

6.4.5 EXHIBIT E - Reclamation Plan

- (1) In preparing the Reclamation Plan, the Operator/Applicant should be specific in terms of addressing such items as final grading (including drainage), seeding, fertilizing, revegetation (trees, shrubs, etc.), and topsoiling. Operators/Applicants are encouraged to allow flexibility in their plans by committing themselves to ranges of numbers (e.g., 6"-12" of topsoil) rather than specific figures.
- (2) The Reclamation Plan shall include provisions for, or satisfactory explanation of, all general requirements for the type of reclamation proposed to be implemented by the Operator/Applicant. Reclamation shall be required on all the affected land. The Reclamation Plans shall include:
 - (a) A description of the type(s) of reclamation the Operator/Applicant proposes to achieve in the reclamation of the affected land, why each was chosen, the amount of acreage accorded to each, and a general discussion of methods of reclamation as related to the mechanics of earthmoving;
 - (b) A comparison of the proposed post-mining land use to other land uses in the vicinity and to adopted state and local land use plans and programs. In those instances where the post-mining land use is for industrial, residential, or commercial purposes and such use is not reasonably assured, a plan for revegetation shall be submitted. Appropriate evidence supporting such reasonable assurance shall be submitted;
 - (c) A description of how the Reclamation Plan will be implemented to meet each applicable requirement of Rule 3.1;
 - (d) Where applicable, plans for topsoil segregation, preservation, and replacement; for stabilization, compaction, and grading of spoil; and for revegetation. The revegetation plan shall contain a list of the preferred species of grass, legumes, forbs, shrubs or trees to be planted, the method and rates of seeding and planting, the estimated availability of viable seeds in sufficient quantities of the species proposed to be used, and the proposed time of seeding and planting;
 - (e) A plan or schedule indicating how and when reclamation will be implemented. Such plan or schedule shall not be tied to any specific date but shall be tied to implementation or completion of different stages of the mining operation as described in Rule 6.4.4(1)(e). The plan or schedule shall include:
 - (i) An estimate of the periods of time which will be required for the various stages or phases of reclamation;

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- (ii) A description of the size and location of each area to be reclaimed during each phase; and
- (iii) An outline of the sequence in which each stage or phase of reclamation will be carried out.

(The schedule need not be separate and distinct from the Reclamation Plan, but may be incorporated therein.)

- (f) A description of each of the following:
 - (i) Final grading - specify maximum anticipated slope gradient or expected ranges thereof;
 - (ii) Seeding - specify types, mixtures, quantities, and expected time(s) of seeding and planting;
 - (iii) Fertilization - if applicable, specify types, mixtures, quantities and time of application;
 - (iv) Revegetation - specify types of trees, shrubs, etc., quantities, size and location; and
 - (v) Topsoiling - specify anticipated minimum depth or range of depths for those areas where topsoil will be replaced.

Acknowledged. Rule 6.4.5(1) is an advisory statement, the particulars of which are provided for, below.

MISSION STATEMENT: Utilizing Resource Recovery of Sand and Gravel as a Method of Conservation to Establish DEVELOPED WATER RESOURCES; and to function as a Foundation for the implementation of other beneficial Multiple End-Uses over the Property.

Reclamation and Development of the Property over Time.

The majority of sand, gravel and other earth product demand, like water, is the consequence of market forces resulting from urbanization. The commercial, industrial, transportation, and other land use matrixes arise to support and sustain a growing residential population. Governments count the roof tops for they rely upon public and commercial revenue to sustain the roads, schools, water supply and infrastructure needed to secure it. With continued growth of human habitat and development in Colorado, the products that make possible the construction and maintenance of it all, comes from the ground.

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Unconsolidated aggregate deposits simply must be taken where they are formed. The aggregate resource must be recovered from undeveloped locations first, before those locations are overtaken by ever expanding urban development; or it is lost. Now is the time and this is the geologically determined and economically feasible location from which the proposed extraction activity must occur. Hence, the **Two Rivers Sand Gravel and Reservoir Project**.

Underlying earth resources are too often squandered when human development occurs in advance of resource extraction and recovery. Extraction and resource recovery are required by Colorado law to occur in advance of development where sand and gravel deposits are present. The resource is 'recovered' to benefit inevitable and unrelenting human habitat and infrastructure expansion, while providing a more enduring indigenous buffer to the very impacts it serves.

