Harquahala Mine PA/SI Proposal

Client: Bureau of Land Management

Prepared by:

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CENE 476

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Introduction

- Preliminary assessment and site investigation
- Site considered high risk
  - §Lead, arsenic, antimony found in 2018
    - Used for recreational off-roading
- Mining operations began ~1888
  - Currently operating
  - Heap leaching to extract metals

Table 1: Summary of 2018 site conditions

Contaminant	Lead	Arsenic	Antimony
Range concentrations found (ppm)	693-4578	56-356	33-219
AZ Non-residential standard (ppm)	800	10	410

Site Location

Fig. 1: Harquahala Mine location in central Arizona

Fig. 2: Site location in Arizona

Fig. 3: Harquahala Mine in Reference to Salome

Fig. 4: Harquahala Mine Private Boundaries

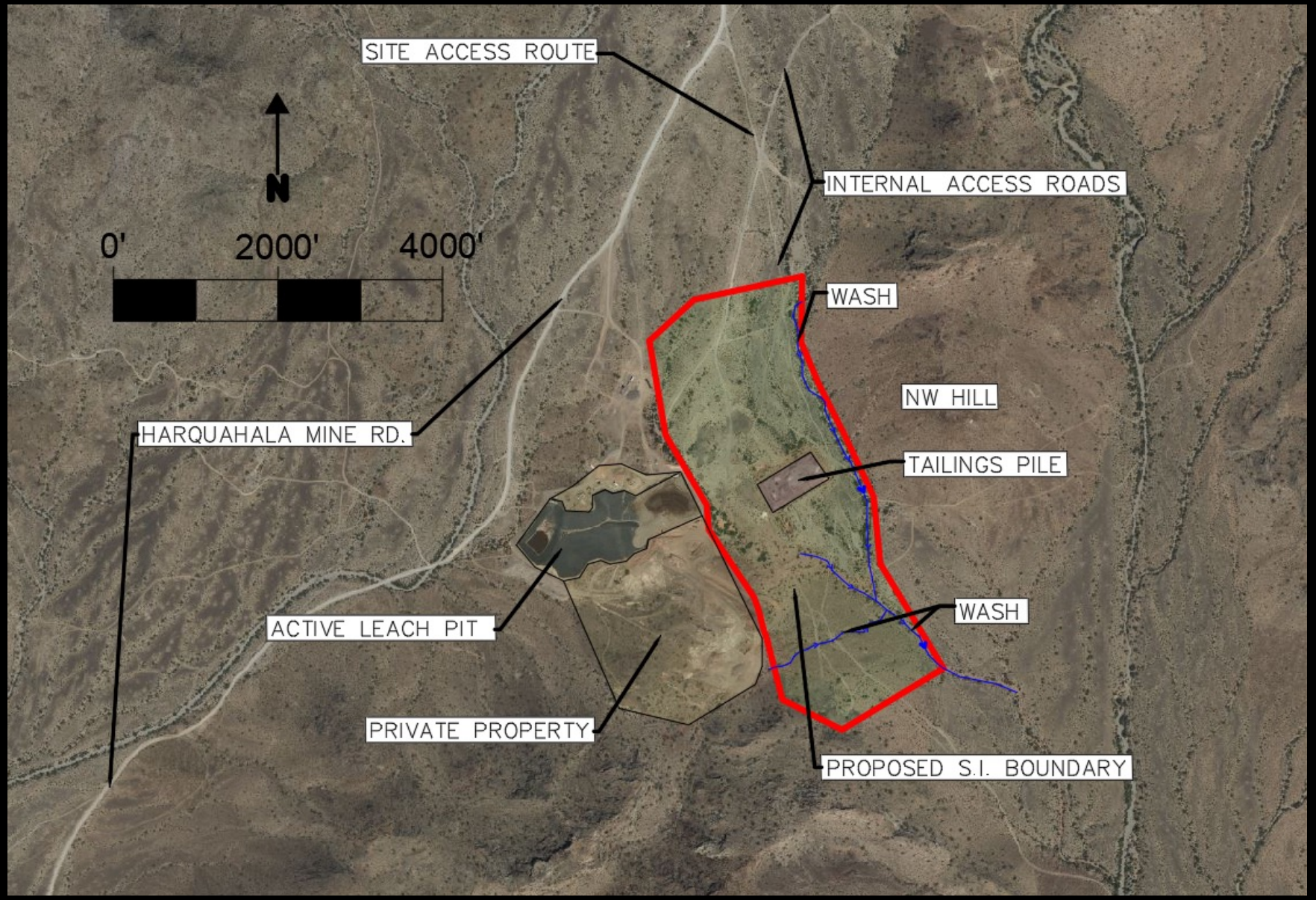
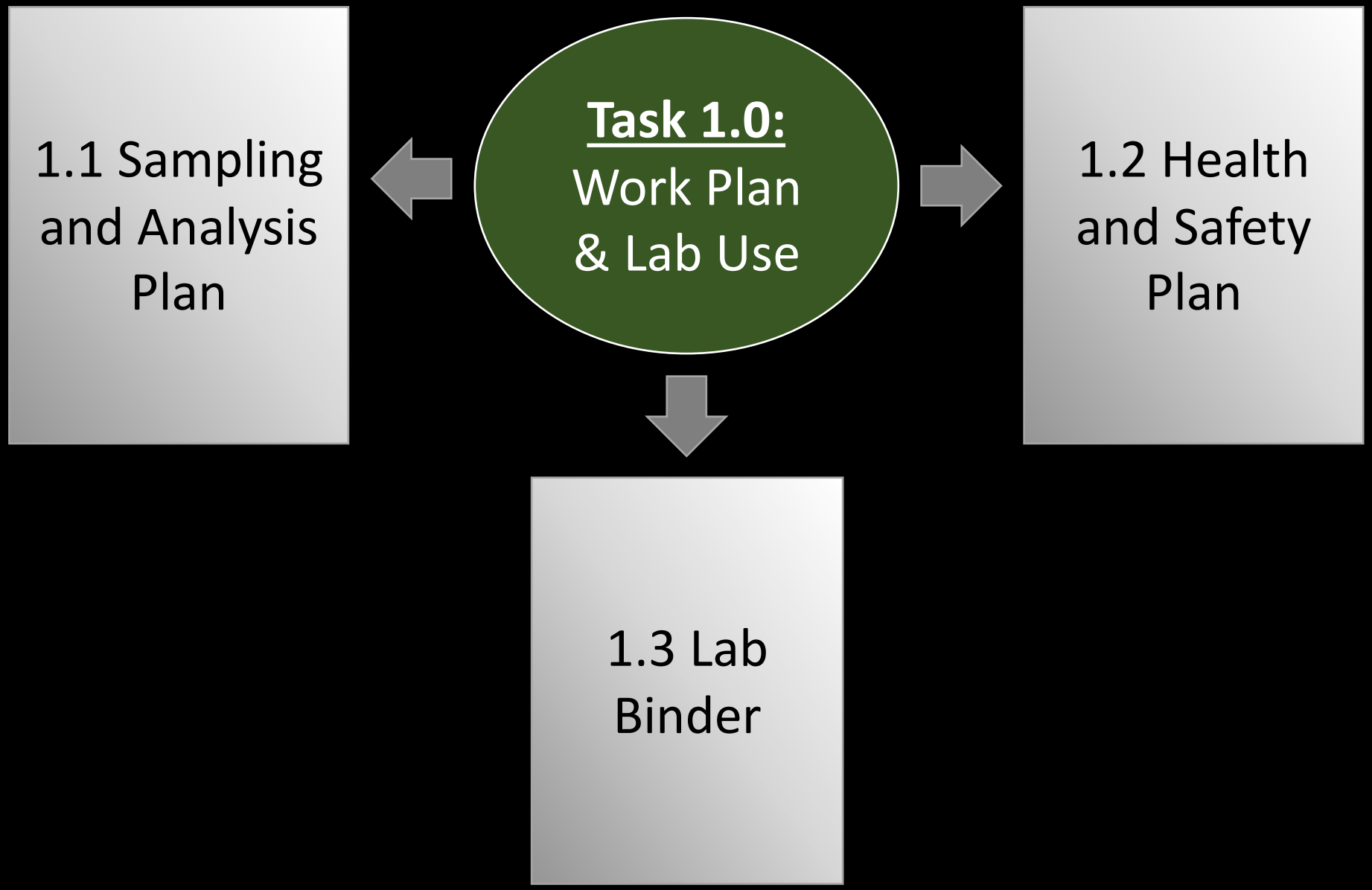


