



US-89 Page Roundabout

ARNA Engineering
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CENE 476
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Figure 1 Aerial View of study intersection. Image Credit Google Earth[1]

Introduction

Purpose: The roundabout will allow vehicles to travel more efficiently along Highway 89 and cut down the congestion seen at the intersection for vehicles entering/exiting the highway.

Client: Nate Reisner, PE, ADOT District Development Engineering Manager

Technical Advisor: Dr. Brendan J Russo, ph.D., P.E., Professor

Location: Intersection of Highway 89 and North Lake Powell Boulevard in Page, Arizona

Background:

- A roundabout is being considered for this intersection due to traffic conflicts and incidence of crashes.
- Reduce the congestion of vehicles entering and leaving highways at intersections.

Location

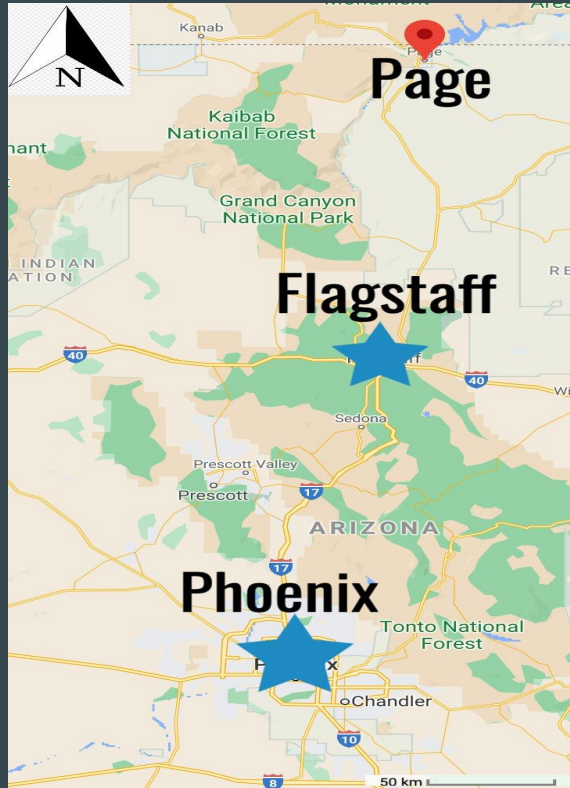


Figure 2 Location of Page within Arizona. Image credit Google Maps [2]



Figure 3 Location of the project within Page. Image credit Google Earth [3]

Research and Site Investigation

Task 1.0: Obtain Existing Data

- Task 1.1: Traffic Data
- Task 1.2: City Codes and Standards
- Task 1.3: Survey Data
- Task 1.4: Geotechnical Data

Task 2.0: Site Visit



VISSIM Roundabout Example [4]



Figure 4 Aerial View of study intersection. Image Credit Google Maps [3]

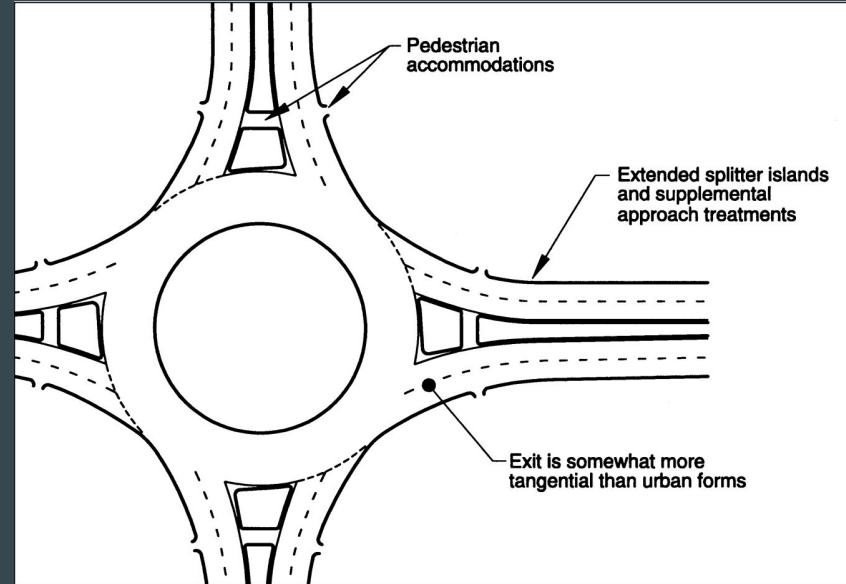
Hydrology and Roundabout Design

Task 3.0: Hydrology Assessment

- Task 3.1: Basin Area Delineation
- Task 3.2: Rainfall Intensity & Time of Concentration
- Task 3.3: Detention Volume

