



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

CENE 476: FINAL PRESENTATION

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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.

# LOCATION



-  NAU Campus
-  Project Location

Flagstaff, Arizona

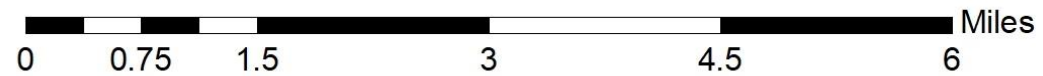
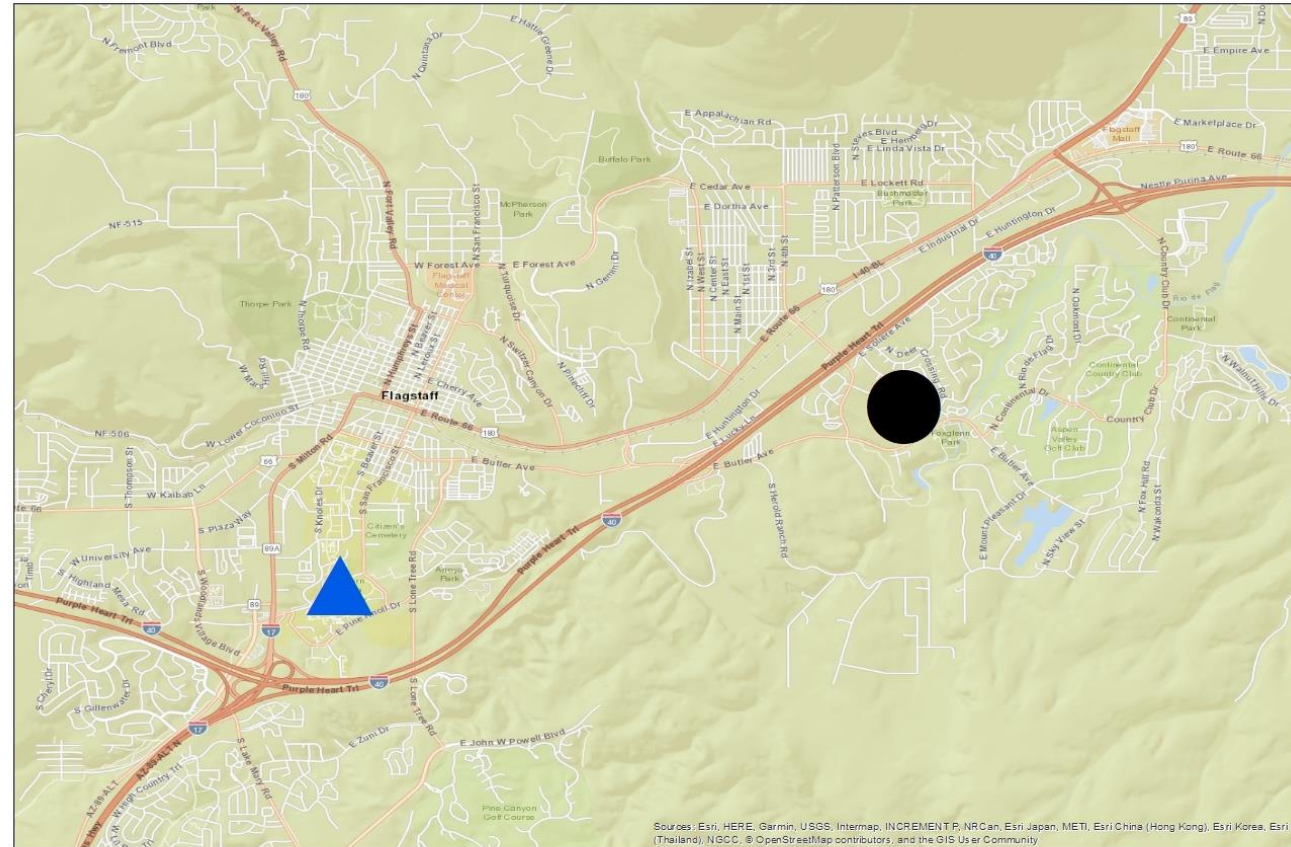
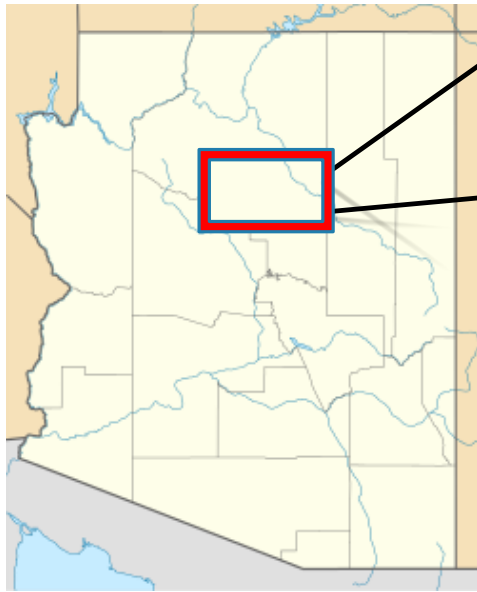