Fig. 5: Harquahala Mine Proposed S.I. Boundary

Scope of Services



Scope of Services

Fig 6. Site Satellite Map

Scope of Services

Task 3.0:
Sample Analysis and Identification of Contaminants of Concern (COCs)

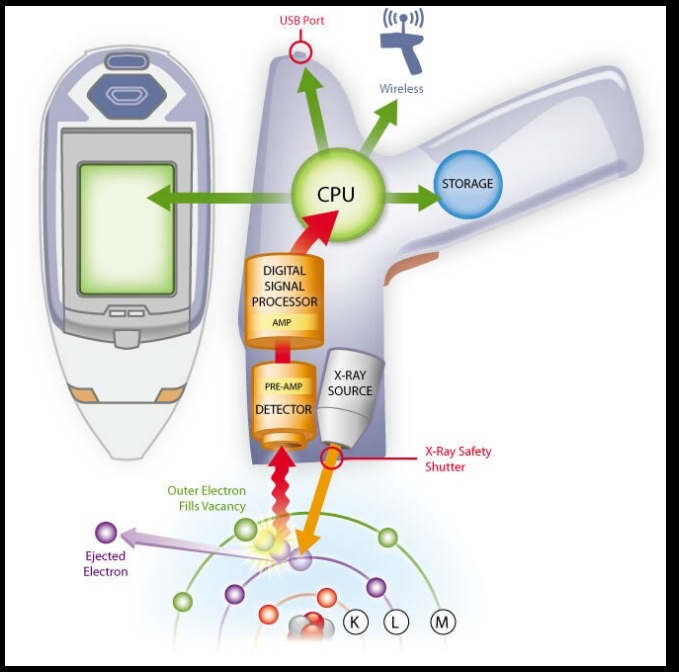
3.1 Sample drying

3.2 Sample sieving

3.3 In-lab x-ray fluorescence

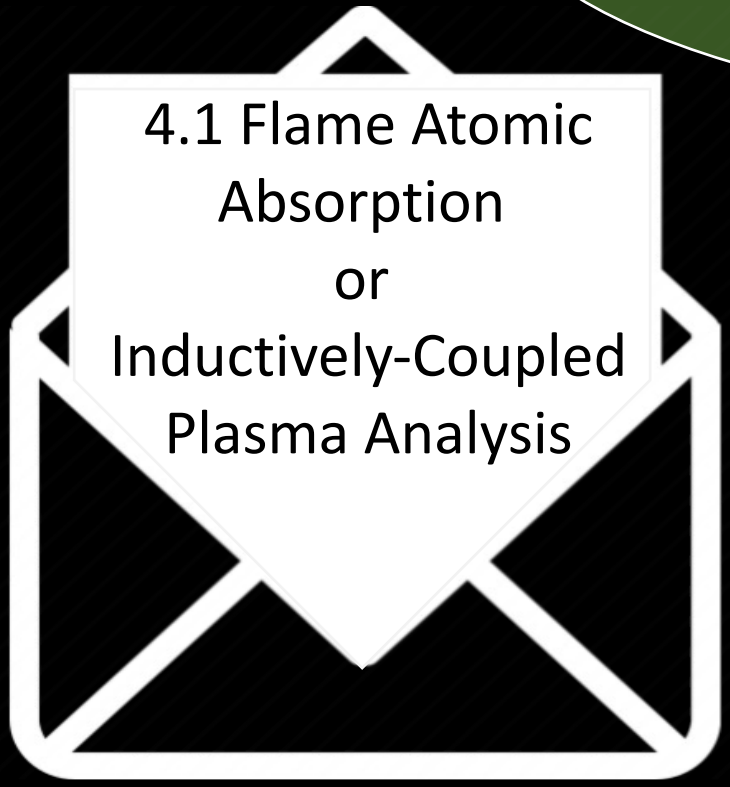
3.4 Identification of Human Health COCs

Fig 7. XRF Equipment



Scope of Services

Task 4.0:
Confirmatory Testing, Mapping, and Identification of Exposure Point Concentrations (EPCs)