The extraction of aggregate resource is in fact resource conservation. Beyond that, it is an essential social asset. Without earth products, transportation maintenance costs increase as infrastructure begins to fall apart. Industries begin to shrink, along with correlated revenues for state and local governments. Impacts would likely spread downstream from there, degrading schools and everything else dependent upon government revenue, as taxes increase to make up the difference. Affected populations would likely begin to flee an ever-increasing tax burden, further depreciating home values while accelerating loss of revenues from ever diminished home valuations, loss of businesses, jobs, and ultimately the very infrastructure itself. Without earth products, the economic engine and quality of life for everyone, begins to unravel.

The secondary and enduring benefit of mineral extraction is in the reclamation and restoration of extracted lands. Extraction of aggregate resources is comparatively temporary and transitional by its very nature. Reclamation at this location is geared to lay a foundation that will capture both short and long-term multiple-end use benefits that will complement the dynamic mix of surrounding land uses over time. While residential, commercial, and industrial development will eventually be inspired by economic forces over portions of the Two Rivers property; the primary end use will be the creation of essential Developed Water Resources.

An understanding of the vital importance of aggregate resources to the people of Colorado is not new, but well established; and protected. It remains the stated duty of any governing body in Colorado to aid in the lawful recovery of these vital mineral resources under Title 34. Section 22-5-80 of Weld County's Code of Regulations is consistent with Colorado law, both of which require that this resource must be recovered prior to other development which would otherwise impede access to it. Municipalities are obligated for the sake of their citizens to assert the same.

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The subsequent development of a diverse multiple land use potential at this location, when complemented with sound environmental parameters, as advanced under this application and the attending OMLR permit exhibits, is in keeping with the spirit and intent of the policies and goals of the State of Colorado, Weld County, and the Towns of Evans and Milliken. Approval of the application will allow the resource to be accessed and utilized in a responsible and orderly manner as required under both Colorado law, and consistent with local County and Municipal Regulations.

Specific Reclamation Elements and Methods:

This application provides substantial detail of features utilizing aerial photography that is ortho-rectified to approximately 1.0± percent of surveyed accuracy. This highly accurate and detailed portrayal of planned extraction and reclamation is visible under Exhibit C-1: Existing Conditions, Exhibit C-2: Extraction Plan Map, and Exhibit F – Reclamation Map. How reclamation will occur over affected lands is further detailed under Exhibit L – Reclamation Costs.

As extraction progresses over the Fields south of the Big Thompson River, the resulting 1.25H:1V slopes (2H:1V, where indicated) created during extraction will be concurrently modified when and where practical. Concurrent reclamation is a natural incentive for Operations to speed site recovery while generally serving to lower attending financial warranty burdens. The cut slopes along the extraction limits perimeter will be finish graded by methods including pushing the resulting pit bottom with a dozer upslope, excavation, hauling and placement of pit bottom material as backfill, or backfilling using previously excavated surplus material of limited or low market value until the resulting basin slopes conform with Rule 3.1.5(7).

Since the primary end use is Developed Water Resources, the basins are intended to hold waters based upon the rights assigned by decree, or as stipulated in regulatory compliance with the Colorado Division of Water Resources, Office of the State Engineer (OSE). This may include the need to augment water sufficient to cover the anticipated exposed groundwaters of the basins in the unlined state. The entire unlined basin is or will be sufficiently covered under an approved substitute supply plan. In order to again liberate waters set aside for augmentation, the basins will at some point in the life of the activity be lined to segregate the basin from Colorado groundwaters.

Lining of basins involves the placement of low permeability compactable fill, from on-site or other suitably sourced geologic materials, into the keyway (dewatering trench¹); the same keyway used to facilitate discharge to keep the basins dry and

¹ Adequacy Item 15: Keyway clarification

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free of groundwaters at the time of extraction. The balance of the basin floors (where needed) and slopes are also covered and compacted with the same materials until it meets the standards established under the August 1999 State Engineer Guidelines for Lining Criteria. Typical to obtaining approval for the constructed liner, the lined basin must pass a 90-day leak test. Correspondence from the OSE approving the construction of the lined basin will be submitted to the OMLR on receipt; or as part of any request for release of the permit, in part or whole.

Essentially, the pushed parent rock material will form the minimum 3h:1v slopes of the basin and be compacted to a permeability of 10^{-6} ; forming a lined basin that complies with Colorado Water Law and Guidelines mentioned, above. In this manner, the lined basins will maintain a required separation and accounting of stored water from the underlying ground waters. Evidence of compliance with the rules and regulations of the Colorado Division of Water Resources will be provided to the OMLR on completion of the lined basins.

