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KLICKITAT COUNTY, WASHINGTON

May 1, 2001

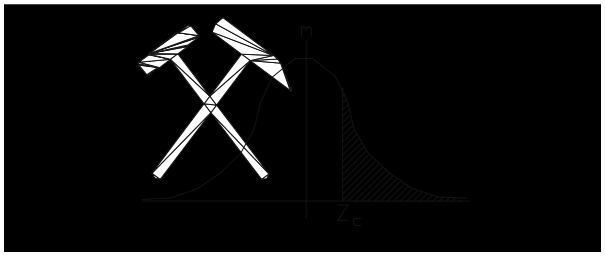
Prepared for:

Pacific Northwest Aggregates, Inc.
P.O. Box 82879
Portland, Oregon 97282-0879

Site Address:

Avery Sand and Gravel Pit
5 Avery Boat Ramp Road
Wishram, Washington 98673

Prepared by:



Halstead GeoNumerics
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Daniel R. Hack
Principal

EXECUTIVE SUMMARY

Halstead GeoNumerics was retained by Pacific Northwest Aggregates, Inc. to prepare and submit a revision to the existing mining plan *Mining and Reclamation Plan for Avery Sand and Gravel Pit, Lease Number 1-1020, August 1990*. This proposed revision involves an expansion of the north boundary of the present active mining operation approximately 600 feet to the north, as well as *daylighting* through to a sand and gravel operation contiguous to the west. The new plan provides for more clearly defined standards of reclamation, as well as a discussion of the extent of overburden material and basalt talus above sand and gravel resources in the northern portion of the property.

The projected mineable volume is approximately 7.7 million short tons, yielding a potential mine life of 3 years 11 months. Of this total production, 3.8 million short tons are from the present permit area, and 3.9 million tons are from the expansion area. An additional 500,000 tons is potentially available, pending further characterization of cultural resources in the eastern portion of V-179A.

MINING AND RECLAMATION PLAN, BIA LEASES #3-2-0087-9924 & 3-2-0066-9909,
AVERY SAND AND GRAVEL PIT

APPLICANT AND
OPERATOR:

Pacific Northwest Aggregates, Inc.
P.O. Box 82879
Portland, Oregon 97282-0879
(503) 239 - 5504

LAND MANAGEMENT:

USDI, Bureau of Indian Affairs
Yakama Agency
Toppenish, Washington 98948
865 - 2255

SURFACE AND
MINERAL OWNERS:

Vancouver Allotment V-179A
Shirley Iman
P.O. Box 575
Dallesport, Washington 98617

Vancouver Allotment V-179
Arthur Sanchey
980 Simcoe Creek Road
White Swan, Washington 98952

Charmine Sanchey	Jayson Umtuck
Josephine Barney	Earl Barney
Casey Barney	Shirley Barney
Delores Barney	Edna Barney
Christine Barney	Arnold Barney

SITE ADDRESS:

Avery Sand and Gravel Pit
5 Avery Boat Ramp
Wishram, Washington 98673
(509) 748 - 9190

APPLICANT'S
REPRESENTATIVE:

Halstead GeoNumerics
P.O. Box 1535
Portland, Oregon 97207
Contact: Daniel R. Hack (503) 234 - 4411

SUBJECT PROPERTY:	Vancouver Allotments 179 and 179A, Section 14, T2N, R14E, WM
FEDERAL LEASE SERIAL #:	3-2-0087-9924 (V-179 Allotment) August 19, 1999 3-2-0066-9909 (V-179A Allotment) July 12, 1999
PERMIT AREA:	Approximately 61 acres
LAND STATUS:	Designated under the General Allotment Act (or "Dawes Act") of 1887. Original Indian Allotment Patent Issued in October 1907. Managed by the Bureau of Indian Affairs, Yakama Agency. Mineral materials operations managed by Bureau of Land Management, Wenatchee Resource Area
PERMIT STATUS:	Mining and Reclamation Plan of July 1990 currently in effect. Bureau of Indian Affairs Sand and Gravel Permits and associated leases still in effect.
REQUEST:	A revision of the currently approved mine plan is submitted for technical review and approval. The proposal involves an expansion of the current operation approximately 600 feet to the north, as well as *daylighting* through to the approved sand and gravel operation to the west.
AVAILABILITY OF THIS PLAN:	A copy of the approved mine and reclamation plan together with all other applicable permits and environmental assessments are on file at Pacific Northwest Aggregates business office and at the mine operation office on V-179 / V-179A.

TABLE OF CONTENTS

LIST OF APPENDICES

1.0
PROPERTY DESCRIPTION

1.1 PROJECT BACKGROUND

Halstead GeoNumerics (Halstead) was retained by Pacific Northwest Aggregates, Inc. (PNA) to prepare a revision to the existing mining and reclamation plan for the present active Avery pit, or *V-179,* and the land parcel known as *V-179A* to the north.

Daniel Hack of Halstead GeoNumerics has examined the active Avery Pit and Avery Flat area on numerous occasions from April 1997 to the present.

1.2 PHYSICAL SETTING AND PROPERTY DESCRIPTION

The Avery property (Avery) is located in an area known commonly as *Avery Flat* on the north side of the Columbia River between the Washington towns of Dallesport to the west (downstream) and Wishram on the east (upstream). See Figure 1 in Appendix I for site location. Regionally, the Columbia River Basin area is a plateau subdivided by gorges and canyons, with broad extensive slopes and low mountain ranges. The main topographic feature is the westward-trending 800-foot deep channel etched by the Columbia River. Avery is not within the "Columbia Gorge", as the east end of the Gorge is generally placed at Rowena Gap, approximately 13 miles to the west. Locally, the Avery property lies on the steeper south limb of the Columbia Hills anticline (an up-fold in the local bedrock). The majority of the pit floor is currently at an elevation of about 165 feet above Mean Sea Level, with a few areas below that. The average pit rim is at an elevation of about 300 feet. Topography current as of December 1998 is shown in Figure 2.

The land containing the currently active Avery Pit is located in Klickitat County, Washington, two miles west of the town of Wishram, in the SE ¼ of the NE ¼ of Section 14, Township 2 North, Range 14 East, Willamette Meridian. This parcel is also known as "Government Lot 1" or "Vancouver Allotment #179", and was allotted under the General Allotment Act of 1887, remaining under the management of the Bureau of Indian Affairs, Yakama Agency. The pit is currently under the operation of Pacific Northwest Aggregates, Inc. The pit is bordered on the south by a Burlington Northern and Santa Fe (BNSF) rail line and the Columbia River (including the landlocked parcel lying between the railroad tracks). To the east of the Avery Pit is a tract known as "East Avery", belonging to Mr. Edmond C. Layman of Goldendale, Washington and under a purchase option to PNA. This parcel was originally known as "Vancouver Allotment #189", and is described as *"ÿ 63 acres within the west one half of the NW ¼, Section 13, T 2N, R 14E, W.M. ÿ"*

To the west, also within Section 14, is a parcel known as "Vancouver Allotment #194" (V-194). This tract was leased by the Bureau of Indian Affairs, Yakama Agency, at the recommendation of the Yakama Indian Nation to Wheeler Logging for development of sand and gravel. Development is subject to a mine and reclamation plan approved by BLM in

January 2000 which calls for extraction of 10.5 million cubic yards of sand and gravel over 7 - 10 years. As described in Section 3.4.1.2 – Relation to operations on V-194, PNA and Wheeler Logging will be cooperating in several aspects (i.e. trans-shipment of material to the barge load-out and storage of overburden), but will operate as separate production units. This relationship is the result of an agreement signed in May 2000. The mining and reclamation plan for V-194, as well this MRP, details mining to create a coordinated land form connecting V-179 and V-179A to V-194, rather than leave an un-mined boundary pillar along the property (lease boundary) line. This will be to the economic benefit of the mineral owners of the three tracts, and will achieve the concept of *ultimate maximum recovery*, required by operating regulations 43 CFR 3590.

The proposed expansion site to the immediate north of the existing Avery Pit permit boundary is identified as *V-179A*. The lease area is described as:

> *That part of the NE ¼ NE ¼ lying south of the right-of-way granted to State of Washington and excluding 13.27 acres homesite in Section 14 T 2N, R 14E, W.M., Wa., containing 21.00 acres more-or-less.*

Cadastral surveyors in the BLM Branch of Geographic Sciences completed a comprehensive survey of the area from June to September 2000. Among other topics, it addressed a discrepancy between the 1999 Hackwith Surveying survey of Allotment V-194 and the legal survey done by R.A. Edwards & Associates for Allotment V-179 in 1978. The final plat was approved on December 23, 2000, and was posted for a 30-day appeal period in the Federal Register starting March 12, 2001. This survey delineated the boundary of V-179A, as shown in Figure 2. The surveyed line will define the northern extent of mining of V-179A. Including a 50-foot buffer along the northern boundary and cemetery protection buffers, this yields a total mineable area of 10.0 acres within V-179A.

Access to the property is by State Route 14 (SR-14) via a paved turn-off to the Avery Boat Landing (see Figure 1). An unpaved road leading from the boat landing to the east accesses the active Avery Pit, and continues uphill into V-179A. Since the bulk of commercial aggregate shipments is and will continue to be by barge, local truck hauls through this access have generally been limited to 12 round-trips per day. Truck transport relative to barge transport will continue to decrease in importance. Although access to SR-14 has existed via the paved turn-off for several decades, access agreements (whether implied or expressed) pertaining to commercial truck haulage of aggregate with the Washington State Department of Transportation (WSDOT) are unclear. If a permit is required, PNA will submit an appropriate Access Permit Application with WSDOT.

Existing power transmission line, belonging to the Klickitat County Public Utility District, parallel the rail line, as well as SR-14. The latter provides electric power to the existing processing facilities on V-179.

OTHER ACTIVE/INACTIVE QUARRIES IN VICINITY

Several inactive pits and quarries exist in the general area. BIA leasing records indicate that the Avery Pit was mined as early as the 1950s. A small quarry exists on allotments approximately 1 ½ miles to the east. Several more quarry sites exist in the basalt bluffs between the Avery Pit and the town of Wishram to the east. Sand and gravel was mined on Miller Island five miles to the east as late as the 1970s. Much of this previous mining activity was likely coincident with construction of The Dalles Dam, relocation of the former Spokane Portland & Seattle Railway (now BNSF), maintenance of SR-14, and development, construction, and decommissioning of aluminum smelters. The Dallesport Peninsula, six miles to the west, is the site of three currently active sand and gravel operations. Commercial interest has been expressed regarding other sites in the Dallesport area and along the reach of the Columbia River to the east of Wishram, Washington.