Task 4.0: Roundabout Design

- Task 4.1: Projected 20-yr Traffic Counts
- Task 4.2: Alternative Designs
- Task 4.3: Selection of Alternative
- Task 4.4: Final Roundabout Design
- Task 4.5: Hydraulic Assessment
- Task 4.6: Plan Set



Fhwa two lane roundabout design [5]

Administrative Tasks

Task 5.0: Project Impacts

Task 6.0: Deliverables

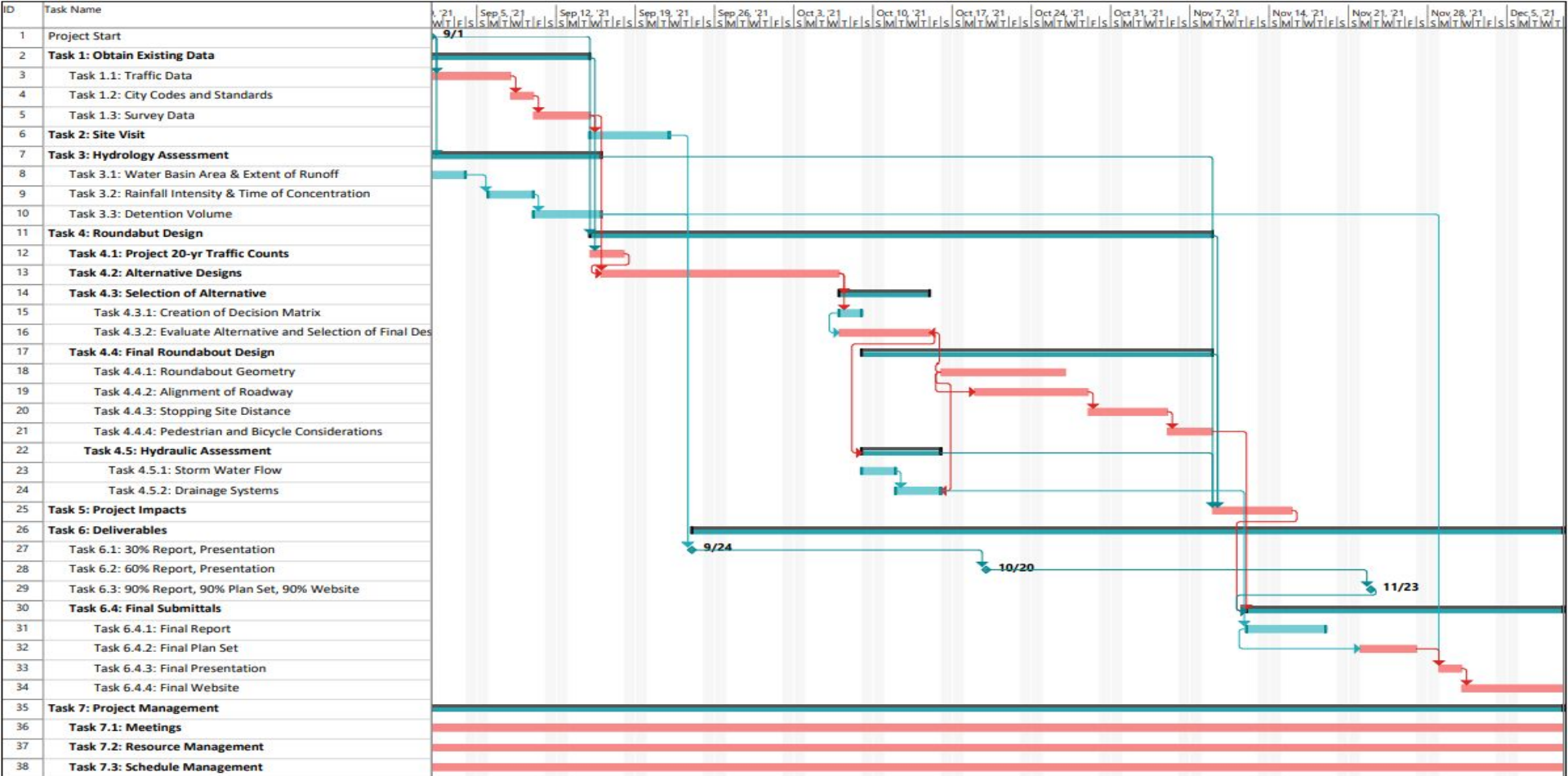
- Task 6.1: 30% Report, Presentation
- Task 6.2: 60% Report, Presentation
- Task 6.3: 90% Report, 90% Plan Set, 90% Website
- Task 6.4: Final Submittals

