

*NORTH STAR
ENGINEERING*

POLARIS

Northern Arizona University
ASCE Concrete Canoe Team
North Star Engineering
2015-2016

Project Management

- Chelsie Kekaula - Project Manager
- Evan Kaichi - Concrete Lead
- Brent Lipar - Structural Analysis Lead
- Colton McConnell - Construction Manager
- Emily Melkesian - Reinforcement Lead
Conference Manager



Figure 1: 2015-16 Concrete Canoe Team [1]

Project Purpose

- Hands on Experience
- Practical Experience
- Leadership Skills
- Project Management



Figure 2: NAU Star Logo [3]

Project Background

- Last's year's Concrete Canoe "Dreadnoughtus" finished 3rd at PSWC 2015
- Sacrificed stability to optimize speed
 - Lengthened the canoe and made it narrower



Figure 3: Dreadnoughtus [8]

Potential Challenges

- Resources
 - Finances
 - Equipment
 - Materials
- Time
 - Curing Time
 - Conference
- Weather
 - Paddling



Figure 4: Snowy San Francisco Peaks [5]

Stakeholders

- Client: Mark Lamer P.E.
 - Tech Advisor: Thomas Nelson P.E
 - ASCE National Board
 - NAU
 - NAU ASCE Student Chapter
 - Sponsors
-



Figure 5: Mark Lamer [6]



Figure 6: Thomas Nelson [7]

ASCE Conference

- The team is required to design and build a concrete canoe for the 2016 ASCE Pacific Southwest Conference in Long Beach, California
- Overall team score is based on four categories
 - Final Product (25%)
 - Design Report (25%)
 - Oral Presentation (25%)
 - Canoe Races (25%)



Figure 7: Dreadnoughtus [8]

Exclusions

Canoe Mold

- Will not construct a new mold
 - Renovate by filling in the depressions and seams
 - Place new shrink wrap

Canoe Coffin

- Will not construct a new coffin
 - Renovate by adding padding to the coffin cross-sections



Figure 8: Male Foam Mold [9]

Project Design and Technical Consideration

- Structural
 - Shear and Moment Analysis
 - Hull Analysis
 - Minimum Compressive Strength
 - Excel, RISA 3D, Prolines 7, AutoCAD
- Concrete
 - Ekkomaxx™
 - Aggregate
 - Admixtures
 - Testing Strength of Concrete Mixes
- Reinforcement
 - Percent of Open Area
 - Flexibility
 - Strength
 - Post-Tensioning



Figure 9: Reinforcement Mesh [10]

Construction

- Pour Day
 - Civil and Environmental Engineering Field Station
 - Shotcrete
 - Reinforcement
 - Complete Aesthetics
- Mold and Coffin Renovation
- Curing System
 - Create a Reusable “incubator”
- Finishing
 - Sanding
 - Sealing



Figure 10: 2015 Curing System [11]