Raptor has extensive experience successfully constructing lined storage reservoirs with several prior projects completed, tested and approved by the OSE. The deposit contains extensive materials suitable for use in constructing the liner including claystone, sandstone-claystone-siltstone and sandstone-siltstone bedrock, clay lenses in the sand and gravel deposit, and overburden often comprised of low plasticity sandy silty clay to silty sand. Excess topsoil has also been successfully used as a liner construction material and would be available from the temporary topsoil stockpile location in the North-East Section of Central Field. Other materials encountered within the sand and gravel deposit during excavation would be stored in temporary piles on the excavation floor. Parameters such as plasticity, percentage of fines etc. have not been determined for the deposit materials at this time but extensive experience in constructing several approved lined storage reservoirs with similar materials along the South Platte river provides high confidence in the availability of suitable materials within the extraction area.

The liner will be progressively constructed once the pit is developed sufficiently to allow regrading and any problems with the efficacy of the liner can usually be detected prior to leak testing through evidence of seeps in the constructed liner which can have remedial action taken. Similarly, although not common, seeps are sometimes observed in the bedrock floor. While these have generally in Raptor's extensive experience proved to be self-healing, where needed remedial action and spot lining and compaction would be undertaken.

Liner construction involves building a compacted low permeability core by placing and compacting suitable material in $6'' \pm$ lifts. A Caterpillar 815 or 825 (or equivalent) compactor generally makes 2-4 passes to achieve suitable compaction of the core and which experience has shown provides integrity of the core both

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laterally and vertically. This process starts in the keyway and continues until the core reaches ground level. As the core is built the internal slopes are also brought up to achieve a 3:1 or shallower slope. The exact mix of material used to construct the core is determined at the time of construction based on the materials available. Moisture adjustments required have generally been minimal in prior experience and judgements on additional water are made during construction to achieve a moisture content typically in an optimum range of 2-4 percent. The internal slopes do not necessarily have to be clay materials, but can consist of pit run, overburden, shale or a mixture of these materials. The general approach to construction of the core and regrade of a typical wall at the extraction limit is shown in the Figure 1 below.