1.4 GEOLOGY AND HYDROGEOLOGY

Avery is located within a gravel bar on the north bank of the Columbia River, left as an erosional remnant from the series of regional floods that occurred at the end of the last Ice Age, some 10,000 years before Present. This series of floods, called the Missoula Floods for its point of origin, inundated the lower Columbia River Basin with water from the failure of several large ice dams, creating a number of erosional features in the basin, including the Channeled Scablands and the Columbia River Gorge. The gravels in the Avery deposit have their provenance in what is now Eastern Oregon and Washington, Northern Idaho, Montana, and Southern Canada. Cursory geologic maps (Newcomb, 1969) propose that the gravel bar extends from ½ mile east of the Avery Pit entirely through Section 14, pinching off approximately ¼ to ½ mile west of the section line. Talus slopes on the south flank of the Columbia Hills anticline define the north extent of the deposit.

Along the north extent of the gravel bar, maximum deposit depth probably coincides with the talus slopes. Until further subsurface investigations are done (i.e., borings or geophysical surveys), the exact depth and extent of the deposit will not be known.

Washington Department of Ecology lists one water well in the immediate vicinity (see Appendix II – WDOE Water Well Report), coincident with an adjacent residence (see Figure 3 for location). The well report (from September 1977) describes water at a depth of 275 feet, which roughly coincides with the adjacent Columbia River elevation. Direction of ground water movement is interpreted to range from being sub-parallel to the River, in a downstream direction, to a direction at right angle to the riverbank.

The drill log for the Water Well Report also describes the intercept of fractured basalt at a depth of 207 feet, which would roughly coincide with an elevation of approximately 220 feet above Mean Sea Level. The interval from 170 to 207 feet depth (approximately 220 feet to 260 feet elevation) demonstrates *boulders* mixed with *sand and gravel*. These elevations are interpreted to be the intercepts of the bedrock and talus float, respectively.

Surface trenching performed on V – 179A is described in Section 3.11 – Parcel V-179A subsurface examination.

2.0
GOVERNING REGULATIONS AND GUIDELINES

Authority for leasing the mineral resources on V-179 and V-179A is found in 25 CFR 212.4, where operations management is officially delegated to 43 CFR 3590 – Solid Minerals (Other Than Coal) Exploration and Mining Operations. Part 212 of Title 25 CFR covers the leasing of allotted Indian lands for mineral development (*allotted lands* refers to parcels outside the reservation proper that were awarded to individual Tribal members in the General Allotment Act of 1887).

BLM's authority and operator obligations for allotted Indian lands leased under 25 CFR part 212 are described in 43 CFR 3590-0-7. BLM's authority is primarily as *trust manager* for approval of the mine and reclamation plan and oversight of the day-to-day operations, as well as advisors to the Bureau of Indian Affairs (BIA) at the leasing and bonding stage. BLM's authority is shared with BIA by virtue of regulatory requirements and Memoranda of Understanding to consult and manage lease/permit sites pursuant to 43 CFR 3590. Under the Indian Mineral Development Act, most of the dominant authorities of the Bureau of Indian Affairs were relegated to the individual tribal units. In terms of environmental compliance, 25 CFR Section 212.7 requires compliance with the National Environmental Policy Act (NEPA), Archaeological and Historic Preservation Act, National Historic Preservation Act, and the American Indian Religious Freedom Act.

As noted above, operating standards are defined in 43 CFR 3590. The expressed requirements are primarily found in Subpart 3591.1 – General Obligations of Lessees, Licensees, and Permittees, and makes reference to *established requirements*, meaning those principles set forth during leasing, and consistent with the NEPA processes. This Subpart, through descriptions like *Soil erosion* and *Damage to vegetation*, refers to 10 specific areas of environmental damage/pollution that are to be avoided, as well as delineation of relevant Federal and State standards. Subpart 3592 states requirements for plans and maps, which are virtually identical to those required by most States with applicable mining laws (i.e. pre- and post-mining topography, local hydrology, adjacent land owners, re-vegetation species, etc). In terms of surface mining, the only other references made are for protection of excavation for public safety purposes, and the concept of *ultimate maximum recovery*, which requires that the maximum economically mineable material be removed from the site prior to abandonment, taking into consideration safety concerns and local land use.

Further standards required for mining plan submittals are clearly explained in 25 CFR 216.7 – Approval of Mining Plans. This mine and reclamation plan is based on these standards, as well as further guidance provided by BLM officials. The mining plan must also fully comport with 43 CFR 3592.1. Further operational standards and conditions are included in the BIA *Sand and Gravel Permit*, such as the requirement for a 5-wire perimeter fence. A chain link fence will be installed along the north line of V-179A, adjacent to residential areas.

2.1 EXISTING PERMITS AND AGREEMENTS

In addition to this Mining and Reclamation Plan (MRP) and affiliated Environmental Assessment (EA), several other leases and agreements are valid at this time. These include:

Lease DACW57-1-95-0004 (formerly DACW57-1-85-5) between PNA and the U.S. Army Corps of Engineers for occupation of a submerged 1.85 acre tract for the purpose of barge loading. This agreement includes a right-of-way for use of the portion of the main access road through the Avery Boat Launch park.

A *Joint Aquatic Resources Permit Application* was filed in February 1999 for Washington Department of Wildlife *Hydraulic Project Approval* and for a U.S. Army Corps of Engineers *Section 10 Permit*. These approvals were necessary to install four new mooring and breasting dolphins, a new conveyor support platform and tower, a new walkway, and a new belt conveyor. The purpose of this construction was to improve the efficiency of barge load-out systems. The application was approved and the permits were issued in the Spring of 1999.

December 1999 lease with the Burlington Northern Santa Fe Railway Company for the use of an 85 foot wide right-of-way on the north of the mainline, as well as a frontage road, and several track and culvert crossings.

May 2000 agreement between PNA and Wheeler Logging detailing cooperative development of V-179, V-179A, and V-194.

To date, the level of service of haulage operations from the Avery Pit have not required a Washington Department of Transportation access permit to SR 14.

Copies of the above documents can be found in Appendix III. Federal water quality permits are only required for point source discharges to surface waters. This operation has no point source discharges.

3.0
DESCRIPTION OF PROPOSED MINING PLANS

3.1 PRODUCTION SCHEDULE

Mining will primarily be accomplished by excavation with a rubber-tired loader (see Section 3.4.1. – Mining method description for further details), and for the foreseeable future will be exclusively for *pit run* material that will be loaded onto barges. It will consist of six phases, four in V-179 and two in V-179A. The four phases in V-179, from 5 to 6 ½ acres in size, will be mined primarily from south to north (see Figure 3 in Appendix I), in sequence with mining on V-194. The two phases in V-179A will be mined from west to east and consist of, respectively, 4.8 acres and 7.0 acres (including buffers) (see Section 3.2 – Mining acreage descriptions for further details, as well as Figure 3). In addition, there is a 3.6 acre zone between the present northern access road and the eastern boundary of V-179A that is a potential future expansion area, pending investigation of cultural resources and the impact of drainage and erosion on the Tribal cemetery immediately to the south (See Section 4.9 – Protection of cultural resources). The expected maximum output of the mine will be 1,000 short tons per hour. At one 8-hour shift per day, 5 days per week, and 50 working weeks per year, the maximum annual production should be 2,000,000 short tons per year. At 1.64 short tons per loose cubic yard, this yields approximately 1,200,000 loose cubic yards processed per year. At 14% swell, this yields approximately 1,050,000 bank cubic yards excavated per year. See Section 3.4.4.1 for discussion of volume calculation methods and derivation of factors.

Preliminary reserve calculations yield an estimated 7.7 million short tons of sand and gravel available for mining back to reclaimed slopes. Of this total, 3.8 million short tons are within V-179 (the present pit) and 3.9 million short tons are within V-179A (the expansion area). This would give a total life of mine of 3 years 11 months, with approximately 160,000 short ton per month projected maximum production. This volume figure includes overburden excavation (see Section 3.4 – Overburden and excavation).

3.2 MINING ACREAGE DESCRIPTIONS

As shown on Figure 3, mining will occur in six phases, four within V-179 and two within V-179A, and possibly one additional phase in V-179A that requires further investigation (see above). Phases will be of varying sizes, and in different final stages of depletion throughout the life of the project.

Time frame, tonnage, and basic description for the phases in V-179, based on the above calculations, can be summarized as follows. Acreage values do not include buffers and setbacks.

Production from Phase I (7.1 acres) will total approximately 388,160 loose cubic yards (636,582 tons) and will contribute approximately 4 months toward the final production time frame. Activities in this phase will consist of *daylighting* through to V-194 down to

a pit floor of 165 feet elevation.

Production from Phase II (5.6 acres) will total approximately 534,722 loose cubic yards (876,949 tons) and will contribute approximately 5 ½ months toward the final production time frame. Activities in this phase will consist of *daylighting* through to V-194 down to a pit floor of 165 feet elevation.

Production from Phase III (6.6 acres) will total approximately 1,154,181 loose cubic yards (1,892,857 tons) and will contribute approximately 11 ½ months toward the final production time frame. See following paragraph for description of mining activity.

Production from Phase IV (5.6 acres) will total approximately 180,105 loose cubic yards (295,372 tons) and will contribute approximately 1 ½ months toward the final production time frame. Completion of Phase IV may not occur in sequence.

Dozer work in the western portion of Phase III south of the present access road is currently bringing the vertical walls within V-179 down to the temporary slope of 1.5H:1V. Extraction of the remaining mineable material in the northern portion of V-179 will continue in this area. Underhand mining in benches will proceed northward to the V-179 / V-179A line, and then from west to east within V-179A using temporary slopes of 1.5H:1V. Final pit slopes will be mined to the approved grade of 2H:1V and reclaimed.

Time frame, tonnage, and basic description for the phases in V-179A, based on the above calculations, can be summarized as follows:

Production from Phase V (3.9 acres, excluding 50-foot buffers) will total approximately 752,895 loose cubic yards (1,234,748 tons) and will take about 8 months to complete. Activities in this phase will consist of *daylighting* through to V-194.

Production from Phase VI (6.1 acres, excluding 50-foot buffers) will total approximately 1,661,013 loose cubic yards (2,724,061 tons) and will take about 16 ½ months to complete.

The cultural resource setback area (3.6 acres) north of the cemetery protection buffer and east of the northern access road could provide an additional 300,000 loose cubic yards (500,000 tons), pending characterization of cultural resources and investigation of the effect of potential erosion on the cemetery area.

Resource quantities are based on property lines established during the June to September 2000 BLM survey, and do not include any material within buffers, setbacks, etc. Quantities for Phases IV through VI include overburden (overburden in Phases I through III has already been removed). Relative overburden quantity and handling are discussed in Section 3.4.

