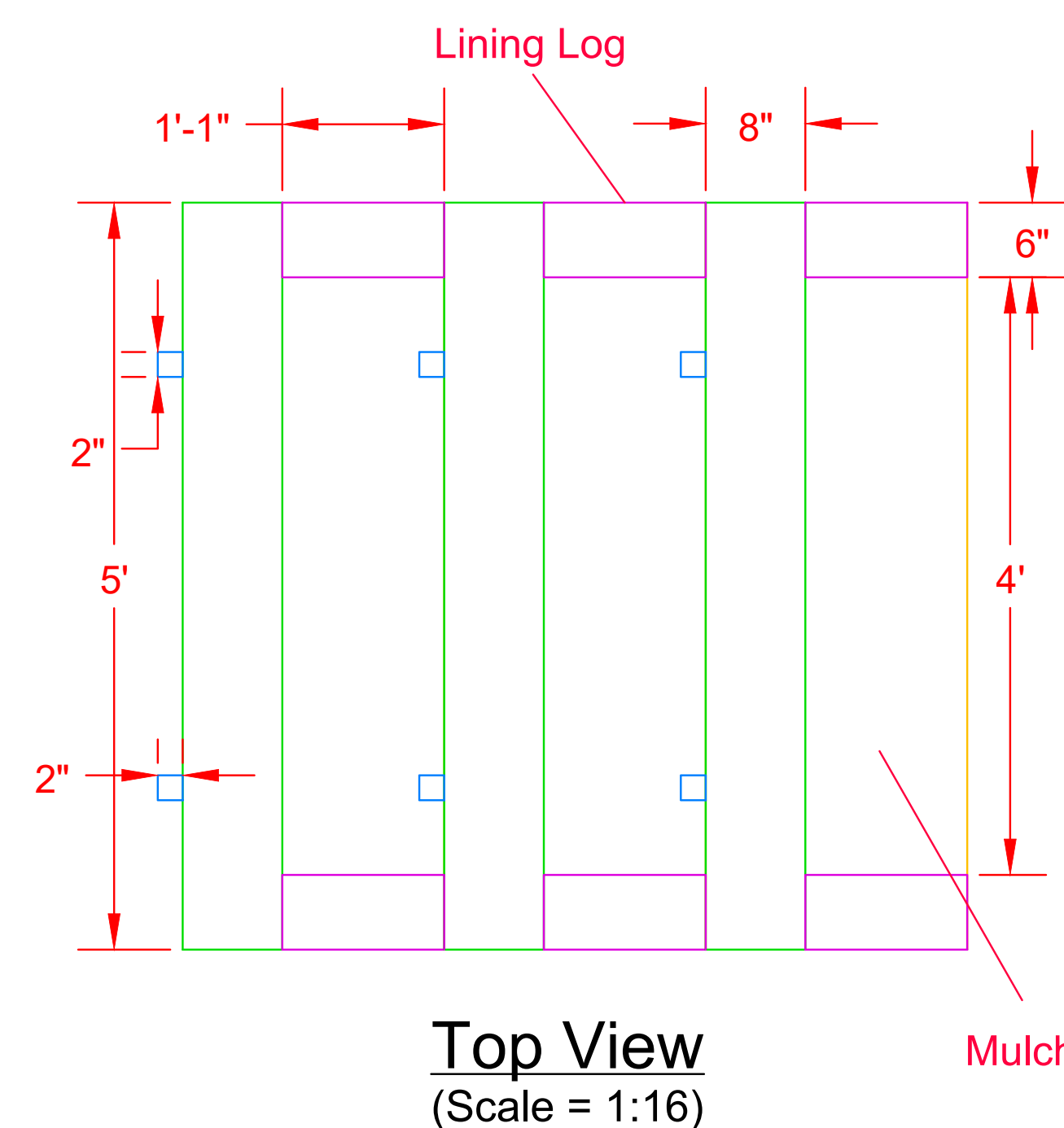
Top Objectives

1. Resilience and Durability
2. Natural Aesthetic
3. Safety
4. Constructability
5. Minimizing Costs
6. Accessibility
7. Community Support

