

DUNCAN, ARIZONA FLOODPLAIN ANALYSIS- HIGHWAY AND LEVEE ALIGNMENT ALTERNATIVES

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Continuation of Previous Teams Work

- This project has been going on for 4 years
 - *Year 1: Floodplain Analysis 1-D Model and Conceptual Levee Alignment Along Gila River (2015)*
 - *Year 2: Floodplain Analysis 2-D Model (2016)*
 - *Year 3: Flood Mitigation (2017)*
 - *Year 4: Highway and Levee Alignment (2018)*

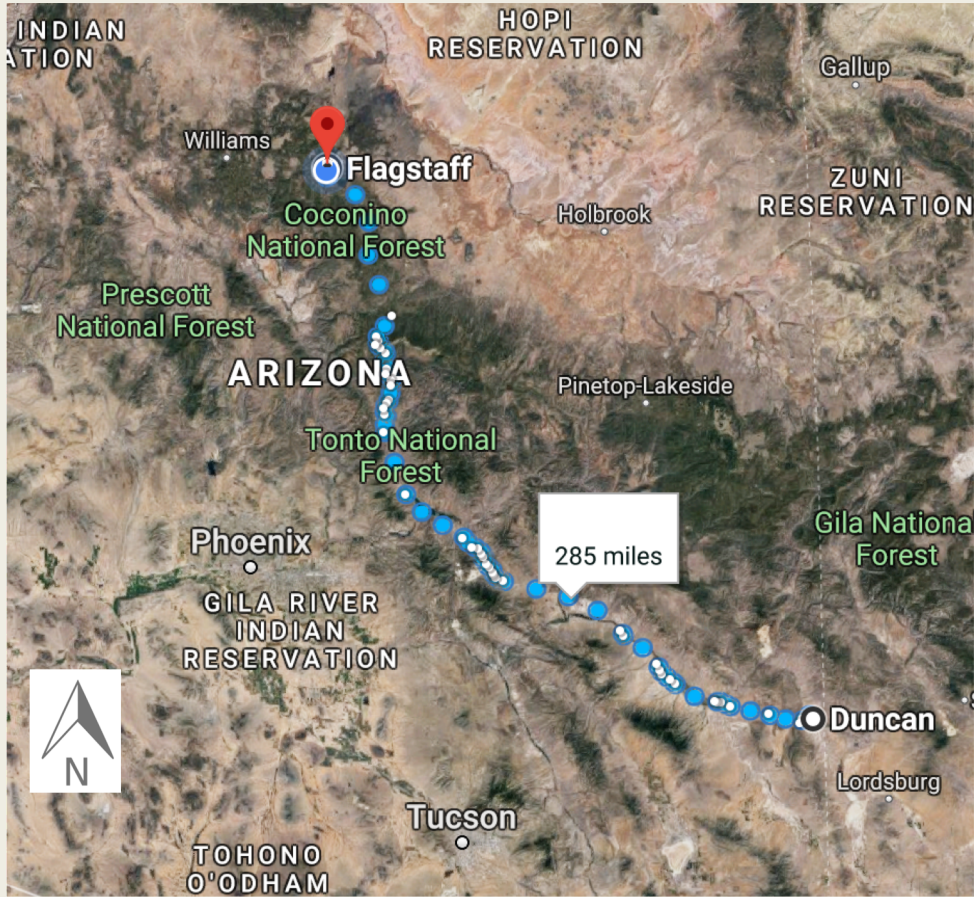


Figure 1: Map of Arizona with Duncan Indicated [1]