Task 7.0: Project Management

- Task 7.1: Meetings
- Task 7.2: Resource Management
- Task 7.3: Schedule Management

Exclusions:

Construction Plan, Permitting, and
Pavement Design



Project: 476 Page Capstone Pro
Date: Wed 4/14/21



Staffing Plan

-This project is estimated to take approximately 613 hours in total
 -Longest task is roundabout design

Task	PE	EIT	INT	TCN
Task 1.0: Obtain Existing Data	-	18	18	6
Task 1.1: Traffic Data	-	8	8	2
Task 1.2: City Codes and Standards	-	4	4	2
Task 1.3: Survey Data	-	6	6	2
Task 2.0: Site Visit	1	3	3	1
Task 3.0: Hydrology Assessment	10	20	25	15
Task 3.1: Basin Area Delineation	3	6	12	5
Task 3.2: Rainfall Intensity & Time of Concentration	3	6	6	5
Task 3.3: Detention Volume	4	8	7	5
Task 4.0: Roundabout Design	60	100	110	92
Task 4.1: Determine Projected 20-yr Traffic Counts	-	8	10	6
Task 4.2: Alternative Designs	3	5	10	3
Task 4.3: Selection of Alternative	3	15	11	6
Task 4.4: Final Roundabout Design	13	18	16	18
Task 4.5: Hydraulic Assessment	8	15	15	12
Task 4.6: Plan Set	7	5	5	8
Task 5.0: Project Impacts	2	2	12	-
Task 6.0: Deliverables	10	10	15	10
Task 6.1: 30% Report, Presentation	2	2	3	2
Task 6.2: 60% Report, Presentation	2	2	3	2
Task 6.3: 90% Report, 90% Plan Set, 90% Web Site	2	2	3	2
Task 6.4: Final Submittals	4	4	6	4
Task 7.0: Project Management	20	20	20	10
Task 7.1: Meetings	5	5	5	4
Task 7.2: Resource Management	5	5	5	4
Task 7.3: Schedule Management	10	10	10	2
Total	103	173	203	134
Total of All Tasks (hours)				613

Table 1 Staffing Matrix

Cost of Engineering Services

- The total cost of engineering services is \$75,587.20
- Traffic lab access for 20 days

Positions	Classification	Rate/Hour	Quantity	Cost
	Project Engineer (PE)	\$150.00	175	\$26,250.00
	Engineer in Training (EIT)	\$115.00	233	\$26,795.00
	Intern (INT)	\$35.00	240	\$8,400.00
	Technician (TCN)	\$65.00	184	\$11,960.00
	Total			\$73,405.00
Travel	Classification	Rate/Mile	Miles	Cost
	1 Vehicles, 1 Round Trip, 260 miles round trip	\$0.57	260	\$148.20
	Total			\$148.20
Supplies	Classification	Rate/Day	Days	Cost
	Lab Access for 20 Days	\$100.00	20	\$2,000.00
	NAU Rental Vehicle	\$34.00	1	\$34.00
	Total			\$2,034.00
Total Cost of Engineering Sevices				\$75,587.20

Table 2 Cost of Services

Reference

[1]"Google Earth", *Earth.google.com*, 2021. [Online]. Available:

<https://earth.google.com/web/search/North+Lake+Powell+Boulevard,+Page,+AZ,+USA/@36.92557791,-111.47196014,1219.31762014a,200.94732962d,35y,0h,0t,0r/data=CigiJgokCTTnUjqcg0JAEQ1sO8MpdkJAGbOCUVam3lvAIRa3mwfQ51vA>. [Accessed: 08- Apr- 2021].

[2]"Page", *Google.com*, 2021. [Online]. Available:

<https://www.google.com/maps/place/Page,+AZ+86040,+USA/@35.2265512,-111.2402953,7.61z/data=!4m5!3m4!1s0x8734135bfdcd758f:0x6e982f5153384e39!8m2!3d36.9147222!4d-111.4558333>. [Accessed: 15- Apr- 2021].

[[3]"Google Earth", *Earth.google.com*, 2021. [Online]. Available:

<https://earth.google.com/web/@36.92528754,-111.47152512,1221.34070618a,868.02937269d,35y,-0h,0t,0r>. [Accessed: 15- Apr- 2021].

[4] J. Bared, "Screenshot of three-lane roundabout from VISSIM," ResearchGate, 2020.

[5]"Rural double-lane roundabouts", *Fhwa.dot.gov*, 2021. [Online]. Available: <https://www.fhwa.dot.gov/publications/research/safety/00067/00067.pdf>. [Accessed: 08- Apr- 2021].

Questions?