A 50-foot buffer will be maintained along the north and east project boundaries (excluding

the cemetery buffer described below). There will be no buffer along the west because mining in V-179 and V-179A will *daylight* west into V-194. A residence located north of V-179A is approximately 80 feet due north of the lease area north boundary. The distance between this residence and the nearest active portion of the proposed pit will be 400 feet. A cemetery protection buffer incorporating 8.1 acres within the present lease holdings is being implemented in the eastern project area (see Figures 3 and 4, as well as Section 4.9 – Protection of cultural resources). Specific acreage for surface facilities, stockpiles, or processing plants will be variable as mining proceeds into V-179A.

3.3 TOPSOIL

As described throughout Section 4.0 – Description of proposed reclamation plan, topsoil and overburden stripping and replacement will follow the principles of *segmental reclamation*. Due to the steep nature of the project site in the north, as well as the present configuration of the current active pit, it is not always possible to mine and reclaim, or to follow a common regional standard, in uniform 7-acre segments. However, this concept will be followed in principle and practiced to the greatest extent possible. For instance, as mining in V-179 approaches completion, those phases that have been mined back to the final slope in V-179 will be reclaimed. Concurrently, as mining progresses from west to east through V-179A, the sequence of topsoil stripping and replacement will be optimized, and haulage will be minimized, by stripping topsoil and placing it in perimeter berms on the adjacent dormant segment. It will be replaced as mining retreats, ideally no more than 7 acres will be open at a time. This is called *rolling reclamation*. Topsoil for the final reclamation of Phases I through III will be supplemented by excess overburden from Phases V and VI. Refer to Section 3.4 – Overburden and excavation and Section 3.4.4.1 - Material balance for discussions of overburden handling, and Section 3.11 – Parcel V-179A subsurface examination for discussions of overburden thickness.

3.3.1 STRIPPING, HANDLING, AND STOCKPILING

On virgin segments, topsoil will be stripped with a rubber-tired scraper**,** hauled to an adjacent dormant segment, and deposited by the scraper. A track dozer or rubber-tired loader will place the topsoil into perimeter berms for storage until replacement. Stockpiles will be immediately seeded with native grasses to minimize losses from wind and erosion.

In general, overburden will remain on the tract of original ownership. However, storage area limitations and operational constraints may require that overburden be stored on other tracts. This will be done only if the conditions are agreed upon by all parties and approved by BLM in advance, followed by proper identification of and accounting for these materials. Topsoil and overburden material on V-194 that was originally from V-179 will be mapped and surveyed and will remain on V-194 until it is used in final reclamation of V-179, following BLM approval.

3.3.2 EROSION PROTECTION

No topsoil stockpiles will be placed within any existing natural drainage. To minimize erosion from periodic storm events, topsoil stockpiles will be immediately seeded with native grasses, using hydro-seeding. Surface mulching, with anchoring or crimping if necessary, will follow to hold the seed in place until it germinates, thereby minimizing wind erosion. To lessen the likelihood of adverse dust impacts, topsoil stripping will be performed during times of average low wind speed, such as late fall to early spring when the ground is wet; or dust will be controlled by application of water from trucks or a temporary irrigation system.

3.3.3 TOPSOIL STRIPPING AND USE TIMELINE

The proposed topsoil stripping and replacement timeline is given in Table 1.

TABLE 1
PROPOSED TOPSOIL HANDLING TIMELINE

Mining segment	Begin topsoil stripping	**Begin mining**	Complete mining	Complete topsoil replacement
Phase I	N/A	Month 0	Month 4	Month 50**
Phase II	N/A	Month 4	Month 9 ½	Month 50**
Phase III	Month 10	Month 9 ½	Month 21	Month 50**
Phase IV	*	*	Month 22	Month 22.5
Phase V	Month 22	Month 22.5	Month 30.5	Month 31
Phase VI	Month 30	Month 30.5	Month 47	Month 47.5

** Mining within phase may be out of sequence, dependent on site requirements and lay-out*

*** Final topsoil replacement contingent on time frame of final mining to slope*

3.4 OVERBURDEN AND EXCAVATION

Overburden at the project site consists primarily of what is known locally as *blow sand*. Quality of this material varies from gray colored material resembling beach sand to a richer brown material that could be classified as topsoil. This unit is described in Natural Resource Conservation Service (NRCS) reports as the Dallesport Gravelly Fine Sandy Loam. This unit was formed in eolian (wind-blown) dunes and deposits over sand and gravel on the local terraces (Kreft, 1998). For segments on which there has been no mining, overburden will be stripped and stockpiled, unless a market is discovered for it. Excess overburden remaining after reclamation will be blended with the final reclaimed slopes at the approved grade. In the past, topsoil and overburden material had been taken from V-179 and placed on V-194. This material will be dealt with as described in Section 3.3.1 – Stripping, handling, and stockpiling.

Overburden thickness was measured at available outcrops across the active Avery Pit on V-179 and was consistently in the 3 to 5 feet range, typically around 4 feet.

Observations at the private property to the east confirm the continuity of this layer. This large amount is due to the comparatively excessive thickness of the *blow sand* in these areas adjacent to the Columbia River. Exposures within the north-central and western end of the pit rim demonstrate a sufficient quantity and quality of material that would be suitable for use as reclamation topsoil. A limited amount of material exposed in the eastern end of the pit rim appeared to be primarily sand covered by a thin layer of organically derived material. Test pits across V-179A demonstrate that overburden thickness in this parcel decreases from approximately 6 feet in the northeast corner down to 1 foot in the southwest corner. See Section 3.11 – Parcel V-179A subsurface examination for detailed logs.

Several re-vegetated overburden stockpiles, totaling approximately 17,100 cubic yards, exist throughout the Phase III area. Inspection of historic aerial photography shows that these piles were the result of mining activity prior to 1970 and acquisition of PNA by the current owner / operator. The location of these piles are shown in Figure 3, Appendix I. This material will be used in final reclamation (see Section 3.4.4.1 – Material balance).

3.4.1 MINING METHOD DESCRIPTION

Topsoil and overburden will be stripped and stockpiled, with the exception of areas in Phases I, II and IV where none remain. Mining will proceed down in 50-foot benches in accordance with Mine Safety and Health Administration safety requirements under 30 CFR 56, as well as with the BLM's Solid Minerals Reclamation Handbook (see Figure 4 in Appendix I) Temporary slopes will be at 1.5H:1V, with final reclaimed slopes maintained at 2H:1V (see below). Excavation will be accomplished by dozer assisted rubber-tired loaders digging *pit run* material, and dumping it into a feeder hopper. When production is occurring simultaneously on different ownership tracts, excavated material from each tract will have a dedicated feeder hopper each followed by a belt scale. Royalty payments will be based on the quantities measured by these belt scales.

In response to processing requirements and available facilities in the Portland metropolitan area, PNA initially will be primarily shipping *pit run* material by barge. Excavated material from each tract will be transferred to the barge load-out conveyor after proper measurement. Limited on-site processing will be implemented at some point in the future using equipment presently in place. Processing will consist of small production runs processed on-site for local markets, using material mined from V-179 only.

Excavation methods may be modified as mining proceeds subject to BLM review and approval, based on continuing appraisals of the most suitable techniques. Temporary slopes as the pit expands may be as steep as 1.5H:1V. Final reclaimed slopes will be maintained at 2H:1V (measured as the interbench angle – see Section 4.2.1 –

Temporary stabilization measures) to the final maximum pit depth at 165 feet elevation as shown on Figures 4 and 5. During full production, there should be 18 employees, including 1 supervisor, working on-site for one eight-hour shift.

VISUAL SCREENING AND NOISE

Much of the visual evidence of mining activity within V-179 and V-179A will not be discernible from SR-14 or adjacent residences because the bulk of transfer, future processing, and loading will take place on the active pit floor, in a topographical depression. Most mining activity, equipment, and facilities should not be visible from Interstate 84 because it is hidden behind the berm south of the prior settling pond area. If mining and processing operations become visually intrusive, impacts will be mitigated by such means as constructing berms, or use of other screening methods (e.g. planting trees, planting fences, etc). Furthermore, progressive segmental reclamation and rapid re-vegetation, including temporary stockpiles, will improve both the interim and long-term appearance of final slopes.

The expanded V-179 / V-179A / V-194 pit will be visible from SR-14. Visual screening methods will be implemented, and will be a cooperative effort between PNA and Wheeler Logging.

Throughout its forty year history, the present operation has never been the subject of noise complaints from neighbors. In addition, the mine will operate on only one-eight hour shifts per day. The only operations that may take place at night are barge loading which will be ½ mile from the nearest residence and in a topographical low. Appropriate berms and/or vegetation screens will be established at such time as there are mining operations in the northern extreme of V-179A. Office facilities and staging areas in Phase I are shielded from Interstate 84 by a berm as shown in Figure 3.

3.4.1.2 RELATION TO OPERATIONS ON V-194

In January 2000, BLM approved a mining and reclamation plan for V-194, which had been leased to Wheeler Logging for gravel development by BIA in 1999. A May 2000 agreement between PNA and Wheeler Logging laid the foundation for cooperative operation of the two sites. The V-194 MRP *Wheeler Logging Mining-Reclamation Plan for the Eagle Point Gravel Pit*, as well as this MRP, indicate that both operations will *daylight* through to each other along their common boundary, meaning that the ultimate final pit will incorporate V-179, V-179A, and V-194. This final pit will have coordinated slopes and landforms, as well as a common pit floor elevation (165 feet above Mean Sea Level). Furthermore, recent revisions to the BIA lease for V-179 require that payment be made to the owners of V-179 for trans-shipment of material from V-194 and V-179A across V-179 (see Section 3.12 – Accounting for royalties and trans-shipment fees).

PNA will be managing operations on both sites. This will enhance cooperation regarding such aspects as trans-shipment and maintaining common slopes. However, the unique identity and relative quantity of the two sites will compel that they be operated as separate units, influenced by relations with the mineral owners of the various tracts as well as varying market demands

3.4.2 EQUIPMENT

Equipment currently in use, as well as processing equipment used for limited production runs of V-179 material, is listed in Table 2. This includes wheel loaders (4 and 10 yard buckets), Caterpillar D8 bulldozers, graders, backhoes, and 30 - 40 ton pit haul trucks. Off-site haul trucks generally belong to customers or contract carriers, with 10-yard dump trucks and 18-yard belly dump trucks typically in use.