Top Constraints

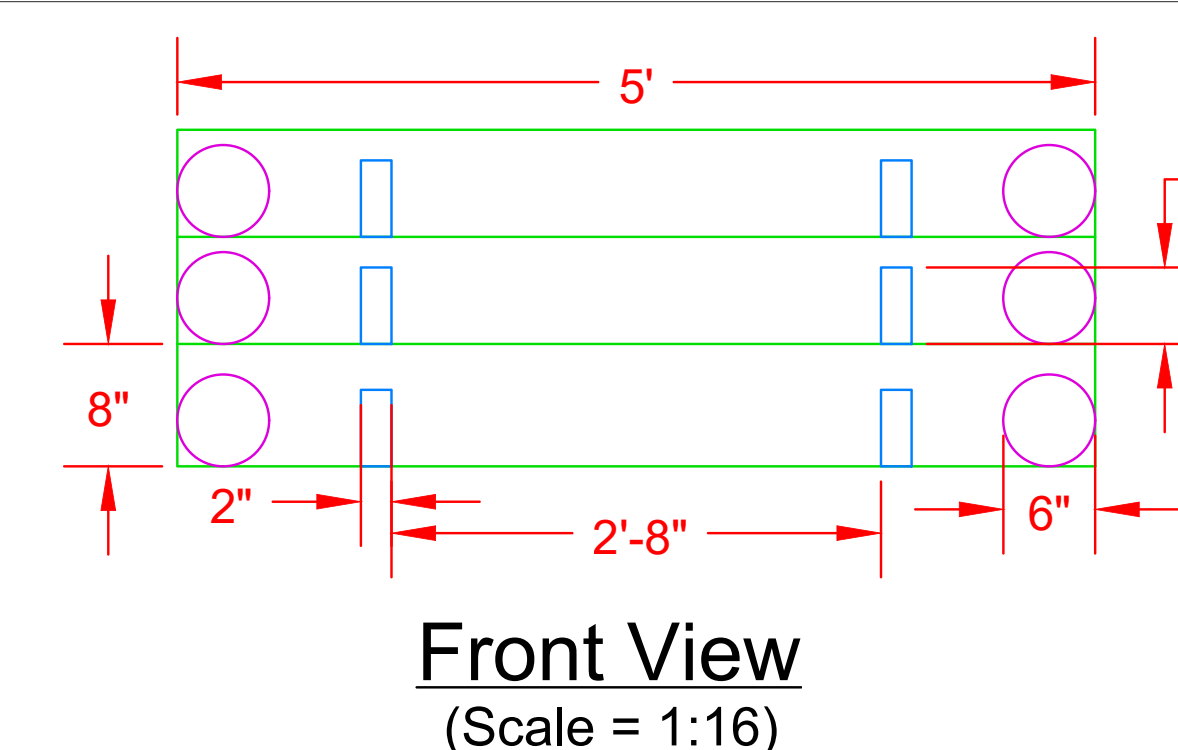
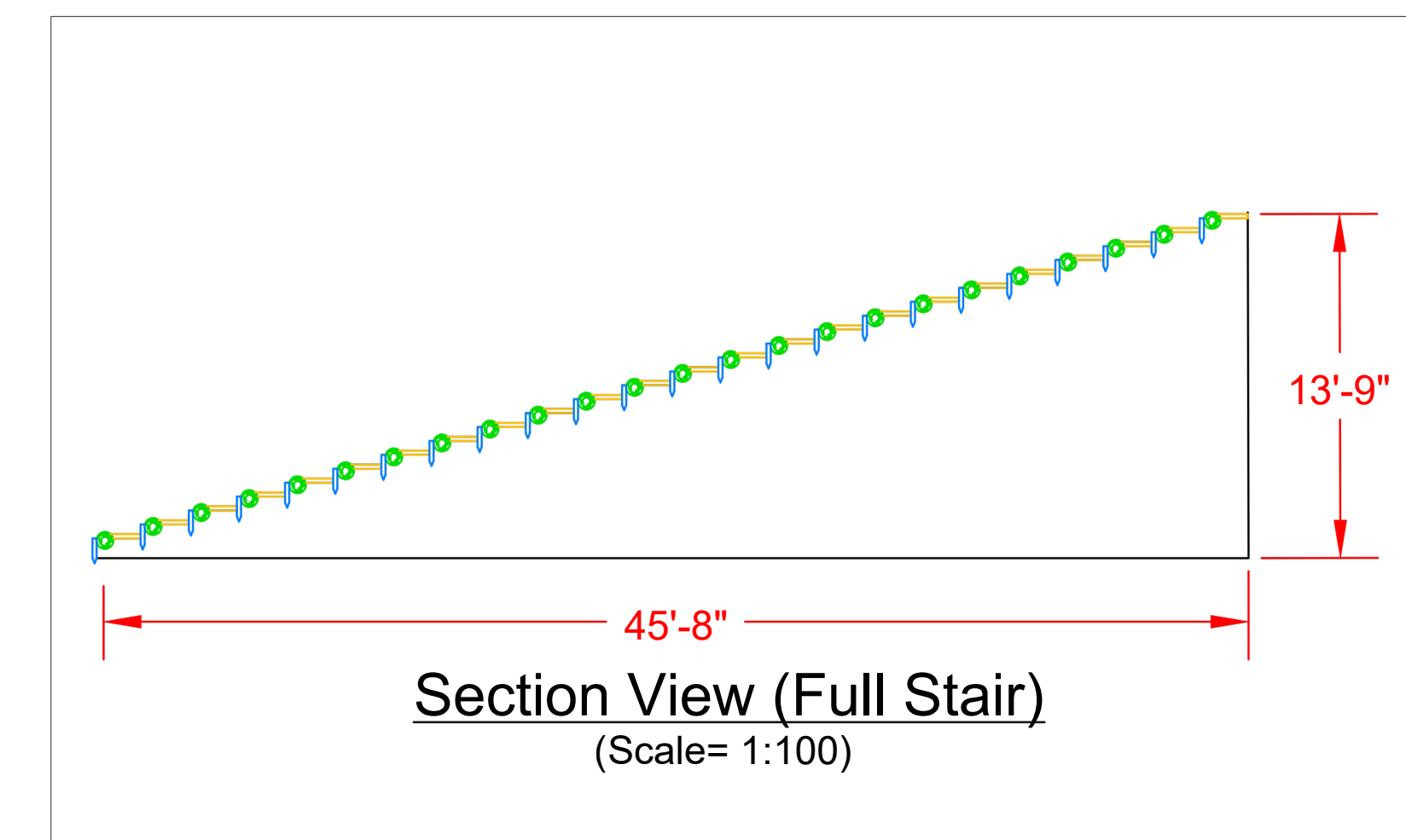
1. Cost
2. Environmental Regulations
3. Resources
4. Labor Force
5. Weather
6. Soil Texture
7. Time