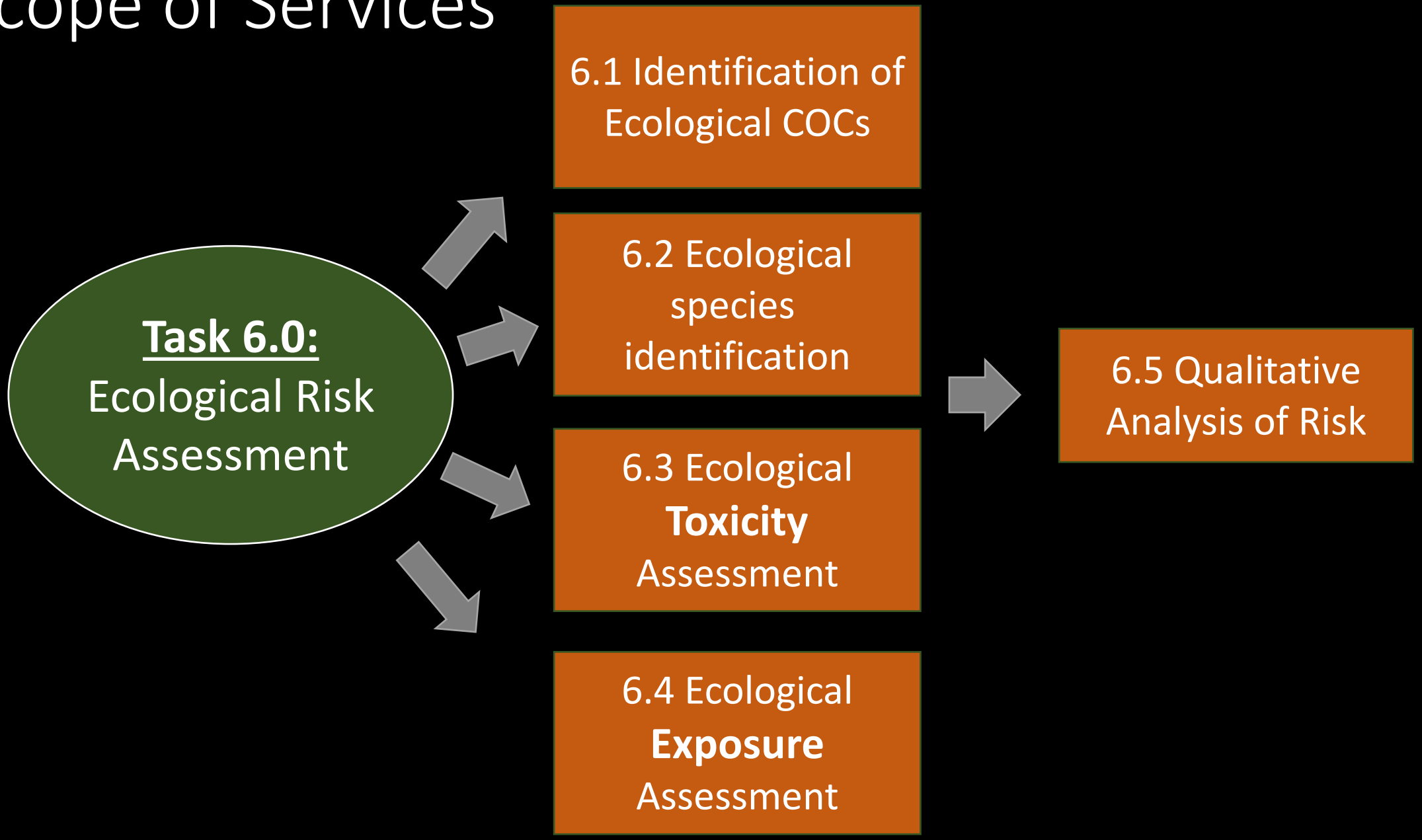


4.2 Statistical analysis and EPCs

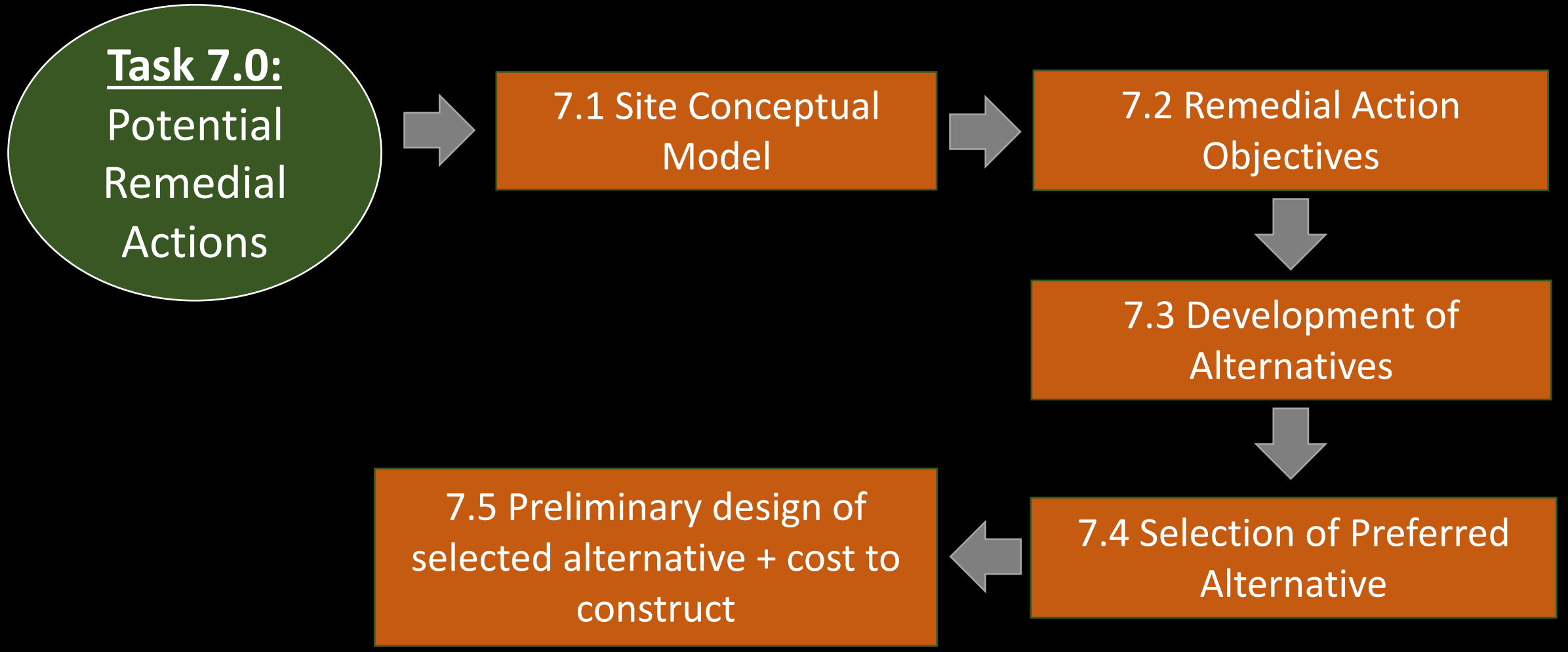
4.3 Spatial distribution mapping

Scope of Services

Scope of Services



Scope of Services



Scope of Services

Task 8.0:
Project Impact Assessment

- Environmental
- Economic
- Social

Task 9.0:
Project Deliverables

Deliverables:
- 30%
- 60%
- 90%
- 100%

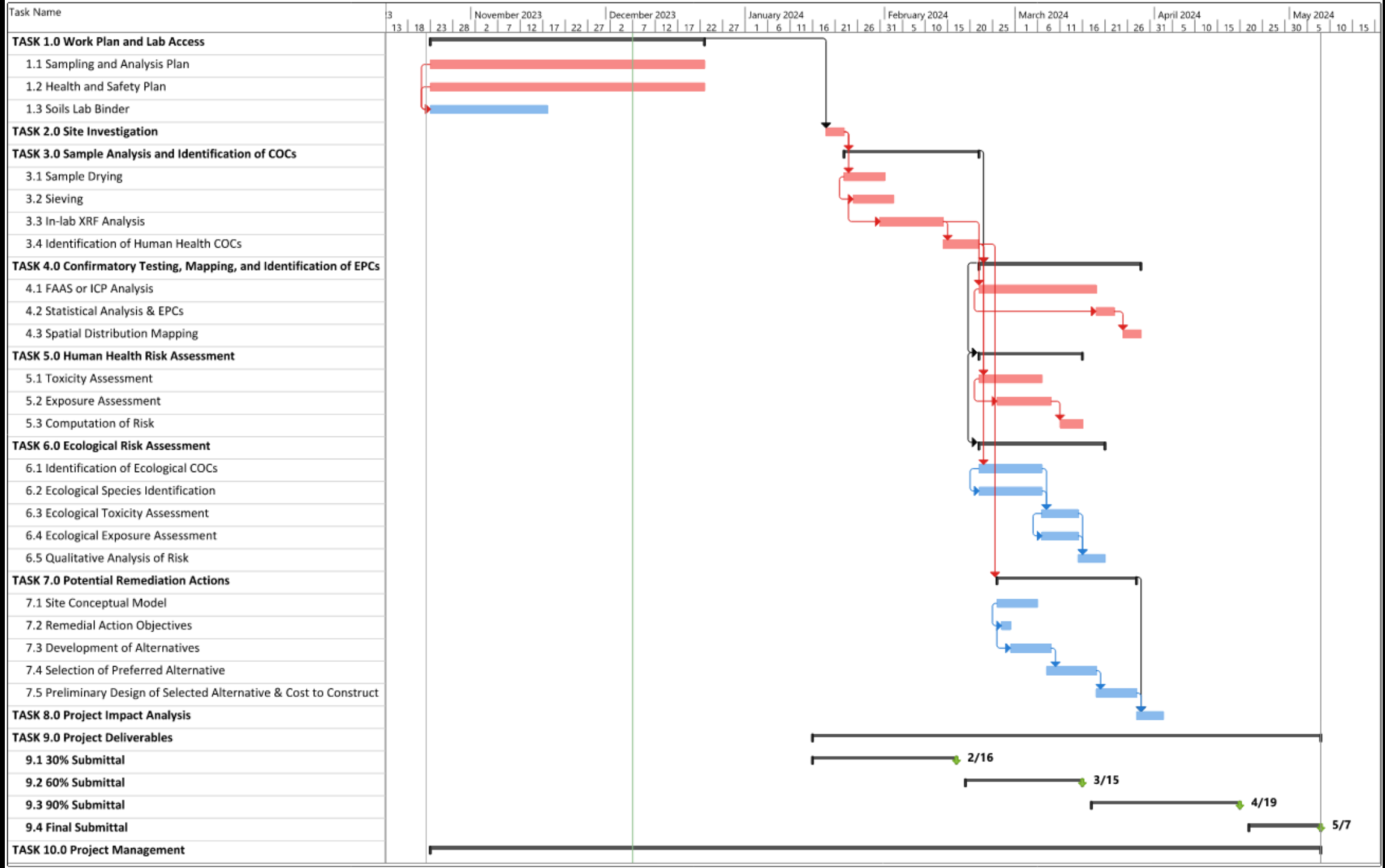
Task 10.0:
Project Management

- Meetings
- Schedule
- Resources

Exclusions

- Water sampling
- Air sampling
- Private property limits

SCHEDULE


Task Name
November 2023
December 2023
January 2024
February 2024
March 2024
April 2024
May 2024
TASK 1.0 Work Plan and Lab Access
1.1 Sampling and Analysis Plan
1.2 Health and Safety Plan
1.3 Soils Lab Binder
TASK 2.0 Site Investigation