TABLE 2
ON-SITE EQUIPMENT

DEVELOPMENT	**PROCESSING**
1 D-8 dozer & 1 temporary dozer as needed	Barge loading conveyor
1 grader	Various conveyors in processing circuit
1 3,200 gallon water truck	Various stockpile conveyors
	Feed hopper
EXCAVATION	Feeder
1 10 cubic yard rubber tired loader (excavator)	Primary jaw crusher
1 4 cubic yard rubber tired loader	Secondary cone crusher
1 rubber tired backhoe	Screen deck and wash plant
1 bobcat	Sand cyclone
HAULAGE	**PRODUCTION ACCOUNTING**
3 30 - 40 ton off highway end dump haul trucks	3 belt scales
1 mechanic truck	

3.4.3 OVERBURDEN AND PRODUCT REMOVAL METHOD

Overburden will be excavated and hauled by dozer assisted rubber-tired loaders or pushed by dozers into on-site stockpiles and berms. Overburden material will not leave the site and will be used in final site reclamation, unless surplus quantities not required for reclamation are sold. If overburden is removed from the tract of origin, subject to BLM approval, the volume will be surveyed prior to final placement to assure appropriate royalty accounting and the stockpile will be clearly identified while in storage until its final placement back on the tract of original ownership. Before moving overburden off of any allotment of origin for storage on another allotment,

PNA shall request a modification for this action and approval from BLM. If this approval is granted, PNA shall provide BLM with volumetric survey information delineating the quantity of overburden moved, a map showing the location and size of the stockpiles, and the method used to clearly mark and protect these piles on the ground. This information shall be provided to BLM within 30 days following the time the overburden of a phased mining unit has been moved.

Sand and gravel will be excavated by rubber-tired loaders. Several options exist for the removal of salable sand, aggregate, and rock from the project site. The ongoing use of the existing on-site barge loading facility has proven to be, by far, the easiest and most economical option. Therefore, it will continue to function as the primary means for off-site haulage of product material. Other off-site haulage methods include truck haulage via the Avery boat launch road and SR-14 to local and regional markets. Truck haulage will likely continue to decrease in importance relative to barge transport.

The main access road consists of the paved *Avery Boat Ramp Road*, which connects the Avery Recreation Site to SR-14. The portion of this road within the Avery Recreation Site is subject to a long-standing lease (renewed in 1999) between PNA and the U.S. Army Corps of Engineers (see Appendix III). This road is contiguous to the graveled railroad frontage road from the Avery Recreation Site to Avery Pit. This portion is subject to a 1999 lease agreement between PNA and BNSF (see Appendix III). PNA is currently in discussion with BNSF regarding commercially viable measures of dust suppression for this road.

Internal haul roads within the leased area will be extended and obliterated gradually as mining, processing, and stockpiles proceed to the north and west. On-site haulage will consist of dump truck trips from the working face to feed hoppers or surge piles. Most off-site haulage will be via barge, but there may be limited truck haulage by local contractors. Throughout 1999, local haulage consisted of an average of 12 round-trips per day, approximately 90% of these from one customer based in The Dalles.

A Washington Department of Fish and Wildlife / U.S. Army Corps of Engineers Joint Aquatic Resources Permit was issued in February 1999 (see Appendix III) for the upgraded barge loading facility. The Washington Department of Fish and Wildlife and National Marine Fisheries Service were both involved in the approval of this action and subsequent impacts on aquatic habitat during the review and consultation process. The figures within the permit application in Appendix 2 provide details of the barge loading facility.

3.4.4 TOTAL QUANTITY OF MATERIAL TO BE MINED

As stated in Section 3.1 – Production schedule, preliminary reserve calculations yielded a potential mineable quantity of 7.7 million tons. This figure can also be expressed as 4.7 million loose cubic yards or 4.1 million bank cubic yards. These values may be adjusted somewhat in the future pending the examination of a recent in-place material density survey (see Section 3.4.4.3 – Material density and swell factors).

As described earlier, the majority of initial production will be *pit run*. Future sales from potential production runs may consist of:

2" - ¾" drain & decorative rock.
Crushed 1" minus, known as *Oregon Inch*.
¾" concrete aggregate
ODOT *spec* pea gravel (88-98% passing 3/8")
Spec concrete sand
Masonry sand
Fines (< 200 mesh) as a soil additive
Special order items, such as specific sizes for filtration media.

At present, there is limited use for *fines* (material passing a 200 mesh screen). However, several potential markets and uses are in active development in the aggregate industry, and may prove successful prior to the completion of mining. Any fines remaining on-site after deposit depletion will be hauled off-site or graded into final slopes at the location shown in Figure 4.

3.4.4.1 MATERIAL BALANCE

A knowledge of the disposition of the relative amounts of topsoil, uneconomic overburden, and economic sand and gravel is important. This will establish the amount of material available for reclamation, as well as define any quantities that may ultimately need to be removed the site. Following are descriptions of the derivations of material volumes, followed by a proposed material balance. The purpose of this section is to determine if there is adequate topsoil available for reclamation, and subsequently define the amount of surplus topsoil and overburden.

Initial production from the site will be primarily *pit run* material, so excess fines (< 200 mesh) will not be a consideration. During limited on-site processing for local markets, sand cyclones will minimize the amount of fines material remaining in settling ponds. Remaining fines material will be re-graded into final slopes. A portion of excess sandy overburden could be sold for fill sand if not used in reclamation.

The total amount of available topsoil material was estimated by multiplying the 4-foot

average overburden thickness (see Section 3.4 – Overburden and excavation) by the surface area of the segments that have a topsoil cover remaining, exclusive of buffers, specifically Phases V and VI (see Section 3.2 – Mining acreage descriptions for mining phase acreage values). This value assumes that the sandier overburden material from the east portion of V-179A can be blended with the richer material from the middle and west during reclamation.

Surface area of Phases V and VI:	569,145 ft^2
Average topsoil thickness:	x 4 ft
Volume of available topsoil:	= 2,276,580 ft^3
	or 84,318 yd^3

This volume includes historically placed overburden on Phase IV (see Section 3.4 – Overburden and excavation). The total amount of required topsoil was estimated by multiplying the one foot of proposed reclamation topsoil by the area that will require topsoil spreading, i.e., Phases I through VI. See Section 4.6.1 – Soil redistribution methods for information on reclamation topsoil.

Surface area of Phases I through VII :	1,562,125 ft^2
Average topsoil thickness:	x 1.0 ft
Volume of required topsoil:	= 1,562,125 ft^3
	or 57,856 yd^3

On V-179A, much of the overburden contains large blocks of basalt talus that will be crushed and sold. However, the generalized assumption of a 4-foot thick layer of topsoil will be used rather than trying to ascribe a percentage or a figure based on mathematical averages of assorted thickness measurements.

Total mineable volume:	5,060,000 yd^3
Total volume of available topsoil:	- 84,318 yd^3
TOTAL VOLUME OF MINEABLE AGGREGATE:	= 4,975,682 yd^3

Total volume of available topsoil:	84,318 yd^3
Total volume of required topsoil:	- 57,856 yd^3
TOPSOIL SURPLUS	= 26,462 yd^3

A surplus of 26,462 yd^3 of topsoil material will be available.

3.4.4.2 VOLUME CALCULATION METHODS

Post-mining volume calculations were performed by two different methods, one during initial design stages and the second during later reconfiguration. The extracted volume for the initial design surface was calculated with the software package *AutoCAD Land Development Development Desktop* v1.02, manufactured by

Autodesk. The program uses an optimized computer version of the ***average end area*** method for calculation of volumes. The method is described from an earthwork surveying standpoint in Moffit and Brouchard (1992), and its applicability to mining excavations was verified in Noble (1992).

Final post-mining topography was redesigned in June 2000 and October 2000 following discussions with the Yakama Indian Nation Cultural Resources Department (see Section 4.9 – Protection of cultural resources). The new design incorporated a larger cemetery protection area (a "buffer"), as shown in Figures 3 and 4 of Appendix I. The difference between the initial design surface and this new design surface was calculated by elementary geometric methods, i.e. surface-to-surface volumes modeled as a wedge, frustum, or pyramid.

The resulting volume, in bank cubic yards, was multiplied by 1.14 to obtain the value for loose cubic yards. This value was multiplied by 1.64 to obtain the tonnage. The derivation of these factors is described in the following paragraph. A recent investigation, however, has indicated swell factors from 6% to 25% are appropriate, depending on the material. Since no spatial correlation could be determined from *in-situ* density values, it is difficult to assign different swell factors for different sectors of the pit. See Section 3.4.4.3 – Material density and swell factors.

Swell factor is the increase from intact bank density to marketable loose density as the material is excavated, hauled, and processed. In order to calculate this factor, Halstead personnel obtained a representative sample from the floor of the active Avery Pit on March 4, 1998. The sample was then sent to Strata Geotechnical Engineering and Materials Testing of Boise, Idaho (Strata) to test the material for Relative Density via ASTM Method D4253/4254, which demonstrates the maximum expansion of the material. Strata personnel stated that in their experience most glaciofluvial gravels exist within a reasonable range of 70% of maximum compaction.

Results of the Strata testing indicate the representative sample will swell 13.9% upon excavation (see Appendix IV). Therefore, a reliable estimate of loose volume for Avery Pit material can be obtained by multiplying the intact bank volume by a factor of 1.14 to correct for the approximately 14% increase from bank density to loose density. This is consistent with Niva (1998) who stated that, most regional sand and gravel deposits will exhibit an approximately 15% swell upon excavation.

The tonnage was obtained by multiplying the derived loose volume by a *tonnage factor* of 1.64. The raw extractable tonnage can be derived from the same Strata laboratory results used for swell factor. This is accomplished by multiplying the loose volume by the Minimum Index Density (MID). The MID, given in Appendix III as 121 lb / ft^3, is the density the material achieves in its loosest natural excavated state (at *loose volume*). The MID is converted to a tonnage factor as follows.

MID * 27 ft^3 / yd^3 * 1 ton / 2000 lb = TONNAGE FACTOR

117.7 lb / ft^3 * 27 ft^3 / yd^3 * 1 ton / 2000 lb = 1.64 ton / yd^3

The occurrence of sand and gravel down to a depth of 207 feet below the surface at the residential water well location, combined with knowledge of the local geologic setting and trenching results (see Section 3.11 – Parcel V-179A subsurface examination), form the basis for concluding that gravel occurs at a sufficient depth throughout tracts V-179 and V-179A to support the current mine plan.

3.4.4.3 MATERIAL DENSITY AND SWELL FACTORS

Northwest Geotech, Inc. of Wilsonville, Oregon was contracted by BLM in November 1999 to perform measurements of *in-situ* (in-place) density and moisture content throughout V-179. Thirteen samples were taken in the gravel unit, nine were taken in the sand horizon, three were taken in topsoil on Phase III, and eight were taken in various material stockpiles. In terms of in-place density of the gravel unit, there did not appear to be any spatial correlation amongst sample locations. The average value was 124.6 pounds per cubic feet (pcf), with a low value of 108.1 pcf (7.5% lower than average) and a high value of 136.8 pcf (10.2% higher). For in-place density of the sand horizon, the average value was 103.7 pcf, with a low value of 93.7 pcf (9.6% lower than average) and a high value of 110.9 pcf (6.4% higher). The three in-place densities for the topsoil measured in Phase III were 101.7 pcf, 103.9 pcf, and 105.2 pcf.