Results or Findings



General Notes

This multi-view drawing of the Lakeland Park trailstair design features three detailed views of a three-step segment of the stairs, along with a view of the entire staircase. This design uses 24 logs for steps, 48 logs for lining on either side, 48 cedar stakes to support steps, and two cubic yards of mulch packed in between steps. Tools needed include shovels, mallets, and wheelbarrows or bags for mulch. Two or more volunteers is ideal for construction.

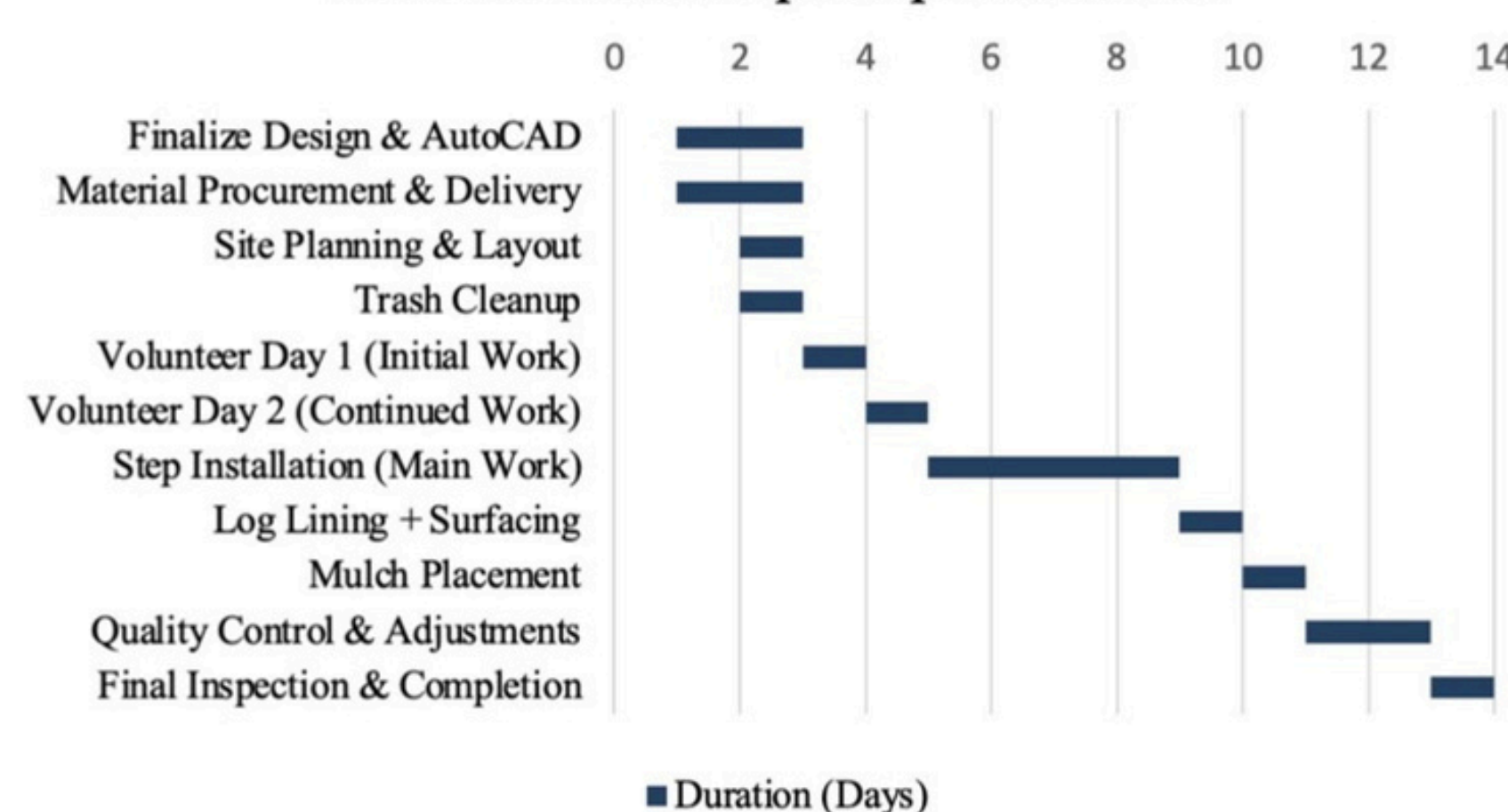


Objectives In Action:

- **Resilience and Durability:** Each step functions as a water bar by rising an inch above the mulch behind, ensuring that water doesn't collect on the steps themselves.
- **Natural Aesthetic:** Stairs made completely of logs, cedar stakes, and wood chips to maintain a natural look.
- **Safety:** Well-supported logs, limited stair rise, and a wide trail maintain the utmost safety.
- **Constructability:** We are only using log 2nds for this project, which means that no heavy machinery will be required. All materials can be transported and installed by the workers using only handheld tools.
- **Minimizing Costs:** To minimize costs, materials will be sourced from Camp Small, where BCRP gets a heavily discounted rate.
- **Accessibility:** This stairway will connect two trails within Lakeland Park, improving the local area for nearby residents.
- **Community Support:** Local students will be involved in clearing the trail and helping to build the steps.

Implementation

Lakeland Park Steps Implementation



Cost Estimate

If all materials are provided by Camp Small and cedar stakes are supplied by BCRP, the direct project cost is reduced to approximately \$150 for transportation only; however, material quantities are still documented to reflect their value as city resources.

Volunteers needed: 3-4 per day

| Element | Unit cost | Unit | Quantity | Subtotal |
|--------------------------------|-----------|------------|----------|----------|
| Log stairs(include water bars) | \$0.30 | Board foot | 502.65 | \$150.80 |
| Lining logs | \$0.30 | Board foot | 197.92 | \$59.38 |
| Cedar stakes | \$9 | 12-Pack | 4 | \$36.00 |
| Mulch | \$10 | Cubic yard | 2 | \$20.00 |
| Transportation | — | Trip | 2 | \$150.00 |

Total Cost: \$416.18

Team Photo