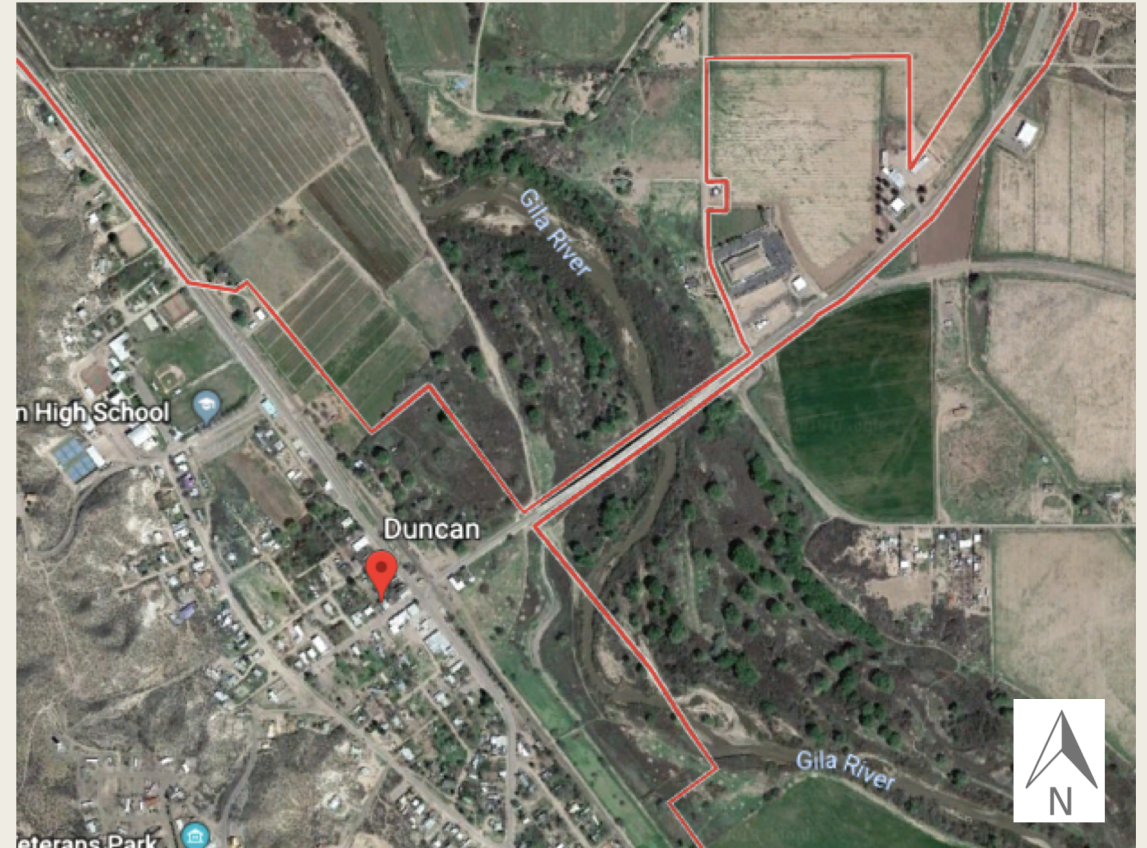


Figure 2: Map of Duncan, AZ [1]