Schedule – Gantt Chart

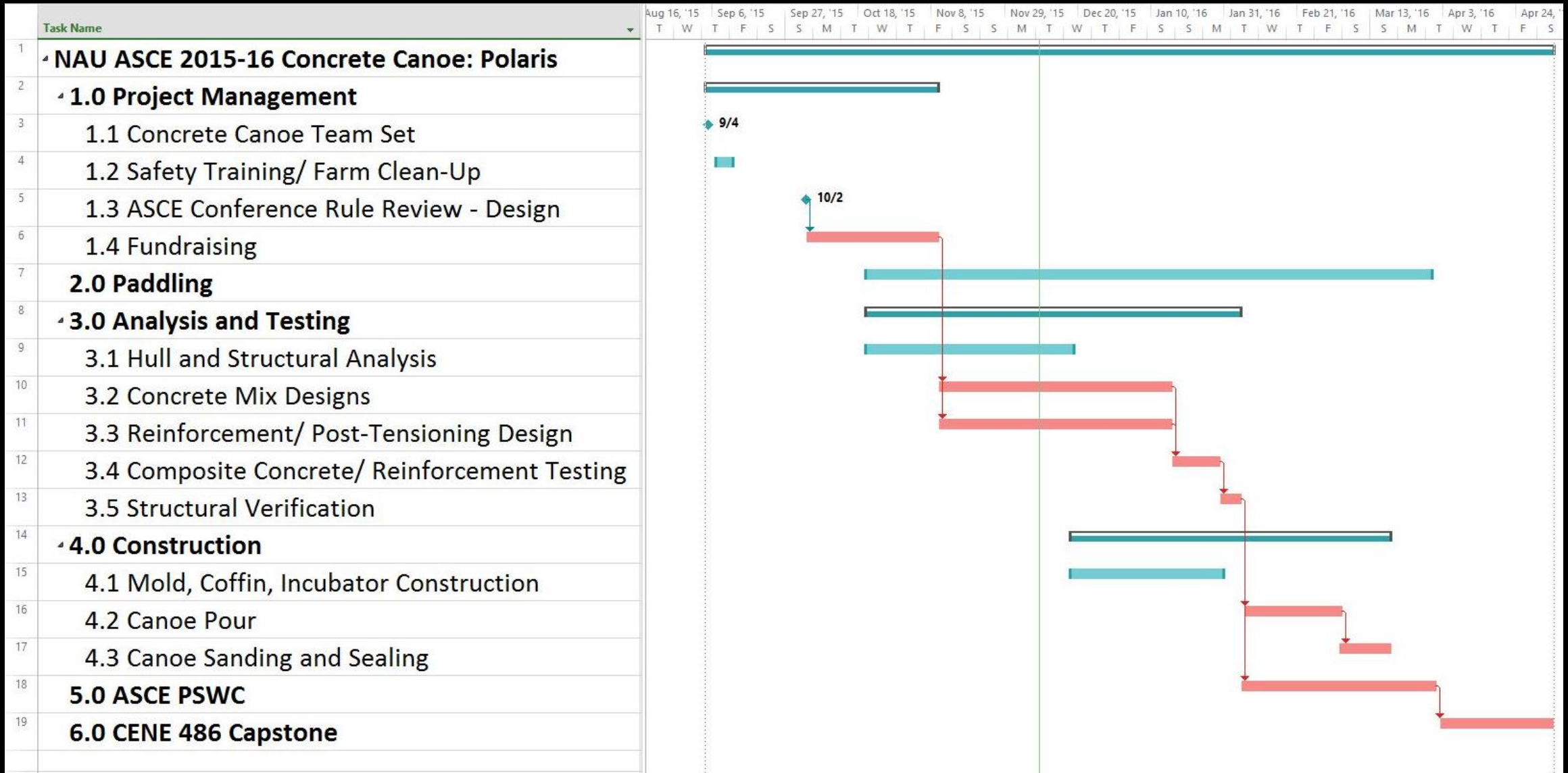


Figure 11: Gantt Chart

Schedule – Critical Path

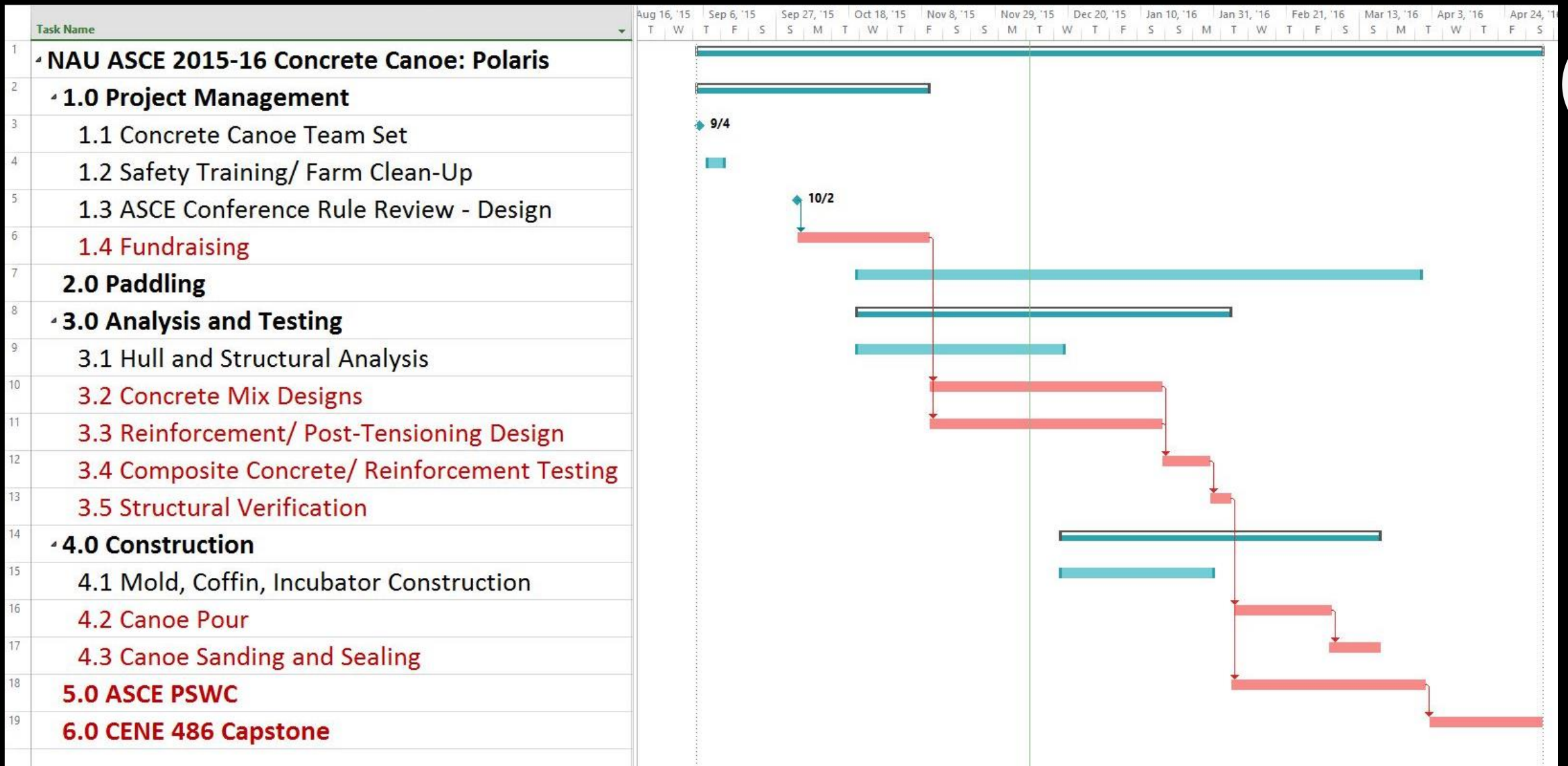


Figure 11: Gantt Chart

Staffing & Cost

1.0 Personnel:

- SENG: Senior Engineer
- ENG: Engineer
- LAB: Lab Technician
- INT: Intern
- AA: Administrative Associate

2.0 Travel:

- Conference Registration
- Lodging/Food
- Mileage

3.0 Expenditures:

- Materials
- Equipment

1.0 Personnel			
Classification:	Hours	Billing Rate	Cost
SENG	267	\$93.77 /hr	\$25,036
ENG	228	\$64.03 /hr	\$14,598
LAB	224	\$34.49 /hr	\$7,726
INT	212	\$12.68 /hr	\$2,688
AA	458	\$32.76 /hr	\$15,006
			\$65,054
2.0 Travel			
Conference Registration:		\$150.00 /person	\$1,500
Lodging/Food:		\$250.00 /person	\$2,500
Mileage (miles roundtrip):		\$0.56 /mi	\$535
			\$4,535
3.0 Expenditures			
Materials:		\$5,250.00 /person	\$6,750
Equipment:		\$1,500.00 /person	
			\$76,340

Table 1: Cost Breakdown

Broader Impacts

- Future NAU Concrete Canoe Teams
- NAU Civil Engineering Department



Figure 12: 2015-16 Concrete Canoe Team [1]