In order to determine a usable swell factor, these in-place values must be compared with stockpile density values. The average of the eight stockpiles measurements was 101.6 pcf. The stockpile with the lowest unit weight was pea gravel at 98.7 pcf (1% lower than average). The highest was ¾" to #4 concrete aggregate at 103.7 pcf (2.1% higher). Swell factor (SF) is calculated as:

SF = (in-place density) - (average stockpile density) / (in-place density)

Average stockpile density is analogous to Minimum Index Density from above. SF will be evaluated for the high, low and average in-place densities of the gravel unit.

SF_{LOW} = (108.1) - (101.6) / (108.1) = 6.0%
SF_{AVG} = (124.6) - (101.6) / (124.6) = 18.5%
SF_{HIGH} = (136.8) - (101.6) / (136.8) = 25.7%

These results indicate a tolerance of as much as 12%, representing a substantial volume difference in calculations. However, the calculated value for SF_{AVG} is less than 5% different than the value used in Section 3.4.4.2. Because the in-place density values did not exhibit spatial correlation, it is difficult to assign different swell factors to different areas of the pit. An average value, the 14% Strata value, will have to be assumed until in-place density can be further characterized.

3.4.5 MINING PHASE DESCRIPTION

As described in Section 3.1 – Production schedule, 3.2 – Mining acreage descriptions, and 3.3 – Topsoil, mining will take place in six phases. Phases I, II, and III represent *daylighting* V-179 west into V-194, Phase IV involves completion and final grading within the existing excavation, and Phases V and VI consist of mining virgin ground in V-179A, generally from west to east, as well as *daylighting* west into V-194. In addition, there is a 3.6 acre zone in the eastern portion of V-179A that is a potential future expansion area pending cultural resource investigation. Descriptions of these parcels, including acreage and mineable volume, are described in Section 3.2 – Mining acreage description. Pre- and post-mining topography, with phase boundaries, are shown in Figures 2 and 4. Temporary slopes may be as steep as 1.5H:1V, but reclaimed pit slopes will be maintained at 2H:1V or shallower.

3.5 WATER REQUIREMENTS AND RESOURCES

As described in Section 3.4.1 – Mining method description, there will be no material processing on-site for an as yet unknown period of time (see Section 3.9 – Processing facilities for description of plans pertaining to the settling pond). However, when material processing is re-initiated to supply local markets, process water will be required in the wash plant for the removal of fines. The existing on-site well will be the primary source of process water, with a portion recycled from on-site settling ponds. Water will also be withdrawn from the on-site well throughout the mine life for dust control, fire protection, hydroseeding during reclamation, etc. Potable drinking water will be imported.

The Oregon Climate Service reports that the average annual precipitation at The Dalles from 1998 - 1999 was 14.6 inches. For January to August 1999, the average monthly precipitation was 0.33 inches per month. The majority of precipitation will be returned to the air via evapo-transpiration. In terms of proposed operations, there are no perennial streams, ponds, wetlands, or springs located on the site. The site and its immediate vicinity are not under the influence of any drainages. The nearest intermittent drainages, based on erosional features, are approximately ¼ to ½ mile to the east and west. Furthermore, there are no point source discharges affiliated with production or processing operations. Surface runoff during storm events would be confined to that resulting from runoff within the pit area itself, i.e. the final pit will impound or contain all surface runoff.

3.5.1 DAILY AND ANNUAL WATER REQUIREMENTS

Initially, water will be used primarily for dust control and incidental uses and will not exceed 5,000 gpd. Future estimates of water required when limited on-site processing begins cannot be estimated until the processing system is designed. This plan will be amended when these requirements are known.

3.5.2 WATER SOURCES AND USES

Stipulation #22 in the present BIA lease for V-179 states *"ÿ water in situ at the premises shall be made available to Permittee for its removal operationsÿ"*. No limit is placed on withdrawal amount, and the withdrawal is not subject to Tribal water rights permits because it is on an off-reservation, individually owned allotment. Furthermore, Washington State Department of Ecology has no authority to issue water rights on lands under the jurisdiction of the Yakama Indian Nation. At an unknown point in the future, this water will primarily be used to supplement processing circuit recycle water. Figure 3 in Appendix I shows the location of the existing process water well. No other process water wells are planned.

When limited on-site processing begins, water recycled from settling ponds, supplemented by withdrawals from the on-site well, will be used in the future wash plant to remove the fine materials (< 200 mesh). This will be, by far, the major water use. Water discharged from the processing circuit will be sent through sand cyclones to the settling pond for recycling. Other significant water uses include dust control, fire protection, and hydroseeding. Any other water uses will be incidental, as described in Section 3.5 – Water requirements and resources above. Potable drinking water will be imported, and sanitary facilities will be regularly-serviced portable units leased from a local company. As needed, well water and/or recycled water will be used on newly seeded areas.

3.6 CONTAMINANTS

Fuel, lubricants, coolants, etc. used in mining and haulage equipment will be stored, dispensed, and collected as regulated by State and Federal workplace safety and health regulations via the Mining Safety and Health Administration, the Occupational Safety and Health Administration, and Washington Labor and Industries laws (details following). Between 200 - 500 gallons of diesel fuel will be used per day of operation. For the foreseeable future, this fuel will be provided by regular service from a local contract carrier. Other quantities of petroleum products on site will be for incidental requirements only. These include motor oil, hydraulic oil, and gear oil, and the amount will not exceed 300 gallons. There is generally no more than 50 gallons (one drum) of coolants on site, as well as 2 cases of grease. Waste oil is removed periodically from the site by a licensed reclaim service.

Regulations described in 40 CFR Part 112 establish *"ÿ procedures, methods, and equipment and other requirements to prevent the discharge of oil from non-transportation related onshore and off-shore facilities into or upon the navigable waters of the United States or adjoining shorelinesÿ"* These regulations apply to owners and operators of facilities that engage in *"ÿdrilling, producing, gathering, storing, processing, refining, transferring, distributing, or consuming oil and oil productsÿ"* that could reasonably be expected to be discharged in harmful quantities into or upon navigable waters of the U.S. These requirements apply to facilities that contain aboveground storage tanks with a total storage capacity of 1,320 gallons or more of oil.

As noted above, present storage of petroleum products is estimated at a maximum of 300 gallons well below the stated threshold. However, to establish operating procedures, methods, and requirements to prevent the harmful discharge of contaminants, provide measures to ensure that causes of any accidental spills are immediately identified and corrected, and that countermeasures are in place to contain, cleanup, and mitigate the effects of any spill, a draft Spill Prevention Control and Countermeasure Plan (SPCCP) has been prepared in accordance with 40 CFR Part 112. The SPCCP has detailed information on design and planning of operations at the Avery Pit.

Fuel will be brought in by a contractor on an as-needed basis. Figure 3 shows locations for on-site storage of lubricants and coolants, as well as the parking and maintenance area. Waste oil will be stored temporarily in this area until removed by a reclaim service. This area is on high ground, away from the potential effects of severe stormwater run-off. Spill containment prevention measures will consist of the following:

All storage containers will be in a reasonable condition, i.e. no leaks or corrosion. If corrosion of any container is noticed, it will be immediately replaced.

The storage and servicing area will be fenced with 2' x 2' x 6' pre-cast concrete *ecology blocks*, except for an equipment ingress / egress area. The entire cell will be lined with an approved 30 mil PVC liner. Fine gravel will be placed on top of the liner to provide a wearing surface. The volume of the cell will exceed the volume of the containers within the cell (i.e., the worst-case leakage volume) by at least 5 times. This cell will be north of the 15' berm that has already been constructed (see Figure 3), minimizing the possibility of impact to the Columbia River.

The containment area will be inspected periodically. Any tears noticed in the PVC lining will result in repair or replacement. Detailed monitoring schedules and protocol have been described in the draft SPCCP.

A 2-foot wide ditch will be cut around the servicing area to create a containment border, and lined with 30 mil PVC. Oil will be drained into pans and then carefully transferred into a temporary waste oil drum in the containment area before periodic removal from the site by a by a licensed reclaim service. The servicing pad will be shaped to drain to a sump to prevent run-off of oily water during storm events. The temporary waste oil drum will be kept in the storage area, and periodically emptied by a licensed reclaim service.

In the event of a spill on an unlined area, a hydraulic line break, or static leak in mining equipment elsewhere than on the service pad, all contaminated ground will be excavated by backhoe or bobcat and placed in appropriate containers. The material will be hauled to a licensed solid waste depository by a bonded carrier approved to transport solid waste. If the spill is of large volume or over a large area, soil samples will be taken after initial cleanup and disposal to confirm that all contamination has been removed. In the event of spillage or leakage in the containment cells, an absorbent will be used to collect the material. Contaminated absorbent will be disposed of at an appropriately licensed solid waste

depository. The nearest depository licensed to receive oil and coolant soaked ground or absorbent at low concentrations is the Wasco County Landfill in The Dalles, Oregon, or the Rabanco Landfill north of Roosevelt, Washington. Contaminated material above toxic waste thresholds can be taken to the ChemWaste hazardous waste disposal site at Arlington, Oregon.

Except for oils, lubricants, and coolants within mining and process equipment, there will be no hazardous materials affiliated with future processing. There will be no reagents or other chemicals use affiliated with future processing.

3.6.1 WASTE CONTROL AND DISPOSAL

All imported wastes, such as domestic garbage, cleaning supplies, etc., will be hauled off site for disposal. All sanitary facilities will be portable and regularly maintained by a local private company.

3.6.2 OTHER HAZARDOUS MATERIALS STORAGE

Since this is an aggregate operation with production from unconsolidated deposits, there will be no use or storage of explosives (for hard rock blasting), reagents (for processing of metallic ores), or other hazardous materials beyond fuel, lubricants, and coolants.

3.6.3 AIR QUALITY

Under 42 USC 7411, new or modified stationary sources listed in various industrial categories must conform to New Source Performance Standards. These standards are detailed in 40 CFR 60. For mining activities, the U.S. Environmental Protection Agency (EPA) has developed the Best Available Control Strategy to minimize fugitive dust emissions. A review will be required to determine the Best Available Control Technology where potential fugitive dust emissions exceed 250 tons per year. However, each mine operator will be expected to employ Best Management Practices (BMPs) for fugitive dust, regardless of concentrations during operation. BMPs to be adapted at the project site are described in the following paragraphs.