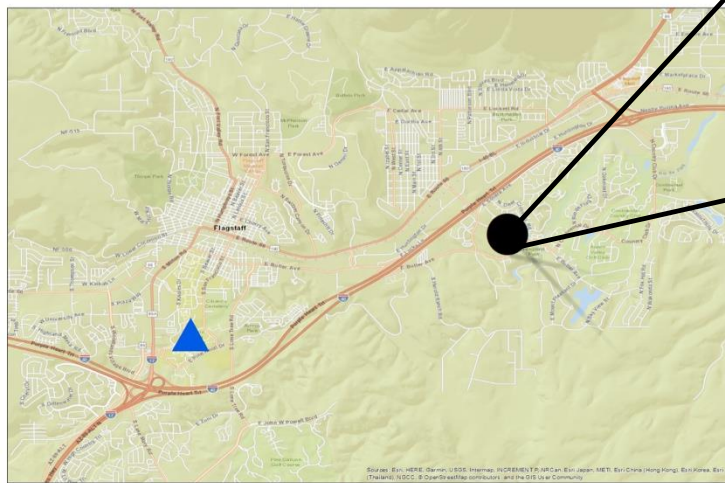


Figure 1: Project Location for Habitat for Humanity Affordable Housing development in Flagstaff, Arizona. [1]