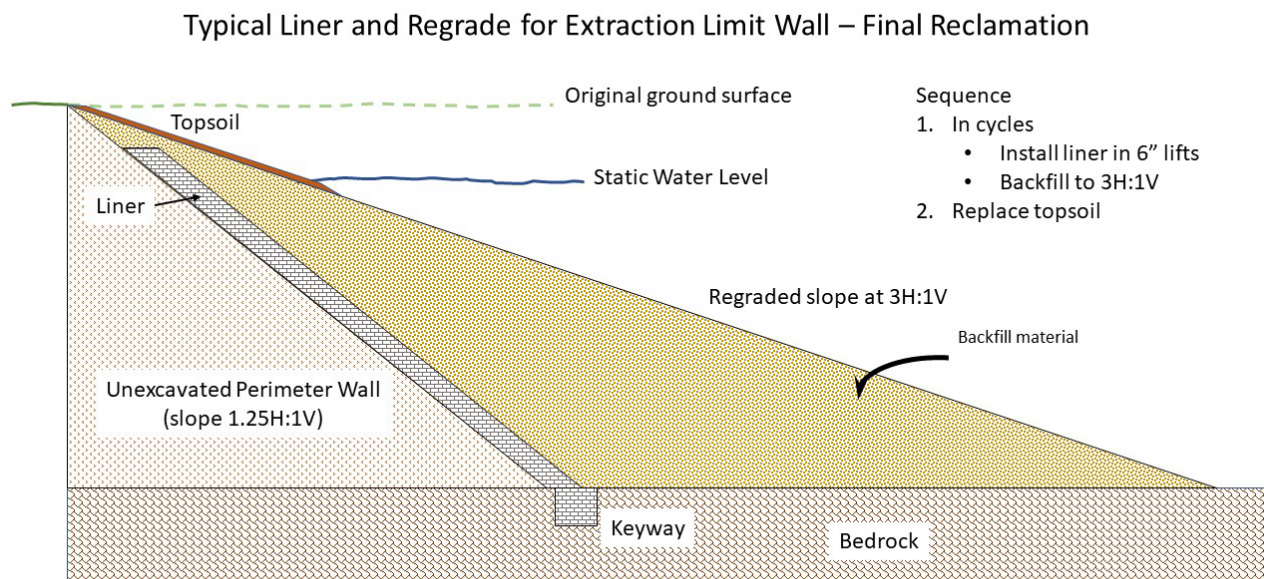


Figure 1: Typical Liner and Regrade for Extraction Limit Wall

²A Backfill Notice is included with this application as an Addendum at the back of Exhibit E – Reclamation Plan, to facilitate the fill of portions of the extracted lands for final end-use potentials beyond water storage, which may include residential, commercial or industrial structures or uses otherwise approved, now or in the future, by Weld County, Colorado; or a Colorado municipality, as applicable. The extent and nature of the water storage basin represents the maximum build-out respective of optimal extraction of commercial product and resulting final slopes.

As part of reclamation, lands situated above the anticipated final water level of the completed basins, and within 10.0± feet below the anticipated final water

² Adequacy Item 28: Paragraph removed as proposed post mining land use is lined water storage.

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level of the basins, will be graded to 3H:1V, or flatter. Lands below 10.0± feet from the anticipated final water level of the basins will also be graded to 3H:1V, or flatter, unless 2H:1V slopes are otherwise approved by subsequent permit revision. Naturally occurring or previously established slopes may exceed 2H:1V where not otherwise affected by extraction activities and may not be altered as part of reclamation unless necessary to facilitate the reclamation of affected lands.

All affected lands between the extraction limits and remaining above the anticipated high-water mark of the basins will be capped with a minimum of six (6.0±) inches of soil, as supported by Exhibit I & J – Soils and Vegetation Information. Timing and use of soil are detailed further under Exhibit I & J – Soils and Vegetation Information and Exhibit L – Reclamation Costs. Where compacted lands exist, and are to be revegetated, those locations will be ripped prior to re-soil application. There are no known areas of compaction at the time of this application which would require such activity; and ripping remains a contingency of the application.

The final land configuration will ultimately result in two (2) reservoir basins totaling 203.61± surface acres, with a static water elevation surface area of 187.66± acres (refer to Exhibit F: Reclamation Map). The balance of unoccupied affected lands above the anticipated static water level will be stabilized where necessary utilizing the seed mixture as shown under Exhibit L - Table L-1: Primary/Preferred Revegetation Seed Mixture. Lands not otherwise occupied for developed water resources will be later developed to the highest possible end-use, and will likely comprise a mixed use which may include other general agricultural uses as well as light residential, commercial or industrial uses.

The Primary Revegetation Seed Mixture, combines a thoughtful mingling of predominantly native grasses of diverse height, form, color and function, to assure that the reclaimed site can provide for a multiple-use benefit. Should post resource recovery land development be deferred, or even negated, all affected land remaining above the anticipated final water level of the resulting ponds will be stabilized with a diverse and durable cover of predominantly native grasses. This is compatible with, and an improvement over the diminished lands located in the floodplain of the two rivers, and area monocultures of residential bluegrass lawns and surrounding cropped land.

³Generally, warm and cool seed mixtures can be treated in a myriad of ways. In Table L-1 this distinction is indicated in the column labelled “C/W”. Cool season mixtures are often planted in the fall and warm in the spring, however,

³ Adequacy Item 33

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exceptions may apply. Some argue warm season grasses are better broadcast, while others like them drilled with the cool season grasses.

Combined with the creation of waterfowl habitat, the baseline reclamation plan provided for under this submittal will provide less fragmentation of the area ecology than what may otherwise exist or transpire. As such, the operation will result in immediate and enduring positive impacts to area habitat as a long-term beneficial buffer against continued developmental impacts to the river ecosystem.

Consistent with previous discussions with conservationists from the Division of Wildlife; operations will result in a desirable establishment of irregularities for the finished reservoirs. For example: The basin irregularities will be provided for, both by direct concurrent grading, post mine landform grading and establishment, and use of fill from excess or residual materials and reject fines from the operations. Shallower locations due to variations in site geology may allow for the creation of other shoreline features through the placement of fill.

Due to the unpredictable nature of the anticipated geology [actual depth of material and type will vary - extraction and pond depths are approximated typical maximum extent] and other factors, it is a near misrepresentation to forecast the final appearance of the ponds, as it creates an unrealistic expectation in a regulated environment on the minds of various regulating agents, the general public, and on Operations. Simultaneously, setting false expectations about the final appearance of the ponds, beyond that already portrayed, will drain flexibility from Operations essential to the creation of more desirable effects, while simultaneously exerting pressure for needless and on- going revisions to the permit. It should be remembered that the Annual Report to the OMLR will provide a graphic record of this effort. Since the pace occurs over many years, there is ample time for reflection and analysis of the effort.