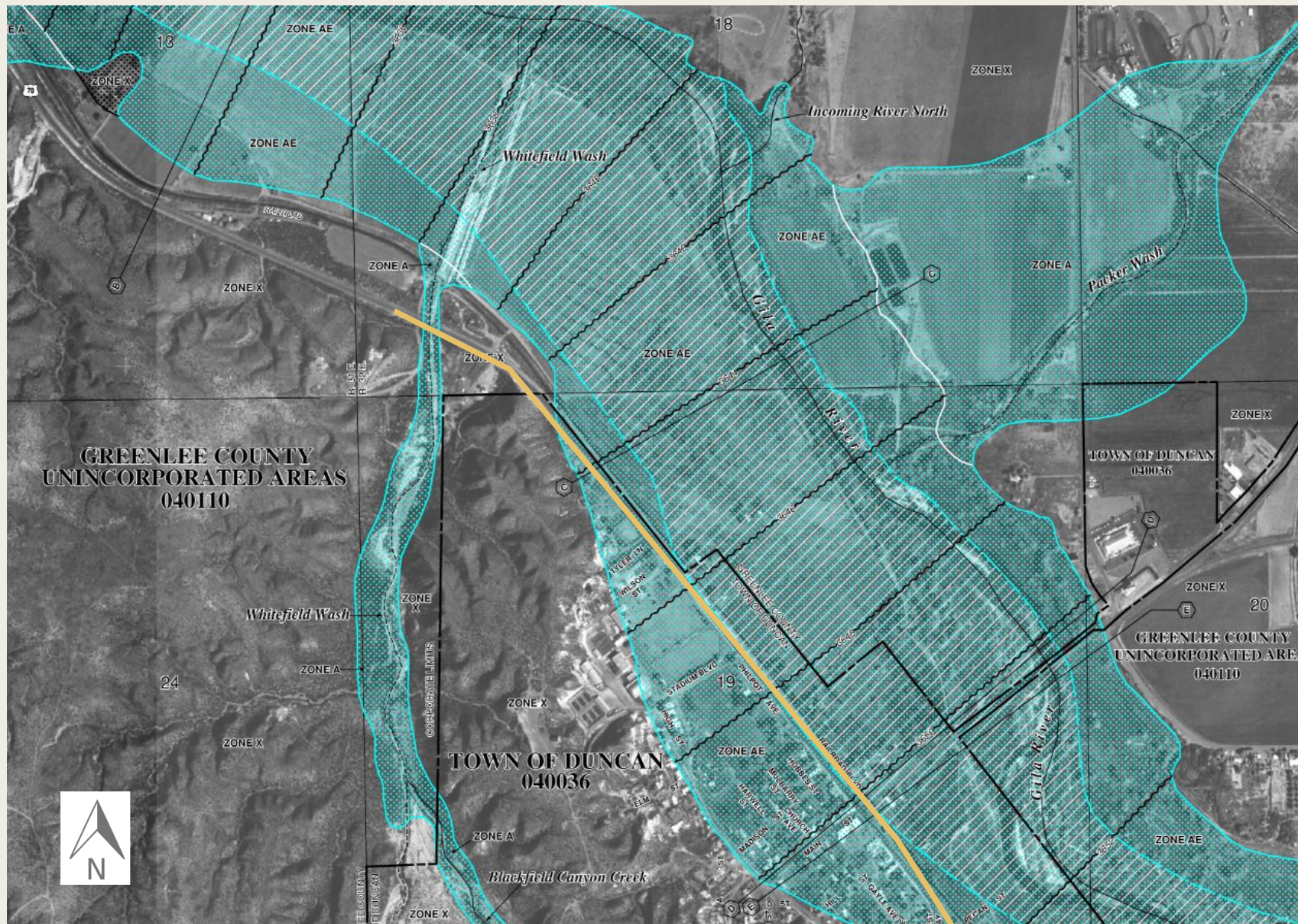


Figure 3: Map of Duncan Floodplain Zone. [3]

Current State of Duncan, AZ

- Depth: Ranging from 2-12 feet
- 20% of the downtown area floods
- Agricultural dike in place
- Overtopping of the Gila River begins around 24,000cfs



Figure 4: Downstream of Bridge [4]

Project Understanding

- To create highway and levee alignment alternatives for the town
- This must be done in order to stop the road from being flooded out
- 20 Year Life Span
- To be developed following set guidelines and standards (Includes: AASHTO, HCM, and ADOT)



Figure 5: Duncan Flood, 2005 [5]

