



GOLDER

Selection Criteria for Sedimentation Ponds that may be Transitioned to Permanent Impoundments for a Reclaimed Surface Mine in the Southwest USA

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Project History

INTRODUCTION

- Large surface coal mine
- Mining has been completed and site is in reclamation monitoring & maintenance phase
- Sedimentation ponds no longer needed as mine area has been reclaimed and seeded
- Landowners requested that as many water resources as possible remain for permanent post mining land use

Project Location

INTRODUCTION

- Arid Southwest USA
- Highly Erosive Environment
 - Average annual precipitation is 11.5 inches
 - Rainfall typically occurs over a two-month period in July/August
 - 70% of design rainfall event falls in 30-minute period
- Water resources are scarce and many sources do not hold water year round

Permanent Impoundments

POST MINE LAND USE



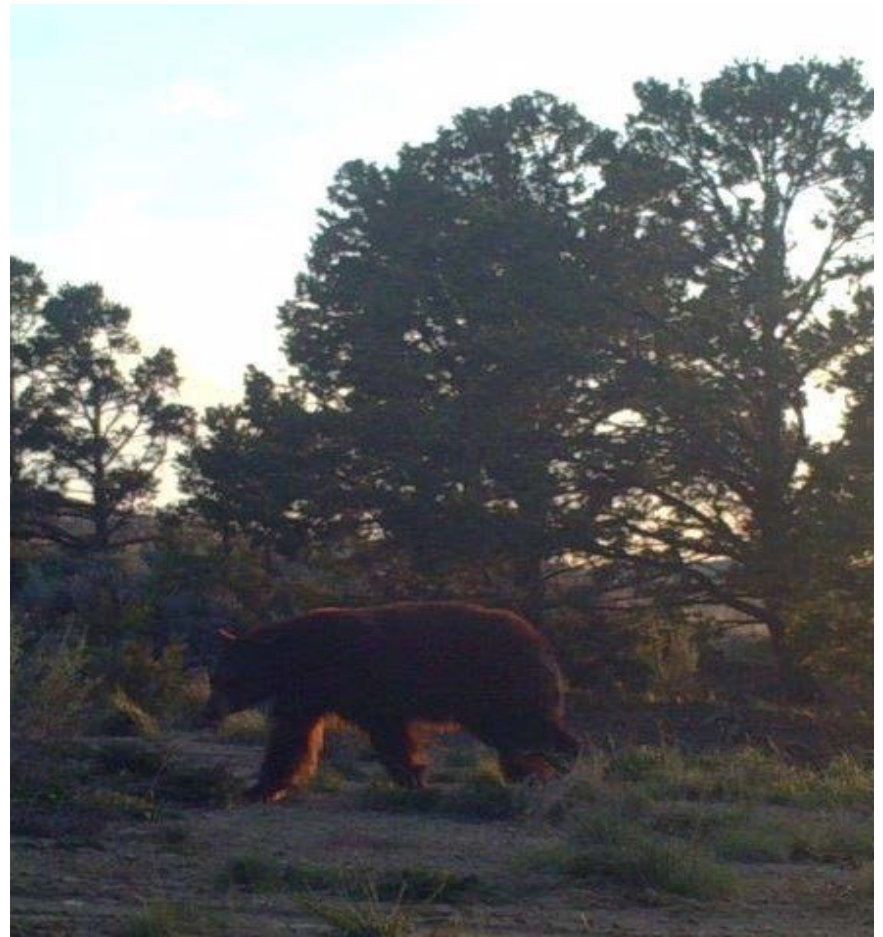
Post Mine Land Use

GRAZING



Post Mine Land Use

WILD LIFE HABITAT



SMACRA

PERMANENT IMPOUNDMENT REGULATIONS 30CFR 816.49B

(b) *Permanent impoundments.* A permanent impoundment of water may be created, if authorized by the regulatory authority in the approved permit based upon the following demonstration:

- (1) The size and configuration of such impoundment will be adequate for its intended purposes.
- (2) The quality of impounded water will be suitable on a permanent basis for its intended use and, after reclamation, will meet applicable State and Federal water quality standards, and discharges from the impoundment will meet applicable effluent limitations and will not degrade the quality of receiving water below applicable State and Federal water quality standards.
- (3) The water level will be sufficiently stable and be capable of supporting the intended use.
- (4) Final grading will provide for adequate safety and access for proposed water users.
- (5) The impoundment will not result in the diminution of the quality and quantity of water utilized by adjacent or surrounding landowners for agricultural, industrial, recreational, or domestic uses.
- (6) The impoundment will be suitable for the approved postmining land use.