Time and timing will also come into play respective of materials to be used as fill. The utilization of fill is dependent upon the space available for deposition over completed areas of extraction in relation to the rate of creation of reject fines and or other deposit materials. Other influences will be the attending space for stockpiling, uses, or market conditions for fill material. Some locations will be more advantageous to fill at a given point in time than others, and the attending circumstances cannot be reasonably anticipated. The random nature of this limitation will actually aid in furthering the establishment of preferred non-geometric patterns of the finished ponds.

Exhibit F - Reclamation Plan Map, represents the regulated base for which reclamation must be judged as adequate for release. At the very least, the

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basins delineated under Exhibit F - Reclamation Plan Map, provide desirable shoreline irregularity and slopes in conformance with existing statutory requirements. Anything more is a bonus, for everyone, and every opportunity will be made to take advantage of it, as stated above. Since the creation of aesthetic effects, edge effect, and other natural landforms, remain subjective and empirical, the stated intentions and any resulting efforts to achieve such effects, beyond those identified in the approved seed mixture and as portrayed in Exhibit F - Reclamation Plan Map, is commendable, and to be encouraged.

Placement of soil and initial stabilization of affected lands with a stabilizing cover of grasses will better assure a foundation for later vertical development and establishment of cover; whether resulting from natural invasion or direct planning of trees, shrubs, and forbs. By themselves, the grasses will provide a stable foundation for later enhancements, while visibly improving wildlife habitat by interrupting area monocultures. While end use development beyond that already described cannot be fully determined or detailed at this time, the trend toward continued residential, commercial and industrial development is self-evident on surrounding lands.

Although the establishment of native grasses is a primal requirement under this permit, the incorporation of forbs, shrubs and trees remains at the discretion of the landowner. Markets and the inherent values of the landowner to enhance the multiple end use worth of the property will serve to encourage the vertical development and diversity of the area vegetation with the contribution of forbs, shrubs, and trees. The purpose is to add cover, food source for wildlife and pollinators, and stratified creatures that will come to inhabit and depend upon the natural configuration, character and extent of the finished landform and diverse stabilizing cover.

It should also be kept in mind that extraction is occurring within an area formerly occupied by monocultural crops, The cottonwoods along the lower terrace of the two rivers will be preserved in the majority. A light culling of a few cottonwoods may occur to assure the integrity of the intended conveyor line and wash basin; or as needed to assure the protection of personnel. The riverine areas will otherwise remain untouched, further complementing the utility of the reclaimed and restored expanse.

Whatever long-term development occurs at the location, and on surrounding lands, resource recovery and correlated reclamation at this location will tend to direct human densities away from the two rivers. The reduced densities will produce direct and indirect long-term wildlife benefits and diverse multiple end-use potentials involving inherent wetland development, water resources development, water fowl improvement, and other desirable effects. The long-term worth of this effect will serve to

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increase the other long-term values for everyone in the area communities formed by the towns of Evans and Milliken; and greater Weld County.

The final acreage of land remaining for development relative to surface acres of resulting ponds is illustrated on the following Exhibit F - Reclamation Plan Map. The map details the post resource recovery land form establishment. The size of the resulting basins is a function of area geology and available resource relative to man-made obstructions that serve to prohibit a greater linkage.

⁴Exhibit F presents Raptor Material's current expectation of the remaining above-ground and underground structures within the Affected Area at the point the reclamation of mining related disturbance is complete. Any revisions, additions, or modifications to this forecast of what may be the outcome of mining and reclamation operations some 30-35± years from now will be updated on required Annual Reports, or by Technical Revision, as warranted, or as otherwise directed consistent with Colorado Statute.

The estimated timetable for extraction, commencing approximately spring to winter 2023; is estimated to take 23-28± years combined, or longer, followed by an additional five years to complete reclamation; or a total estimated life of the mine of 28-33± years; ending approximately winter 2051 to 2056. This is a life of the mine operation and all timetables are estimates and may prove shorter or longer than stated. The final determination will occur five years after the deposit is exhausted and all marketable product has been removed and necessary infill completed at the location to the point of final reclamation as approved or modified under the terms of the permit is completed.