Scope of Services

Task 1: Field Investigation

1.1 Site Investigation

1.2 Traffic Analysis

1.2.1 Crash Data Analysis

Task 2: Traffic Conditions

2.1 Traffic Characteristics

2.2 Highway Capacity Software

Task 3: Preliminary Data

3.1 Horizontal Alignment Determination

3.2 Elevation and LiDAR

3.3 AASHTO Roadway Design Guidelines

Scope of Services

Task 4: Alignment Design Alternatives

4.1 Alignment Design 1

4.1.1 Horizontal Alignment

4.1.2 Vertical Alignment

4.1.3 Property Investigation

4.1.4 Quantities Takeoff

4.2 Alignment Design 2

Sub-Task 4.1.1- 4.1.4 Repeated

4.3 Alignment Design 3

Sub-Task 4.1.1- 4.1.4 Repeated

Scope of Services

Task 5: Intersections

5.1. Intersection Impact Analysis

5.2 Intersection Recommendations

Task 6: Cost Analysis

6.1 Land Value Assessment

6.2 Alternatives Total Costs

- Construction, Materials, and Land Value

Scope of Services

Task 7: Deliverables

7.1 30% Report

7.2 60% Report

7.3 Final Report

7.4 Website

7.5 Impacts Report

7.6 Status Updates

7.7 Final Presentation

Task 8: Project Management

Weekly Team Meetings

Monthly Client Meetings

Monthly Technical Advisor Meetings

Scope of Services

Task 9: Project Limitations

9.1 Challenges

Environmental Impacts Report

Meeting Maximum Allowable Grade

Railroad

Minimal Funding

Traveling to Site

9.2 Exclusions

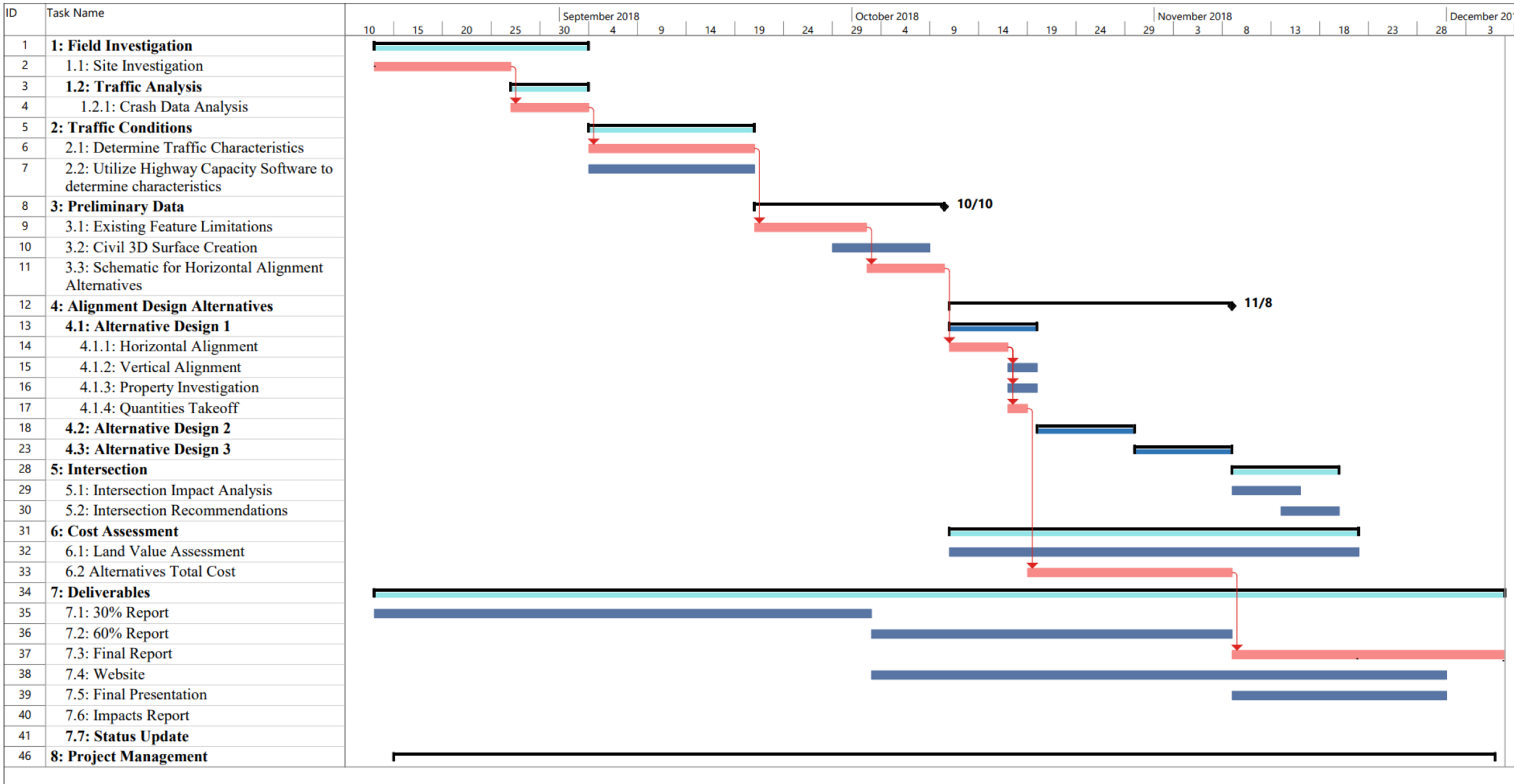
Geotechnical Analysis

Rezoning Permits



Figure 6: Gila River [5]

Project Schedule



Project Staffing

Hours To Be Worked						
Task Name	Sr. Engineer	Prof. Engineer	EIT (4 Combined)	Drafter/Tech	Administrator	Task Total
1: Field Investigation	4	24	80	0	0	108
2: Traffic Conditions	2	7	48	0	0	57
3: Preliminary Data	3	10	64	13	0	90