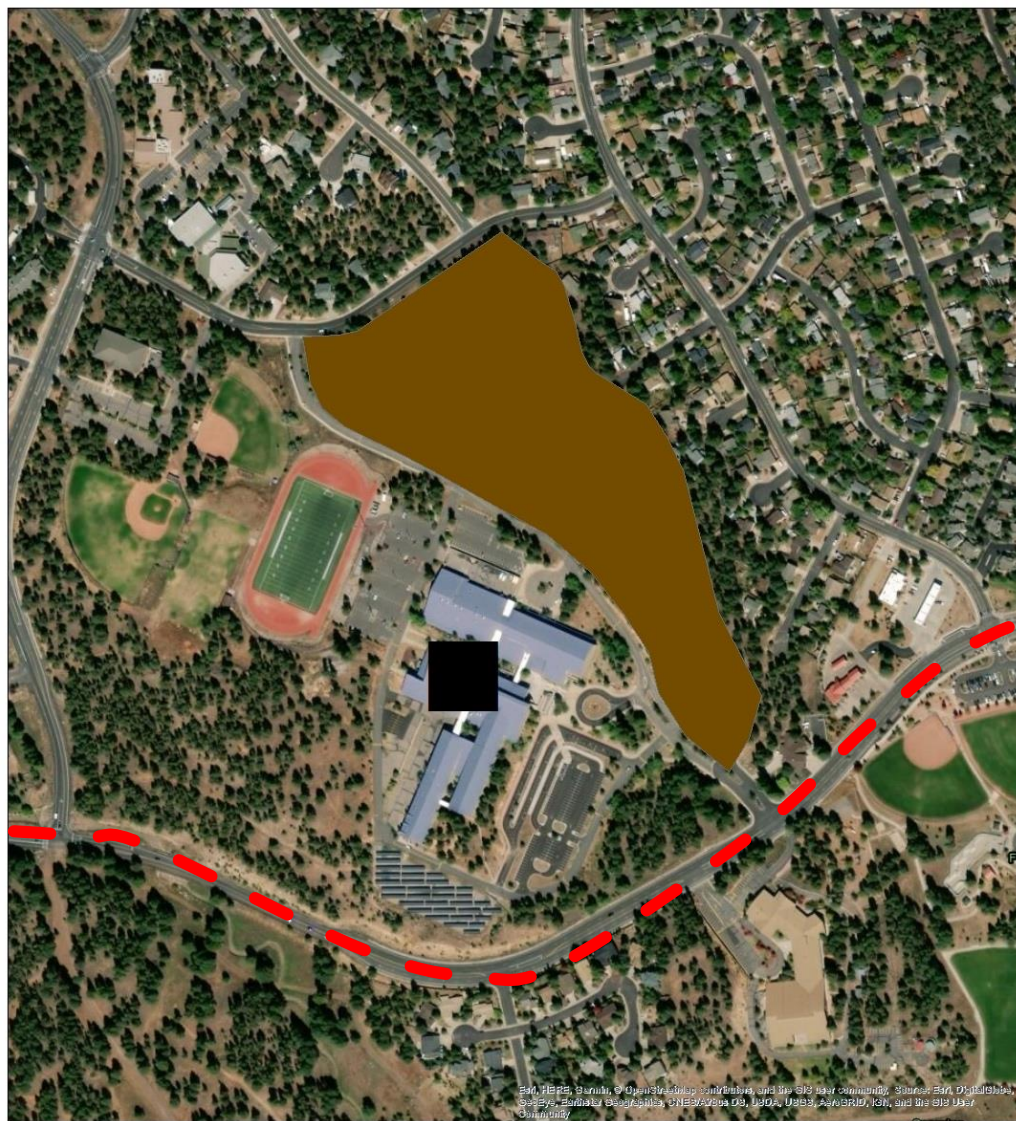
# LOCATION

-  N
-  NAU Campus
-  Project Location
-  Sinagua Middle School
-  E Butler Avenue