⁵Table E-1 provides a projection of mine development and regrading/reclamation. The plan as described in Exhibit D and above in this Exhibit E, is a forecast and may vary according to market conditions with mining and subsequent regrading occurring faster or slower, sometimes significantly so. The geology may also dictate changes in the rate of extraction. If efficiency demands in a higher production demand scenario, separate areas could be developed in the manner described in Exhibit D simultaneously. Such changes may happen quickly and would be addressed in the Annual Report.

Miscellaneous considerations:

Fertilizer may be utilized as part of revegetation efforts. The need for fertilization and any subsequent fertilizer rates will be determined based upon soil tests taken at the time of reapplication of salvaged soil

⁴ Adequacy Item 41

⁵ Adequacy Item 29

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to affected lands remaining above water level. Status of fertilization and soil test results can be included in OMLR Annual Reports, as warranted. Refer to Exhibit I - Soils Information.

Weed Control may involve a mix of mechanical or benign vinegar-based sprays as control methods. A detailed plan to control weeds is described in Exhibit I/J. Treatment and control of noxious or nuisance weeds will be reported in OMLR Annual Reports as warranted.

A Backfill Notice follows this page. The flexible use of inert fill will facilitate the timely reclamation of affected lands.

Continued...next page...

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⁶Table E-1 - Two Rivers Mining-Regrading Schedule

Mining-Regrading Schedule		Years						
Schedule		1-5	6-10	11-15	16-20	21-25	26-30	31-35
	Area (ac)	Area Mined (ac ±)						
Central Field								
Center Section	121.9	50.1	40.0	31.8				
North-East Section	15.6			8.2	7.4			
West Section	25.1				19.0	6.1		
North West Field	41.0				13.6	27.4		
Total	203.6	50.1	40.0	40.0	40.0	33.5	0.0	0.0
	Length (ft)	Pit wall Created (ft ±)						
Central Field	14,311	4,294	2,800	2,800	2,800	1,617		
North West Field	6,672				1,000	5,672		
Total	20,983	4,294	2,800	2,800	3,800	7,289	0	0
	Length (ft)	Pit wall Regraded (ft ±)						
Central Field	14,311		3,200	3,200	3,600	4,311		
North West Field	6,672					489	5,400	783
Total	20,983	0	3,200	3,200	3,600	4,800	5,400	783
	Length (ft)	Pit wall Remaining (ft ±)						
Central Field	14,311	4,294	3,894	3,494	2,694	0	0	0
North West Field	6,672	0	0	0	1,000	6,183	783	0
Total	20,983	4,294	3,894	3,494	3,694	6,183	783	0

⁶ Adequacy Item 29

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BACKFILL NOTICE:

Inert fill may be imported, or utilized from existing on-site sources, to meet or exceed planned post extraction land use development potentials over the project area during the life of the operation. The extent and location of fill will be field determined. All inert materials used for backfilling will be consistent with OMLR Rules and Regulations, and those of the Colorado Department of Health and Environment.

All **backfill material** will be placed with sufficient fines to minimize voids and settling of backfilled areas and slopes. There are no known or expected acid forming or toxic producing materials or refuse at this location, nor will materials known to possess such qualities be knowingly utilized for fill. Any other refuse or reject materials that do not meet the definition of inert and requiring removal and disposal will be placed in closed containers and taken to an appropriate landfill for disposal, unless it is otherwise 'inert,' per **Rule 3.1.5(9)**, of the OMLR Rules and Regulations.

All materials, whether extracted on-site or imported, will be handled in such a manner so as to prevent any unauthorized release of pollutants to surface or ground water resources. All fill will be integrated to meet or exceed the reclamation plan and correlated end uses authorized under the approved Colorado Office of Mined Land Reclamation permit.

All fill above the anticipated static water level of the resulting basins will be soiled and stabilized according to the approved reclamation plan, or as otherwise allowed according to allowed under this application or locally approved land uses. The location and extent of fill utilized over extracted lands will be designated in required OMLR Annual Reports, permit revision, or as part of any request for release of the permitted area, in part or whole.

I, Garrett C. Varra, hereby attest that the material to be utilized as inert fill in the area described as the Two Rivers Sand, Gravel and Reservoir Project; is clean and inert as defined in **Rule 1.1(20)**, of the OMLR Rules and Regulations.

Garrett C. Varra, General Manager
Raptor Materials LLC