Initial production will be for *pit run* material only, so there will be some dust associated with loading, haulage, maintenance and other mine activities. Dust from limited aggregate processing for local markets will be minimal due to wet crushing and screening of aggregate products. Mining within the active pit (V-179) takes place in a topographical low as deep as 250 feet below the north crest of the pit wall. During high winds, dust impact outside of the active pit generally is confined to the unoccupied area to the immediate east, though recent aerial photography has shown wind borne material encroaching in the cemetery area to the northeast (see below for mitigation measures). If blowing dust becomes a problem or exceeds EPA New Source Standards (see below) for aggregate operations, truck application of water or other commercial suppressants will be used to reduce impacts. Furthermore, steeper slopes (1.5H:1V during production, with final pit walls at 2H:1V with benching) afford more dust protection than shallower slopes.

Topsoil and overburden stripping on V-179A will be limited to within 400 feet of adjacent residences. These operations will also be planned for implementation during appropriate weather conditions. Dust impact mitigation will be performed by a water truck only if it does not interfere with archaeological monitoring during topsoil stripping. Stripping operations will be temporarily suspended if dust becomes problematic.

Production operations within V-179A will occur at the least 120 feet below the north crest of the pit wall. Dust impact mitigation will be identical to V-179. However, during mining-to-slope and reclamation grading along the northern boundary, earth moving will be within 400 feet of adjacent residences. These operations will be planned for times not likely to exhibit dry, windy conditions. In the event of blowing dust, passes by a water truck will be used to reduce impacts if practical. Other commercial dust suppressants / tackants may also be used to control wind erosion. Silt fences, 3 feet high, currently shield the railroad right-of-way from wind blown dust and sand. These fences will continue to be used and maintained.

After topsoil is placed in stockpiles or perimeter berms, it will be immediately seeded. Mulch or straw will cover the surface to aid seed and moisture retention, and in dust suppression. Mulch will be tacked down by walking a bulldozer over it. Material stockpiles will generally be on the active pit floor or near the barge load-out. Therefore, any dust impact to adjacent residences or SR-14 should be negligible. As stated above, the BNSF mainline will be protected by silt fences and *equipment barriers* (2' x 2' x 6' pre-cast concrete blocks). In the event of problems, the stockpiles will be watered down to minimize impact.

In areas where blowing sand has been a problem, such as in the vicinity of the cemetery as indicated by recent aerial photography, placement of mesh, straw, and mulch, and/or silt fences will be used as needed. These measures will only be used in a manner that does not interfere with cultural resources. Long-term haulage and access roads will be covered with gravel and wetted as needed, unless other dust control measures are taken, such as paving or use of a tackant. Environmentally suitable dust-suppression methods for the main access road, both mechanical and chemical, are presently being investigated and discussed with BNSF.

3.7 WASTE WATER

No waste water will be discharged off-site. Process water from limited production runs will be recycled to the extent feasible. The location of the railroad mainline and access road right-of-way between the mining operation and the river (approximately 300 feet) precludes the possibility of surface off-site discharge.

3.7.1 DAILY AND ANNUAL WASTE WATER DISPOSAL

There will be no off-site waste water disposal. Process water will be recycled to the extent feasible, and a certain portion of water in the settling ponds will be lost to evaporation and infiltration. Daily volume of on-site waste water will coincide with normal water

requirements, which are described in Section 3.5.1 – Daily and annual water requirements.

3.7.2 ANTICIPATED POSSIBLE CONTAMINANTS

Potential contaminants within on-site waste water, and a small settling pond affiliated with on-site processing, will be limited to fine sand, silt, and clay. When necessary, fine material from the settling ponds and sold or transported to reclamation stockpiles for use as a soil additive. None of these are known to be the cause of secondary chemical water pollution. See Section 3.6 – Contaminants, regarding fuels, lubricants, coolants, and other petroleum products.

3.7.3 WASTE WATER CONTAINMENT AND DISPOSAL

There will be no off-site waste water disposal. Process water will be discharged to an on-site settling pond, which will be small due to the use of sand cyclones to optimize water removal. When necessary, fine material will be removed from the settling ponds and sold or transported to reclamation stockpile areas for use as a soil additive. All process water remaining in settling ponds will be recycled or left to evaporate.

Portable sanitary facilities (toilets and showers) will be used on-site. Construction wastes will be collected and hauled to local licensed land fills.

3.7.4 ANTICIPATED WASTE WATER TREATMENT REQUIREMENTS

As described in Section 3.7.3 – Waste water containment and disposal, all on-site waste water (future recycled process water) will remain in an on-site settling pond. When necessary, remaining fines will be removed for sale and/or use in final reclamation at deposit depletion.

3.8 WATER IMPOUNDMENTS AND DIVERSIONS

There are no natural water courses on site, expect in the event of extreme storms. Impoundments and diversions will not be necessary for the anticipated amount of local rainfall or snow melt. Final topography will be designed such that all run-off water will be contained on site. There will be no run-off from the operating site to neighboring properties or to the Columbia River.

To date, there have been no reported problems with stormwater run-off traveling off site.

3.9 PROCESSING FACILITIES

As described in Section 3.4.1 – Mining method description, there will be no material processing on-site for the foreseeable future. *Pit run* material will be excavated and conveyed to barges after production accounting. However, when material processing is re-initiated, processing facilities will be located on the pit floor (see Figure 3). It may be necessary to change this location throughout the life of the mine, depending on changing operating layouts

and constraints. On the completion of mining and processing, all equipment and roads will be removed from these phases, and they will be reclaimed as described in Section 4.2.3. – Final closure measures.

The present settling pond area, shown on Figure 3 in Appendix I, has been capped, graded at an elevation of 185 feet, and covered with a crushed gravel surface. A 15-foot berm has been built along the southern edge. The southern half of the prior settling pond area (approximately 0.71 acres) will be used as the new office and parking area (see Figure 3 in Appendix I). The northern half of the prior settling pond area (approximately 0.46 acres) will be used as a staging area as mining proceeds within Phase I and Phase II. This area will also be where the trans-shipment conveyor from excavation operations on V-194 crosses the property line and unloads to its tract-specific surge pile prior to the main barge load-out conveyor.

A new settling pond, smaller than the previous one because of the use of sand cyclones, will be installed in Phase IV as shown in Figure 3. The office area will be moved back to its prior location and the old settling pond bench will be mined out during final *daylighting* to V-194 west from V-179 Phase I late in the mine life.

3.9.1 MATERIAL PROCESSING DESCRIPTION

As indicated throughout this MRP, mining for the foreseeable future will be for *pit run* material that will be loaded directly onto barges. At some point, limited processing for local markets will be implemented as described below. However, in these early stages *pit run* material mined on V-179 will be dumped into a tract-specific hopper, then pass over a belt scale prior to loading. All material mined on V-179A and V-194 will also be dumped into tract-specific hoppers. The material will then pass over a belt scale before loading onto the final barge load-out conveyor.

The future processing unit will be typical of regional aggregate producers. Processing of the sand and gravel will begin with loading from the excavator into a haul truck that will dump into a hopper. A feeder (apron feeder, plate, etc) will feed the material onto the primary crushing feed conveyor, which terminates at a primary jaw crusher. Crushed material will continue to a secondary crusher feed conveyor, terminating at a cone crusher. Screened undersize material will be fed to a final sizing feed conveyor, and oversize material will be recycled back to the cone crusher. The final sizing feed conveyor will terminate at a screen deck and wash plant, where the full final throughput will be screened into different salable fractions. The final fractions will be conveyed to stockpiles for truck or barge loading. Fine sand, silt, and clay will be removed by spray nozzles in the wash plant and the pregnant process water will be discharged to the settling pond. Fine sands will be removed by a sand cyclone prior to discharge settling ponds.

The expected output will be 1,000 tons per hour, or 8,000 tons per work day with one shift.

3.10 SURFACE WATERS

As described in Section 3.8 – Water impoundments and diversions, there are no natural surface waters, except during severe storm events. To protect against erosion, topsoil stripping will be confined only to those areas immediately in advance of active mine excavation.

3.10.1 WATER QUALITY PROTECTION

In the event of a severe storm, mine topography will be designed to trap all run-on water within the active pit. No storm waters will be discharged off-site, either to neighboring properties or to the Columbia River. Refer to Figure 4 in Appendix I. The project area is not within any major drainages and is entirely underlain by highly permeable aggregate. For these reasons, stormwater will rapidly percolate into the ground, and / or evaporate.

Federal water quality permits are required only for point source discharges. This operation has no point source discharges.

3.11 PARCEL V-179A SUBSURFACE EXAMINATION

Pacific Northwest Aggregates staff excavated ten test pits, each 20 feet deep, across parcel V-179A. This was done in response to concerns that the mineable material in this parcel would only consist of basalt talus or bedrock. A Washington Department of Ecology (WDOE) *Water Well Report* was located in public records for a property listed as belonging to *Yakima Indian Nation* in Township 2 North, Range 14 East, Section 14, NE ¼, NE ¼. This well log, which probably is affiliated with one of the residences near SR-14, shows mixed boulders, sand, gravel, and soil down to a depth of 207 feet. See Appendix II for the original report and Figures 3 and 6 in Appendix I for location. There are no current plans for further exploration prior to mining. All test pits were backfilled after logging.

PNA staff performed logging of the test pits on September 19, 1999 and September 25, 1999. The test pit locations are shown on Figure 6 in Appendix I. Descriptions verbatim from PNA field notes along with a cursory description as per the WDOE *Water Well Report* can be found in Appendix V. Relevant results from this subsurface examination program are shown in Figures 7 and 8 in Appendix I. The basic character of the stratigraphy is 1 to 6 feet of overburden over 6 to 18 feet of mixed soil, sand, gravel, and basalt boulders and cobbles, underlain by a layer of *mason sand* of undetermined thickness.

Figure 7 shows that raw overburden thickness decreases from a maximum of 6 feet in the northeast down to 1 foot in the southwest. In terms of elevation of the bottom of the overburden layer, it dips due south. Figure 8 shows that raw depth to the top of the sand unit from the ground surface decreases to the southwest and southeast. In terms of elevation to the top of the sand, it also dips due south, and with approximately the same magnitude as the dip of the overburden layer.

3.12 ACCOUNTING FOR ROYALTIES AND TRANS-SHIPMENT FEES

As described throughout this MRP, the future final pit will incorporate V-179, V-179A, and coordinated *daylighting* into adjoining V-194. These three allotments represent, respectively, ownership by two families, an individual, and the Yakama Nation. For this reason, it will be necessary to clearly define how production from the various tracts is accounted for when mining takes place particularly near property lines. Furthermore, the current lease for V-179 requires payment for trans-shipment of aggregate material from V-179A and V-194. It is necessary to define specific aspects of how this will take place. In consideration of future mining plans, as well as discussions with representatives of BLM and PNA, the proposed methods are as follows:

Material trans-shipped from V-179A and V-194 through V-179 directly for barge load-out will pass over a belt scale before it is received on V-179. See Figure 3 in Appendix I for a proposed conveyor configuration.

Material mined on V-179 will pass over a belt scale prior to processing or loading.