Figure 13: 2014-15 Concrete Canoe Team [12]



Figure 14: 2013-14 Concrete Canoe Team [13]

References

[1] Photo taken by Gerjen Slim

[2] ASCE, and NCCC. 2015 ASCE National Concrete Canoe Competition Rules & Regulations.

[3] NAU Student Affairs, Northern Arizona University Logo. <https://www.youtube.com/watch?v=ng3C1GUcg4Q>

[4] Dreadnoughtus: A New Giant Joins the 'Biggest Dinosaur' Parade (NBC News) <http://www.nbcnews.com/science/science-news/dreadnoughtus-new-giant-joins-biggest-dinosaur-parade-n195306>

[5] KNAU, Snow Storm. URL: <http://knau.org/post/knau-meteorologist-lee-born-weekends-big-snow-storm#stream/0>

[6] Civil and Environmental Engineering (Faculty) <http://nau.edu/cefns/engineering/civil-environmental/faculty/>

[7] Civil and Environmental Engineering (Spring 2013). <http://nau.edu/CEFNS/Engineering/Civil-Environmental/Newsletters/Spring-2013/>

[8] Photo taken by Emily Melkesian

[9] Photo taken by Charlie Wilson

[10] Photo taken by Charlie Wilson

[11] Photo taken by Charlie Wilson

[12] Photo taken by Noel Cruz

[13] Photo taken by Gerardo Gonzalez