Flagstaff, Arizona



0 0.75 1.5 3 4.5 6 Miles



0 0.075 0.15 0.3 0.45 0.6 Miles

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

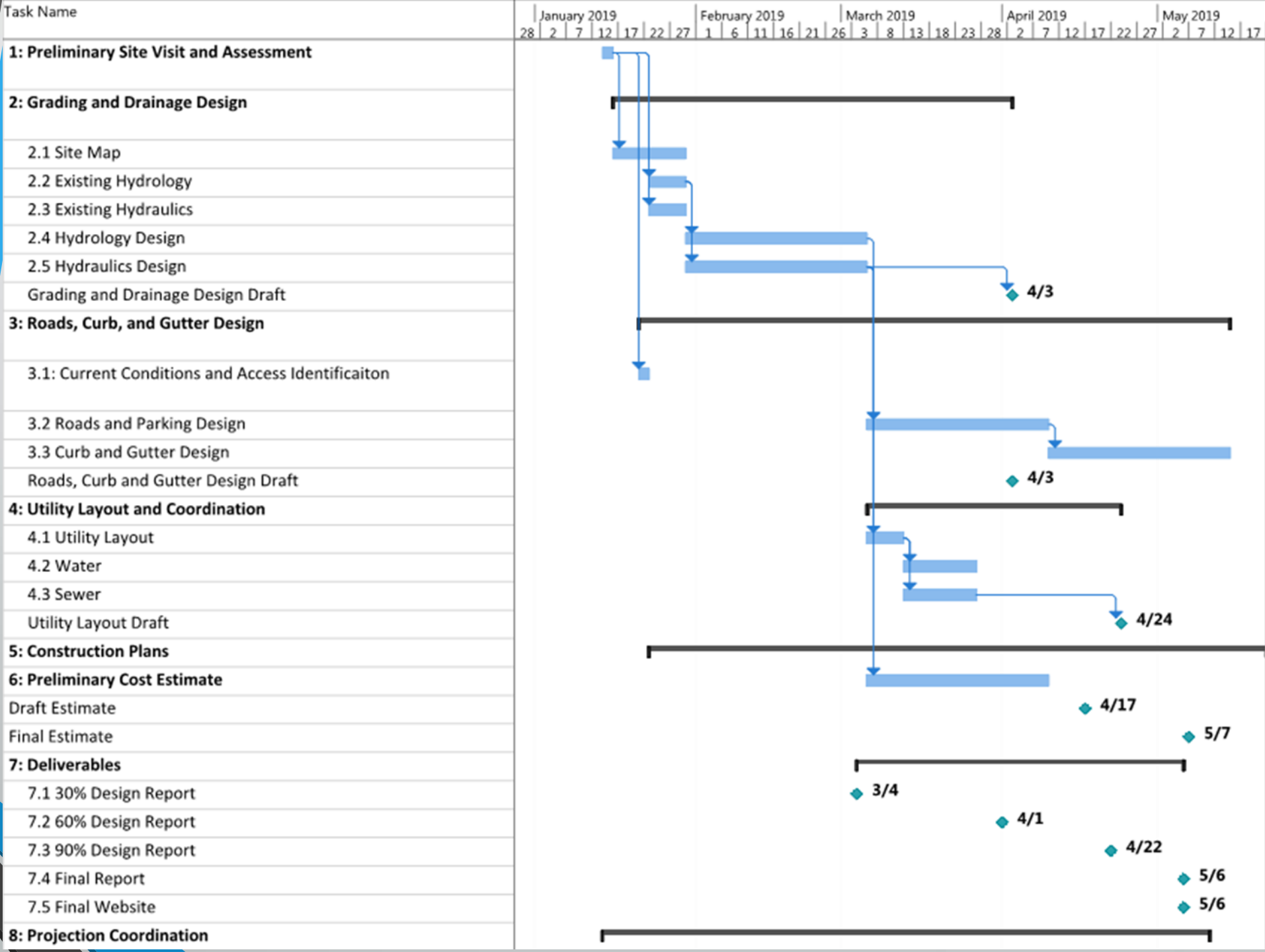


# PROJECT LIMITATIONS

- 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]