Each barge load that leaves the site will entirely consist of material from a single ownership tract. This will aid in production verification, as quantities recorded by the belt scales can be checked against displacements read by the Corps of Engineers at the dam navigation locks. The tugboat captain will have record of quantities recorded by the belt scales, as well as displacement readings from the navigation locks.

Belt scales will be calibrated and certified by a contractor licensed by the state weights and measures authority at least once a year. PNA will make internal calibration checks quarterly, as well as after a belt change. Only PNA employees experienced in the use and maintenance of belt scales will be authorized to perform these duties. Copies of all scale calibration records and certificates will be promptly forward to BLM.

In order to clearly delineate tract boundaries, a permanent *construction laser* will occupy the northwest corner of V-179 (the southwest corner of V-179A). When mining occurs at or near any tract boundary, the line can be located with a surveyor's reflector on a prism pole, and the line flagged exactly.

No co-mingling of material from different ownership tracts will occur.

Where practical, topsoil, overburden, or other unsalable material excavated during site preparation will stay on the tract of original ownership. However, due to limited space available and other operational constraints, it may be necessary to store overburden on other ownership tracts. These stockpiles will be clearly identified and their volume surveyed. They will be returned to the original ownership tract when space or conditions permit.

On a month-to-month basis, royalties will be paid in accordance with quantities as recorded by the belt scales. This will account for all extracted material, even loads to local markets hauled via truck over the truck scales, because all material is measured as soon as it is excavated from the tract of original ownership.

Controlled aerial photographs will be taken annually of the project area. These photographs will be kept on file for later generation of photogrammetric maps if required for production verification.

Once royalties have been paid for aggregate material, that material is then owned by PNA. If stockpiles of unsold material remain at the completion of mining, the permittee will return all remaining stockpiles to the allotment from which this material originated.

Maps and documents pertaining to the above activities will be available for inspection by all mineral owners and/or their designees. Copies of all documentation will be transferred to BLM for use in their independent production verification process. A complete set of all documents, including approved plans, permits, and environmental documents, will be maintained at the mine site.

4.0
DESCRIPTION OF PROPOSED RECLAMATION PLAN

4.1 PROPOSED SUBSEQUENT USE

After reclamation, the intended use for the site will be for *open space*, and will most likely be utilized for grazing or minor dry or irrigated-land agriculture. However, specific goals or intentions for post-mining land use have not been formalized between the land owners and PNA. This plan will be appropriately modified following such discussion and agreement with the land owners.

Reclamation will leave a usable pit floor with stable vegetated slopes. The intention of this plan is to enable the land to facilitate a wide variety of uses. Before the bulk of final re-grading and reclamation begins, specific post-mining land uses will be discussed with the owners. Details will be determined and formalized as soon as possible. If these uses require any changes in the mining and reclamation plan, a modification will be filed as soon as these details are available. Final land use will be consistent with adjoining tracts, as well as overall optimum land-use of the area.

4.2 RECLAMATION TIME SCHEDULE

After final deposit depletion, the final reclamation time schedule will be fairly expeditious. Once mining has retreated a suitable distance from areas mined back to final slope, topsoil replacement can begin immediately. Processing and auxiliary facilities may exist on depleted segments late into the mine life. These depleted mining segments will have topsoil replaced and will be re-vegetated immediately after depletion, but final reclamation (i.e. removal of all material, equipment, and stockpiles) may not occur on all segments until final mine closure. In such instances, temporary stabilization measures will be taken to minimize erosion and generation of wind blown material. See Table 4 for a proposed final topsoil replacement timeline. As discussed in Section 4.6.5 – Re-vegetation time schedule, NRCS recommended seeding times from late fall to early spring, specifically November 1 to February 28. Seeding will take place during this time, or whenever else is deemed appropriate.

As discussed in Section 3.3 – Topsoil, the use of rolling reclamation should assist in the assurance of minimal un-reclaimed areas. In general, final reclamation should be completed six months after final depletion in a given area. It is anticipated that most of the segments will have long since been completely reclaimed at the final completion of mining, but the exact plans cannot be delineated at this time. Instances may arise where nearly reclaimed areas would otherwise remain open for a protracted period of time for unforeseen operational reasons and be subjected to wind and water erosion. In such cases temporary stabilization measures will be employed, i.e. seeding a temporary cover crop, blanketing with small aggregate, use of commercial tackant, etc. In order to optimize the timing of reclamation, reclaimed areas will be managed to assure establishment of a stable and self perpetuating vegetative cover. Management measures include monitoring, reseeding as needed, slope maintenance, fencing to control grazing pressure, and application of herbicides to discourage invasion of noxious weeds. These measures are discussed throughout Section 4.0.

TABLE 4
PROPOSED FINAL TOPSOIL REPLACEMENT TIMELINE

Mining segment	Complete topsoil replacement
Phase I	Month 47
Phase II	Month 47
Phase III	Month 47
Phase IV	Month 22.5
Phase V	Month 30.5
Phase VI	Month 47.5

Figure 3 in Appendix I presents proposed reclamation phases.

4.2.1 TEMPORARY STABILIZATION MEASURES

Final pit walls will be reclaimed to a 2H:1V slope (2 horizontal: 1 vertical), with 30 - 50 foot wide benches every 50 vertical feet (see Figure 4). The individual *interbench angle* is defined as 2H:1V, yielding a shallower overall pit slope (see Figure 9 for terminology). Geotechnical investigations, performed in 1997 on the private property to the east, demonstrate that slopes steeper than 2H:1V are stable in this deposit for all worst-case conditions evaluated, such as varying degrees of saturation and seismic loading. This stability can be attributed to the exceptionally high angle of internal friction (as high as f = 41E), in spite of low cohesion. These conditions are not uncommon in elevated sand and gravel terraces consisting of a high percentage of material in the 3/8" to #4 size range. During the first phases of final reclamation, the above described slope parameters (i.e., slope angle and benching) will be evaluated in a selected test area to determine if these conditions are actually stable, as well as to determine if the slopes can be traversed by the type of equipment that will be used to place and plant the final reclamation soil cover. The test area will be in Phase IV, which will be away from the bulk of production operations. If test slopes show any sign of instability, further stabilization measures or shallower final slopes will be proposed. If this is the case, post-mining topography may have to be reconfigured to make room for the shallower slopes, and the current mining and reclamation plan will be amended.

As described in the preceding paragraph, actual experiences and observations concerning slope stability will be taken into account during final reclamation grading. These observations will consider the relative effects of the type, nature, thickness, etc. of completed pit wall materials.

Topsoil replacement will begin immediately after depletion of each segment and final slope grading of a given Phase. Because of the steep final slopes, topsoil will be

spread by a John Deere 455 dozer. This smaller dozer will be winched up and down the slope by a Caterpillar D8 dozer stationary on the bench above. Re-vegetation will begin immediately after topsoil replacement has been completed. Vegetation has been specifically selected to be drought resistant, suitable for sandy coarse soils, and particularly favorable for slope stabilization in high friction, low cohesion materials. See Section 4.6 – Re-Vegetation for more detail.

4.2.2 CONCURRENT RECLAMATION MEASURES

As described in above sections, topsoil replacement will begin immediately after segment depletion and re-vegetation will begin immediately after topsoil replacement. However, final reclamation and closure of a mining segment will not be conducted until the area will not be used for any activities affiliated with mining of remaining segments. Topsoil, overburden, and fines will be used for final site reclamation on the parcels from which they were originally removed to the greatest extent practicable. Only that material which is clearly in excess of final reclamation needs will be considered for possible off-site market.

4.2.3 FINAL CLOSURE MEASURES

The final reclamation activity will be the topsoil replacement and re-vegetation of Phase VI after final depletion, as well as equipment removal and reclamation of the final staging area on Phase II or III (the *staging area* is the area maintained for processing, storage, haulage, and other operational activities within the active mine). Remaining overburden stockpiles will be used to assist in grading and contouring of the final slopes. Haul and access roads will be stripped of any base gravel, blended to replicate the adjacent natural or reclamation topography, and re-vegetated. Compacted areas will be ripped as needed. If the land owner determines that features such as access roads or other structures are viable *capital improvements* and should remain, then they will not be removed. Royalty will be paid to the appropriate mineral owners of any stockpiled material removed from the site as part of final reclamation.

All of the processing equipment will be portable and will be hauled off-site after processing is completed consistent with regulations. Any pads or decks that were used in the processing and stockpile area and equipment service area will be removed and the site re-vegetated. The construction material will be transported to a suitable disposal site, along with any contaminated ground as may likely occur within the containment area or adjacent to the equipment service pad. All on-site structures are portable and will be trucked away prior to abandonment. The scale house and scales will be dismantled, removed from the site, and the scale pit backfilled. However, these structures will remain if the land owner determines that they are a useable capital improvement. Otherwise, they will be disassembled and hauled off-site and the scale pit backfilled with clean local material. Parking areas and other surface features will be regraded and re-vegetated. Remaining stockpiles of unsold product will be surveyed, royalty paid, and hauled off-site.

Fuel, lubricant, and waste oil storage tanks from the containment area (see Section 3.6 – Contaminants) will be hauled away by an appropriate motor carrier. The PVC liner will be removed from the site and recycled or disposed of as appropriate. The perimeter ecology blocks will be removed from the site for use elsewhere. The secondary containment berm will be graded to conform with post-mining topography, and the site re-vegetated. If there is any indication of leaks or spills in the area, soil and groundwater samples will be taken to determine the extent of subsurface contamination. Contaminated ground will be excavated and disposed of at an appropriate solid waste facility.

Surface features and disturbance along the BNSF right-of-way and access road attributed to mine activities will be removed and/or reclaimed pending BNSF approval or directive. On-shore and in-river barge loading facilities will remain as a capital improvement if a buyer or user can be located. If not the structures will be dismantled and removed. Conditions and techniques of removal will have to be carried out in accordance with the U.S. Army Corps of Engineers, Washington Department of Fish and Wildlife, National Marine Fisheries Service, and the Columbia River Gorge Commission.

4.2.4 MONITORING AND REMEDIAL ACTION

During mining, PNA management will make at least monthly physical inspections of the site, checking for drainage and erosion problems and re-vegetation success. Areas that show significant erosion or re-vegetation problems will be stabilized and/or re-seeded. PNA staff will also accompany inspections made by BLM, BIA, MSHA, OSHA, Indian land owners, and other agency officials with site jurisdiction such as for mine health and safety.

After final closure, employees of PNA or affiliate companies will periodically monitor the abandoned site to confirm that the final slopes continue to be stable, that the re-vegetation program has been successful, and that there is no off-site discharge of storm waters. The time schedule will be that as requested or explicitly required by the Bureau of Land Management in consultation with BIA. These activities will be continued until the Bureau of Land Management *authorized officer* and the BIA Yakama Agency Superintendent have declared that the site is fully and acceptably reclaimed consistent with the approved mine and reclamation plan.