Selection Criteria

SIZE AND CONFIGURATION

- Final structures should be distributed throughout the reclaimed area as much as possible
- Provide access to the impoundment
- Large enough to support post mining land use but not too large to require excess maintenance
- Not located in major drainage way which can increase maintenance
- Soil type in area conducive to holding water

Selection Criteria

WATER QUALITY ASSESSMENT

- All surface waters of the Navajo Nation have to meet the criteria of the Navajo Nation Surface Water Quality Standards (NNWQS)
- Established by
 - U.S. Environmental Protection Agency (USEPA)
 - Navajo Nation Environmental Protection Agency (NNEPA)

Selection Criteria

WATER QUALITY ASSESSMENT

Table 1-1 Summary of minimum data required to determine Designated Use Support

Water Quality Standard (WQS)	Designated Use(s) ¹	Minimum Number of Values	Number or Percent Exceedances of WQS	Designated Use Support Decision
Metals, Organics, Inorganics, and Radiologicals	Dom, FC, PrHC, ScHC, AgWS, A&WHbt (chronic), LW	5 values in 3 years	≤ 1	Supported
			≥ 2	Not Supported
Metals, Organics, and Inorganics	A&WHbt (acute)	5 values in 3 years	< 1	Supported
			≥ 1	Not Supported
Asbestos	Dom	5 values in 3 years	< 1	Supported
			≥ 1	Not Supported
Dissolved Oxygen, pH, Suspended Sediments, Temperature, Turbidity	Dom, PrHC, ScHC, A&WHbt	10 values in 10 years	< 15 %	Supported
			≥ 15 %	Not Supported
<i>E. coli</i> Bacteria	Dom, PrHC, ScHC	10 values in 10 years	< 15 % for single sample and < 1 for geometric mean	Supported
			≥ 15 % for single sample and/or ≥ 1 for geometric mean	Not Supported
Narrative Standards	One or more	Designated Use Support Decision made on a case-by-case basis.		

1) Designated Uses listed in the NNWQS are: Domestic Water Supply (Dom), Fish Consumption (FC), Primary Human Contact (PrHC), Secondary Human Contact (ScHC), Agricultural Water Supply (AgWS), Aquatic and Wildlife Habitat (A&WHbt), and Livestock Watering (LW); however, for the impoundments the minimum applicable designated uses are FC, ScHC, A&WHbt and LW.

Selection Criteria

WATER QUALITY ASSESSMENT

- 22 Ponds were sampled as potential ponds to be converted to post mining impoundments
- 17 Ponds met NNWQS and could be considered for post mining land use

Selection Criteria

WATER QUANTITY AND CAPACITY EVALUATION

- Water Quantity Evaluation
 - Conduct a watershed evaluation to ensure enough runoff was provided to support intended use
 - Watershed should not be so large as to require maintenance due to frequent large discharges

Selection Criteria

WATER QUANTITY AND CAPACITY EVALUATION

- Capacity Evaluation
 - Pond has enough capacity to maintain a relatively constant seasonal water level
 - Pond has sufficient capacity for sediment accumulation thru a designated period while still maintain capacity
 - Pond capacity will support the intended use while not being over sized which may require more maintenance