# CRITICAL PATH

# = Earliest Start Time

# = Latest Finish Time

→ Critical Path

□ Tasks with no Float

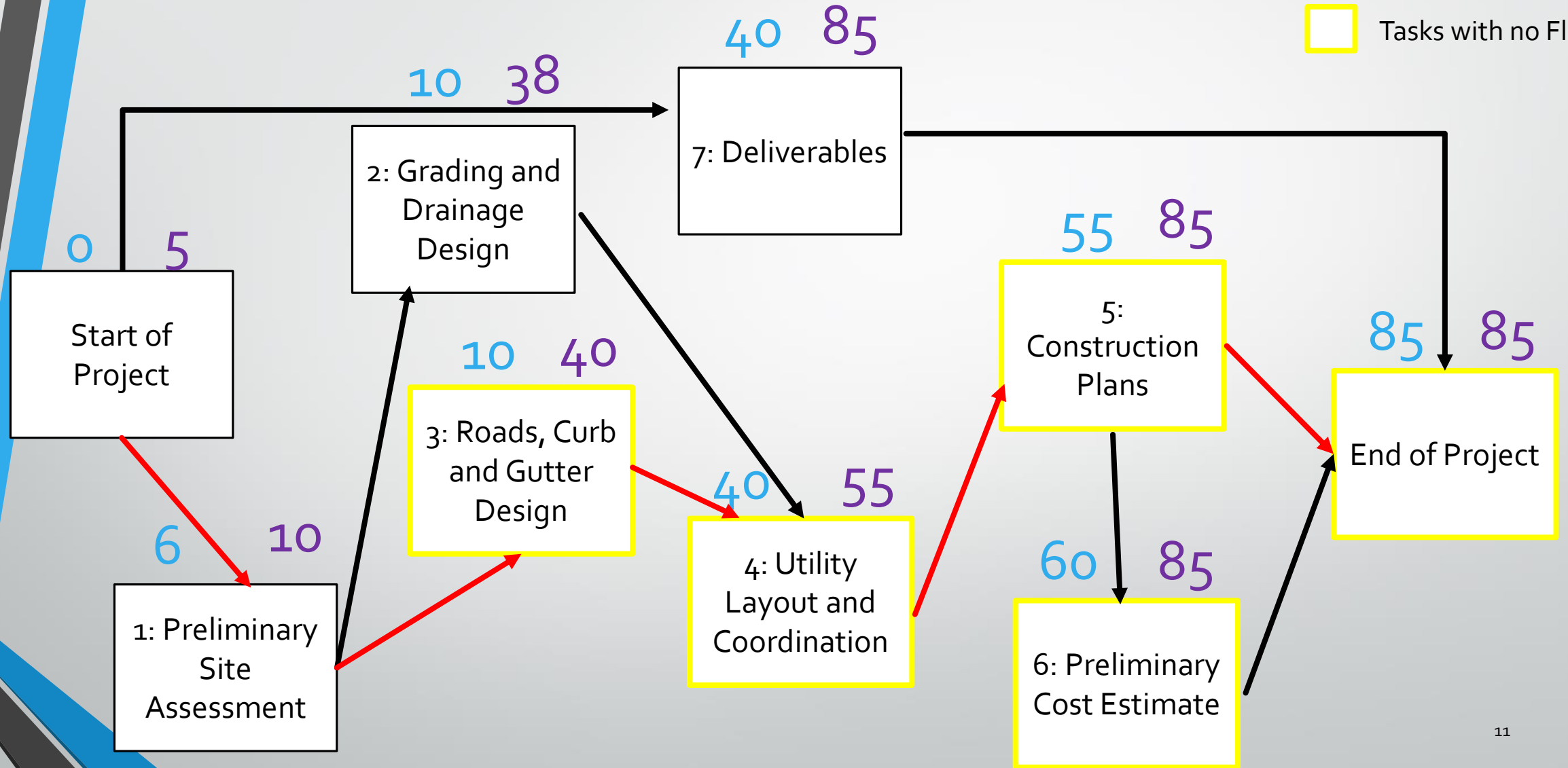


Figure 4: Critical Path based on required start and end dates and working days in project duration .

# STAFFING

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

SENG	ENG	EIT	INT
Senior Engineer	Engineer	Engineer in Training	Intern

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

<b>Task</b>	<b>SENG Hours</b>	<b>ENG Hours</b>	<b>EIT Hours</b>	<b>INT Hours</b>
1.0 Preliminary Site Visit and Assessment		8	4	4
2.0 Grading and Drainage Design	20	60	55	55
3.0 Roads, Curb and Gutter Design	16	60	55	55
4.0 Utility Layout and Coordination	8	40	40	10
5.0 Construction Plans	40	80	60	60
6.0 Cost Analysis	16	10		
7.0 Deliverables	35	10		
8.0 Project Coordination	80			
<b>Subtotal</b>	215	268	214	184
<b>Total (hours)</b>	881			

# COST OF ENGINEERING SERVICES

Table 3: Cost of Engineering Services Breakdown for Personnel and Travel on the Tiny Home Affordable Housing Site Design [1]

Personnel	Classification	Hours <sup>1</sup>	Rate, \$/hr	Cost
	SENG	215	150	\$32,250
	ENG	268	91	\$24,388
	EIT	214	65	\$13,910
	INT	184	23	\$4,232
<b>TOTAL</b>				<b>\$74,780</b>
<sup>1</sup> Number of hours/day × 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 :  
<https://onedrive.live.com/view.aspx?resid=565C70869A7714A1!116&ithint=file%2cdocx&app=Word&authkey=!AmFru8ZQYdBNQkQ>
- [2] City of Flagstaff, "Title 13 Engineer Design Standards and Specifications for New Infrastructure," 24 October 2018. [Online]. Available: <https://www.codepublishing.com/AZ/Flagstaff/>.
- [3] City of Flagstaff, "Flagstaff Municipal Code," 24 October 2018. [Online]. Available: <https://www.codepublishing.com/AZ/Flagstaff/>.
- [4] City of Flagstaff, "Title 10: Flagstaff Zoning Code," 24 October 2018. [Online]. Available: <https://www.codepublishing.com/AZ/Flagstaff/>.
- [5] City of Flagstaff, "City of Flagstaff Stormwater Management Design Manual," March 2009. [Online]. Available: <https://www.flagstaff.az.gov/DocumentCenter/View/58133/SWMgmtDesignManual-3-09?bidId=>.

# Questions



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