TASK 3.0 Sample Analysis and Identification of COCs
3.1 Sample Drying
3.2 Sieving
3.3 In-lab XRF Analysis
3.4 Identification of Human Health COCs
TASK 4.0 Confirmatory Testing, Mapping, and Identification of EPCs
4.1 FAAS or ICP Analysis
4.2 Statistical Analysis & EPCs
4.3 Spatial Distribution Mapping
TASK 5.0 Human Health Risk Assessment
5.1 Toxicity Assessment
5.2 Exposure Assessment
5.3 Computation of Risk
TASK 6.0 Ecological Risk Assessment
6.1 Identification of Ecological COCs
6.2 Ecological Species Identification
6.3 Ecological Toxicity Assessment
6.4 Ecological Exposure Assessment
6.5 Qualitative Analysis of Risk
TASK 7.0 Potential Remediation Actions
7.1 Site Conceptual Model
7.2 Remedial Action Objectives
7.3 Development of Alternatives
7.4 Selection of Preferred Alternative
7.5 Preliminary Design of Selected Alternative & Cost to Construct
TASK 8.0 Project Impact Analysis
TASK 9.0 Project Deliverables
9.1 30% Submittal
9.2 60% Submittal
9.3 90% Submittal
9.4 Final Submittal
TASK 10.0 Project Management
2/16
3/15
4/19
5/7

Staffing

Senior Engineer (SENG)

- MEng degree, Professional Engineer, and 15-yrs experience
- Acts as project manager

Engineer (ENG)

- BS degree, Engineer-In-Training, and 3-yrs experience
- Perform most of project work, checked by SENG

Lab Technician (TECH)

- Supervised by ENG
- Conduct all sampling and lab procedures

Intern (INT)

- Env. Eng. Student
- Assist the ENG and TECH

Table 2: Staffing Plan

Task No.	Task Name	SENG Hours	ENG Hours	LAB Hours	INT Hours
1.0	**Work Plan and Laboratory Use**				
1.1	Sampling and Analysis Plan	5	25		7
1.2	Health and Safety Plan	5	25		7
1.3	Soils Lab Binder		4	8	5
2.0	**Site Investigation**	20	20	20	20
3.0	**Sample Analysis and Identification of COCs**				
3.1	Sample Drying		2	24	24
3.2	Sieving		2	32	32
3.3	In-lab XRF Analysis		2	60	40
3.4	Identification of Human Health COCs	2	2		
4.0	**Confirmatory Testing, Mapping, and Identification of EPCs**				
4.1	FAAS or ICP-OES Analysis			10	10
4.2	Statistical Analysis & EPCs		4		2
4.3	Spatial Distribution Mapping		4		2
5.0	**Human Health Risk Assessment**				
5.1	Human Health Toxicity Assessment		8		10
5.2	Human Health Exposure Assessment		8		10
5.3	Computation of Risk	2	8		8
6.0	**Ecological Risk Assessment**				
6.1	Identification of ecological COCs		3		4
6.2	Ecological Species identification		3		3
6.3	Ecological Toxicity Assessment		2		3
6.4	Ecological Exposure Assessment		2		3
6.5	Qualitative Analysis of Risk	2	2		3