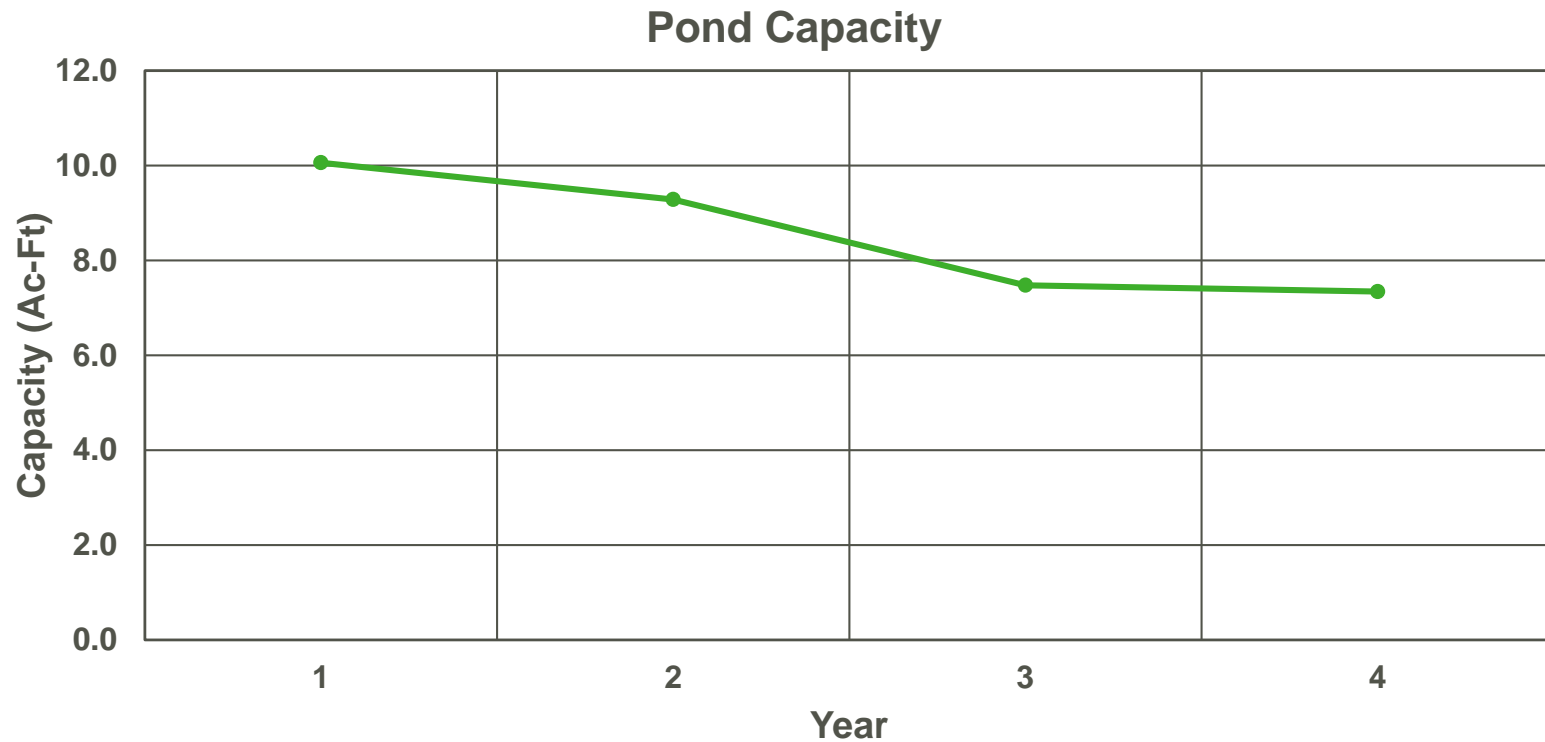
Selection Criteria

WATER QUANTITY AND CAPACITY EVALUATION

- Sediment Accumulation Rate Assessment
 - Pond should have enough capacity to support the intended use without requiring clean outs for a designated period
 - Various Considerations Include:
 - Cover type and land use
 - Watershed gradients and soil types
 - Geometry of upstream structures

Selection Criteria

SEDIMENT ACCUMULATION RATE



Selection Criteria

FINAL GRADING

- Stability Evaluation
 - Pond embankments should have gradients that are easy to be maintained and not prone to erosion
 - Discharge pipes should be removed from embankments to minimize maintenance
 - Open channel spillway geometries need to be evaluated and resized based on final reclaimed watershed and designated design storm

Selection Criteria

SURROUNDING IMPACTS

- Careful consideration should be taken not to impact neighboring water users with quantity or quality
- Currently the National Pollutant Discharge Elimination System (NPDES) permit requires sampling of select discharging structures within 24 hours of a rain event

Permanent Impoundment

OBSTACLES – FERAL HORSES



Permanent Impoundment

OBSTACLES – TRESPASS LIVESTOCK



Permanent Impoundment

POST MINING LAND USE FEATURES – CATTLE ACCESS



Permanent Impoundment

POST MINING LAND USE FEATURES - FENCING



Current Requirements

MONITORING AND MAINTENANCE PERIOD

- Quarterly Inspections
- Annual Impoundment Certifications
- Final Outfall Discharge Sampling
- Sediment Accumulation Monitoring and Clean Out

Permanent Impoundment

POST MINING FINAL CONFIGURATION

Desired Final Result

- Provide water resource to support the post mine land use of grazing and wildlife habitat
- Provide structures that are stable and have a reasonable life
- Provide safe access to water sources for the long term use.

Permanent Impoundment

POST MINING FINAL CONFIGURATION



Permanent Impoundment

POST MINING FINAL CONFIGURATION





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Thank you