HABITAT FOR HUMANITY
TINY HOME AFFORDABLE HOUSING SITE
DESIGN IN FLAGSTAFF, ARIZONA

CENE 476: FINAL PRESENTATION
December 7th, 2018
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PROJECT UNDERSTANDING

Purpose

• Development of 45 Tiny Homes to provide affordable housing solutions in Flagstaff
• Preliminary site design with grading and drainage, roads, curb and gutters, utilities, and preliminary cost estimate

Client: Dr. Steve Mead

• Joint Venture with Habitat for Humanity and Flagstaff Unified School District

Technical Advisor: Stephen Irwin

• Shephard-Wesnitzer Inc.
Figure 1: Project Location for Habitat for Humanity Affordable Housing development in Flagstaff, Arizona. [1]
Figure 2: Project Location for Habitat for Humanity Affordable Housing development in Flagstaff, Arizona. [1]
PROJECT SCOPE

TASK 1: Site Investigation

1.1: Preliminary Site Visit and Assessment: Identify challenges and components of design relating to location, topography, and possible access points

1.2: Topographic Map: Created using existing LIDAR data from City Of Flagstaff

TASK 2: Grading and Drainage Plan

2.1: Existing Hydrology: Determine peak flows and existing drainage

2.2: Existing Hydraulics: Identify existing infrastructure

2.3: Hydrology Design: Software will be used to model hydrology

2.4: Hydraulics Design: Design conveyance systems to handle flow
TASK 3: Roads, Curbs, and Gutter

3.1: Current Conditions and Access: Identification of slopes, trees, and existing infrastructure will be identified

3.2: Roads and Parking Lot Design: Centerlines, offsets, curvatures, and elevations for a new road and parking lots will be identified using COF 13-10 and ADA Standards

3.3: Curb and Gutter Design: Offsets, curvatures, and elevations will be identified following COF 13-10 and ADA Standards

TASK 4: Utility Layout and Coordination

4.1 Utility Layout: Designed utilities will be permanent connections to existing infrastructure following COF codes and ADEQ standards.

4.2 Water: Identification of existing water lines and design for additional connections

4.3 Sewer: Identification of existing sewer lines and design for additional connections
TASK 5: Construction Plans: Cover sheet, notes and details, existing site plan, design sheets, and SWPPP

TASK 6: Preliminary Cost Estimate: Sheet of estimate for construction and labor cost of project for the design provided

TASK 7: Deliverables

7.1: 30% Design Report: Update provided for minor corrections
7.2: 60% Design Report: Update provided for minor corrections
7.3: 90% Design Report: Update provided for minor corrections
7.4: Final Design Deliverables: Final design report, final presentation, final website
TASK 8: Project Coordination

8.1: Meetings: To be conducted with Technical Advisor, Client, Grading Instructor and Capstone team meetings no less than every 3 weeks

8.2: Schedule Management: Review schedule weekly for upcoming deliverables

8.3: Resource Management: Budget, scheduling of equipment, and task tracking

8.4: Project Tracking: Item of review in Client and Grading Instructor meetings to plan and assign tasks for completion
PROJECT LIMITATIONS

• Challenges:
  • Site Topography
  • Communal Parking Lot / ADA Compliance
  • City of Flagstaff Codes: Tree Preservation and Fire Lanes

• Exclusions:
  • Survey and Tree Survey
  • Geotechnical Analysis
  • Traffic Impact Analysis
  • Structural Engineering/Retaining wall designs

Figure 3: Photo of Project Site Location from Sparrow Ave. [1]
1: Preliminary Site Visit and Assessment

2: Grading and Drainage Design
   2.1 Site Map
   2.2 Existing Hydrology
   2.3 Existing Hydraulics
   2.4 Hydrology Design
   2.5 Hydraulics Design
   Grading and Drainage Design Draft

3: Roads, Curb, and Gutter Design
   3.1: Current Conditions and Access Identification
   3.2 Roads and Parking Design
   3.3 Curb and Gutter Design
   Roads, Curb and Gutter Design Draft

4: Utility Layout and Coordination
   4.1 Utility Layout
   4.2 Water
   4.3 Sewer
   Utility Layout Draft

5: Construction Plans

6: Preliminary Cost Estimate
   Draft Estimate
   Final Estimate

7: Deliverables
   7.1 30% Design Report
   7.2 60% Design Report
   7.3 90% Design Report
   7.4 Final Report
   7.5 Final Website

8: Projection Coordination
Figure 4: Critical Path based on required start and end dates and working days in project duration.
### STAFFING

Table 1: Project Member Titles and Abbreviations for staffing of the Affordable Housing Tiny Home Project [1]

<table>
<thead>
<tr>
<th>SENG</th>
<th>ENG</th>
<th>EIT</th>
<th>INT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Engineer</td>
<td>Engineer</td>
<td>Engineer in Training</td>
<td>Intern</td>
</tr>
</tbody>
</table>

Table 2: Hours provided for each project member for each task listed [1]

<table>
<thead>
<tr>
<th>Task</th>
<th>SENG Hours</th>
<th>ENG Hours</th>
<th>EIT Hours</th>
<th>INT Hours</th>
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</thead>
<tbody>
<tr>
<td>1.0 Preliminary Site Visit and Assessment</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.0 Grading and Drainage Design</td>
<td>20</td>
<td>60</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>3.0 Roads, Curb and Gutter Design</td>
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<td>60</td>
<td>55</td>
<td>55</td>
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<tr>
<td>4.0 Utility Layout and Coordination</td>
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<td>40</td>
<td>40</td>
<td>10</td>
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<td>5.0 Construction Plans</td>
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<td>80</td>
<td>60</td>
<td>60</td>
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<tr>
<td>6.0 Cost Analysis</td>
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<td></td>
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<tr>
<td>7.0 Deliverables</td>
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<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0 Project Coordination</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Subtotal</strong></td>
<td><strong>215</strong></td>
<td><strong>268</strong></td>
<td><strong>214</strong></td>
<td><strong>184</strong></td>
</tr>
<tr>
<td><strong>Total (hours)</strong></td>
<td><strong>881</strong></td>
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## Table 3: Cost of Engineering Services Breakdown for Personnel and Travel on the Tiny Home Affordable Housing Site Design [1]

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Classification</th>
<th>Hours(^1)</th>
<th>Rate, $/hr</th>
<th>Cost</th>
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<tbody>
<tr>
<td>SENG</td>
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<td>215</td>
<td>150</td>
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<td>ENG</td>
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<td>268</td>
<td>91</td>
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<td>EIT</td>
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<td>214</td>
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<td>184</td>
<td>23</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>$74,780</strong></td>
</tr>
</tbody>
</table>

\(^1\) Number of hours/day \(\times\) number of days, for each classification
REFERENCES

[1] Habitat for Humanity Tiny Homes Affordable Housing Site Design Proposal for Flagstaff Unified School District in Flagstaff, Arizona. ABK : Anna Kurn, David Borja, Michael Bulriss, Abdulrahim Abdullah, Mobarak Alsulaiman. CENE 476 Capstone:


Questions

Figure 5: Photo of Project Site Location from Corner of Sparrow Ave[1]