Task No.	Task Name	SENG Hours	ENG Hours	LAB Hours	INT Hours
7.0	**Potential Remediation Actions**				
7.1	Site Conceptual Model		8		4
7.2	Remedial Action Objectives		8		5
7.3	Development of Alternatives	2	6		5
7.4	Selection of Preferred Alternative		6		
7.5	Preliminary Design of Selected Alternative & Cost to Construct	4	6		
8.0	**Project Impact Assessment**	1	2		
9.0	**Project Deliverables**				
9.1	30% Submittal	4	10		10
9.2	60% Submittal	4	10		10
9.3	90% Submittal	4	10		10
9.4	Final Submittal	6	12		12
10.0	**Project Management**				
10.1	Meetings	15	15	15	15
10.2	Schedule management	10	5		
10.3	Resource management	10	5		
	Subtotal hours	96	229	169	264
	Total hours		**758**		

Cost of Engineering Services

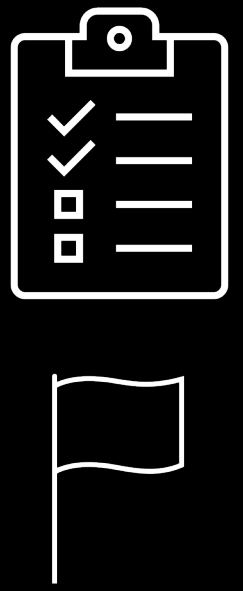
Table 3.1: Cost of Engineering Services

	Classification	Quantity	Rate	Unit	Cost
1.0 Personnel	SENG	96	$321	$/hr	$30,816
	ENG	229	$137	$/hr	$31,373
	LAB	169	$49	$/hr	$8,281
	INT	264	$26	$/hr	$6,864
				Subtotal Personnel	**$77,334**
2.0 Travel	NAU Mileage Rate	466	$1	$/mile	$466
	NAU Suburban	2	$65	$/day	$130
	Hotel 1 Night; 3 Rooms	3	$100	$/night	$300
	PerDiem; 5 persons	2	$30	$/day-person	$60
				Subtotal Travel	**$956**
3.0 Supplies				**Subtotal Supplies**	**$1,009**
4.0 Analysis	Rental: NAU Soils Lab	20	$100	$/day	$2,000
	Rental: XRF	5	$300	$/day	$1,500
				Subtotal Analysis	**$3,500**
5.0 Subcontract	Western Technologies	10	$100	$/sample	$1,000
				TOTAL	**$83,799**

Cost of Engineering Services

Table 3.2: Expanded Cost of Supplies

	Classification	Quantity	Unit Price	Unit	Cost
3.0 Supplies	Ziplock Gallon Freezer Bags, 152 ct	1	$20.00	$/pack	$20
	Trowel	10	$5.00	EA	$50
	GPS	3	$175.00	$/day	$525
	Dish Soap	1	$2.00	EA	$2
	Marking Flags	90	$2.00	EA	$180
	Bins	4	$10.00	EA	$40
	50 gal Buckets	3	$5.00	EA	$15
	Water	10	$1.00	$/gallon	$10
	Paper Towels, pack of 2	1	$9.00	$/pack	$9
	Pens/Markers, pack of 6	1	$5.00	$/pack	$5
	Nitrile Gloves, 1000 ct	1	$45.00	$/pack	$45
	Trash Bags, 40ct	1	$14.00	$/pack	$14
	Clipboards	4	$8.00	EA	$32
	Logbooks	2	$5.00	EA	$10
	Measuring Tapes	2	$20.00	EA	$40
	Scrub Brushes	4	$3.00	EA	$12
				Subtotal Supplies	**$1,009**



References

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[2] Apple Maps. *Harquahala Mine.* Online.

[3] Maps for Design. *Powerpoint Map of Arizona*. Online. Accessible at: www.mapsfordesign.com

[4] Google Maps. *Harquahala Mine Tailings Pile*. Accessible at: earth.google.com

Questions? Comments?