4: Alignment Design Alternatives	7	22	144	29	12	214
5: Intersection	2	5	32	7	2	48
6: Cost Assessment	2	5	32	0	8	47
7: Deliverables	7	22	144	0	20	193
8: Meetings	2	5	34	0	7	48
Total Hours	29	100	578	49	49	805

Cost of Engineering Services

Rate Table					
Staff	Pay Rate (\$/hr.)	Multiplier	Billing Rate (\$/hr.)	Hours	Cost (\$)
Sr. Engineer	60	3	180	29	\$5,220.00
Prof. Engineer	40	2.5	100	100	\$10,000.00
EIT	25	2.5	62.5	578	\$36,125.00
Drafter/Tech	25	2	50	49	\$2,450.00
Administrator	20	2	40	49	\$1,960.00
ADOT Coordinator	30	2	60	20	\$1,200.00
OTHER EXPENSES					
	Cost (\$/mi.)		Trips	Miles	
Travel	0.7		2	600	\$840.00
	Cost (\$/night)			Nights	
Hotel	150		-	2	\$300.00
				Total Cost	\$58,095.00

References

- [1] "Duncan AZ," Google, [Online]. Available: <https://www.google.com/maps/place/Duncan,+AZ+85534/@32.7340706,-109.1307981,13z/data=!3m1!4b1!4m5!3m4!1s0x86d86bdb57ca9e63:0x5feb969696e599e3!8m2!3d32.7214599!4d-109.1053408>. [Accessed 2018].
- [2] "Flooded Highway," The Advocate, 2018. [Online]. Available: http://www.theadvocate.com/baton_rouge/news/environment/article_b8522ea2-6199-11e6-b682-c7938a607486.html. [Accessed 22 April. 2018].
- [3] "FEMA Flood Map Service Center," FEMA, 2016. [Online]. Available: <https://msc.fema.gov/portal> [Accessed 22 April. 2018].
- [4] (2017). duncan arizona flooding - Google Search. [online] Available at: https://www.google.com/search?q=duncan+arizona+flooding&rlz=1C1GGRV_enUS760US760&source=Inms&tbm=isch&sa=X&ved=0ahUKEwi7qqbl99_XAhWKhVQKH T9iBM0Q_AUICygC&biw=1920&bih=984#imgdii=2IR78UpNSA-gNM:&imgsrc=H90InIRjGcwL4M [Accessed 30 Nov. 2017].
- [5] <https://www.cefns.nau.edu/capstone/projects/CENE/2016/GreenleeCty/Project.html>

**Any
Questions?**