4.3 DESCRIPTION OF POST-MINING TOPOGRAPHY

Post-mining topography has been designed to carry out a number of functions:

Blend with the character of adjacent natural topography.
Provide stable individual slopes at 2H:1V or less, based on initial tests (see Section 4.2.1).
Benching at 50 foot intervals will be developed to aid in slope stability and re-vegetation, maintenance, as well as enhancing the safety of equipment operators.

As suggested by Norman et al. (1997), benches will be sloped toward the hillside at approximately 8H:1V to minimize erosion of benches. Furthermore, benches will be sloped laterally at 1% toward two central drain sumps on the north and east pit walls (see Figure 4 in Appendix I).

Provide a slope shallow enough for re-vegetation to be successful indefinitely.

Direct all storm water into the interior of the project site, where it will be naturally attenuated by the highly permeable ground.

Be suitable for livestock grazing, minor dry-land agriculture, or other post-mining land uses as desired by the land owners.

Proposed post-reclamation topography is shown on Figure 4, Appendix I. Affiliated cross-sections are shown in Figure 5, Appendix I.

4.4 IMPOUNDMENT RECLAMATION

No impoundments will be left on site. Water in settling ponds will be allowed to evaporate or attenuate, the ponds bailed of mud (to be used as a soil additive in reclamation), and the remaining impoundment excavations filled with stockpiled overburden material.

4.5 REHABILITATION OF NATURAL DRAINAGE

As stated previously, there are no on site or nearby natural water courses, notwithstanding the Columbia River, except in the case of severe storm events. The post-reclamation topography will be designed to trap any run-on storm waters within the project site, as well as to not disturb any nearby natural water courses.

4.6 RE-VEGETATION

There are three possible plans to follow for re-vegetation:

The original Bureau of Indian Affairs (BIA) Seeding Recommendation for the active Avery Pit.

Seeding recommendations obtained from the local District Conservationist of the Natural Resources Conservation Service (NRCS). This seeding plan was designed specifically to be quick growing, drought resistant, successful in sandy soils, and to aid in slope stabilization (see Appendix VI for specific NRCS information). This mix does contain non-native species.

A seed mix recommended by the Yakama Nation Vegetation Management Program for re-vegetation after proposed mining on V-194, adjacent to V-179/179A on the west. This plan is a modification of the original V179 mix, but also contains species to aid stability.

Because of its mixture of native species and stability enhancement, the third option

will be chosen. The plan recommends the following seed mix at 65 - 70 pounds per acre:

Indian Ricegrass *(Nezpar).*

Thickspike Wheatgrass *(Critana).*

Prarie June Grass added for stability.

Critana is a *sod forming* native grass that performs well on eolian soils (*sand dunes*), and will protect against erosion of topsoil and underlying sandy material.

If excessive topsoil erosion becomes a problem, elements of the NRCS plan can be implemented if the Yakama Nation Vegetation Management Program approves. For example, Siberian Wheatgrass has a fibrous root mass that protects against topsoil erosion. Yellow Sweetclover has deep taproots that will help protect against sloughing of gravely slope faces (Kreft, 1998). Portions of the draft NRCS soil survey for the Avery area are presented in Appendix VI.

Several species of noxious weeds have been identified in the project area. These species will be regularly controlled to prevent further infestation. Weed growth will be controlled by mechanical cutting and limiting movement of equipment cross-country. Furthermore, the use of hydro-seeding will assist native species in out-competing exotic (noxious) species. Infested areas will be treated by approved herbicides or pre-emergents if required by the Yakama Nation Vegetation Management Program.

There are no long-term artificial irrigation systems planned for the site. Fences, in addition to the perimeter fence required in the lease, will be constructed around newly re-vegetated areas to limit access and control grazing pressure until these areas have successfully matured. These fences will be subsequently removed after maturity unless the land owner requests otherwise. Selected portions may be retained with the landowner permission to benefit long term public safety, such as along the northern pit limit in V-179A due to nearby developed housing lots.

4.6.1 SOIL REDISTRIBUTION METHODS

Soil will be redistributed by loaders, dumptrucks, and dozers. Topsoil stockpiled during development operations will still be suitable for re-vegetation, since it will have been stored for, at the most, 2 ½ years and probably much less. As per NRCS recommendations, the topsoil will be hauled to strategic locations along the final pit slopes by loaders or dumptrucks. A two-dozer combination will be used to spread it to the specified thickness and imprint the area to aid seeding and to crimp in the mulch cover.

4.6.1.1 AVERAGE TOPSOIL THICKNESS

Average topsoil thickness will be a minimum of twelve inches (after placement) on sloping surfaces and six inches (after placement) on non-sloping surfaces. The greater depth on sloping surfaces will improve the possibilities of reclamation success on steeper slopes. As necessary excess overburden and topsoil will be infilled to the pit bottom or slopes prior to final reclamation grading and seeding.

4.6.1.2 DETERMINATION OF RE-VEGETATION SUITABILITY

As soon as there is a small parcel on a depleted mine segment where topsoil has been replaced, this strip will be used as a test and determine the need for further soil amendments, as well as the success of selected reclamation species.

4.6.1.3 EROSION PROTECTION METHODS

As described in Section 3.3.2 – Erosion protection, topsoil and overburden stockpiles will be seeded with native grasses to protect against soil and wind erosion. Excessive blowing sand, characteristic of the area, may affect the success of reclamation. To remedy this, additional stabilization will be implemented as deemed necessary by the BLM, landowner, or PNA. Stabilization measures will include placement of a mulch or straw cover, erection of wind barriers, or the use of physical / chemical dust suppressants.

4.6.2 NEED FOR SOIL AMENDMENTS

Fertilizer will be applied in the quantities listed below as per the recommendation of the Yakama Nation Vegetation Management Program:

Actual nitrogen at 1 – 2 pounds per 1,000 square feet
Phosphoric acid at 1.5 pounds per 1,000 square feet
Potash at 1.5 pounds per 1000 square feet

If re-vegetation testing as described in Section 4.6.1.2 – Determination of re-vegetation Suitability is not successful, then further consultation with the Vegetation Management Program will be made.

4.6.3 LANDSCAPE PLAN

Upon completion of topsoil replacement, site preparation will consist of ripping and disking. The seed mixture described in Section 4.6 – Re-vegetation will be seeded by the methods described in Section 4.6.4 – Planting methods, and mulch and fertilizer will be added as described in Section 4.6.2 – Need for soil amendments. Table 1 provides an approximate schedule for topsoil replacement which will be immediately followed by reseeding.

No re-vegetation map is included with this plan, because planting will involve a uniform seed mix across the project area.

4.6.4 PLANTING METHODS

As per YIN recommendations, hydro-seeding the prepared surface will be the preferred planting method. After seeding, mulch or straw will cover the surface to protect against wind erosion, and will be tacked down by walking a bulldozer over it. Other methods such as drilled seeding will be evaluated if hydro-seeding fails to yield acceptable results.

4.6.5 RE-VEGETATION TIME SCHEDULE

NRCS recommends that optimal time of seeding and re-seeding, as needed, would be from November 1 to February 28. However, actual planting schedules may be altered due to weather.

4.7 RECLAMATION MONITORING AND MAINTENANCE

Reclamation monitoring and maintenance will be performed by employees of PNA or affiliate companies until BLM, and ultimately BIA, determines that it is no longer necessary (i.e, final reclamation and re-vegetation have reached a stable, self-sustaining, and acceptable condition). A continuous program of on-site inspections will be carried out during active production by PNA personnel.

During the early seeding and growing cycle, the segment will be roped or fenced off to prevent inadvertent disturbance by company personnel or others on the premises. At present, there is no active grazing on or near the project site, and the effect of wildlife on plantings will be minimal. Furthermore, a perimeter fence is a condition of the initial permit and will further abate wildlife impacts.

4.7.1 MONITORING OF RE-VEGETATION SUCCESS

Re-vegetation success will be monitored and evaluated by operations personnel on-site during production, and by employees of PNA or affiliate companies after final depletion. Representatives of BIA and PNA will meet every 6 months to formally review re-vegetation success. Monitoring will continue until the the re-vegetation is completely successful and the BIA Superintendent determines that no further action need be taken.

4.7.2 RECLAMATION SUCCESS STANDARDS

There are a number of guidelines for determination of the success of re-vegetation, erosion control, and public safety. Many of these, including practical standards from private industry, were consolidated and manifested as *Best Management Practices* (BMPs) published by the Washington State Department of Natural Resources and the

Oregon Department of Geology and Mineral Industries (Norman et al, 1997). These BMPs are widely implemented by the aggregate industry and state agencies, and have met with good success. Post-mining land use for the subject property and adjacent properties should also be taken into account, as well as applicable standards of the Department of Interior, whether implied or expressed.

Using a composite of these guidelines, a standard can be proposed. In terms of re-vegetation, inspections will be performed at 6 months and 12 months after final closure. The re-vegetation program will be determined to be successful if growth is consistently equal to or better than that on surrounding undisturbed areas, and/or uniformly consistent with post-mining land uses. Inconsistent growth may be an indication of unsuitable topsoil distribution or slope instability. Measures will be taken to correct these insufficiencies. Uniformly poor growth may indicate the need for additional fertilizer or irrigation. Signs of *slope creep* will require additional grading, application of other physical slope stabilization measures, or seeding.

Since the site is not within a major drainage, any erosion occurring after final closure indicates a problem. If erosion is detected during post-closure inspections, additional grading, seeding, or placement of rip rap or backfill material will occur to further control erosion.

In terms of public safety, a safe site is one in which the slopes remain stable, no adverse erosion takes place, and the post-abandonment project area can be utilized in a safe manner by the land owner for the agreed upon post-mining use.

4.7.3 RECLAMATION MAINTENANCE PERSONNEL

Reclamation will be maintained by employees of Pacific Northwest Aggregates or affiliate companies until BLM and BIA determine that no further action is needed (i.e., is consistent with the approved plan and vegetative growth is acceptable to BIA).

4.7.4 CONTINGENCY MEASURES FOR UNSUCCESSFUL RE-VEGETATION

As described in Section 4.6.1.2, tests for slope stability and re-vegetation suitability will be made at the commencement of the re-vegetation program on the first depleted mine segment. The first test parcels will be located on Phase IV, away from the majority of production operations. If these preliminary tests do not appear to work on a larger scale, further consultations will be made with NRCS and the Yakama Nation Vegetation Management Program to develop test plantings on larger experimental parcels.

4.8 PUBLIC SAFETY

In the 40-year history of the Avery Pit, there have been no recorded incidents of problems with public safety in coincidence with the mining operations. However, to

further ensure public safety, the following protocol will be implemented.

Fire danger within the project site are minimal due to the sparse, low vegetation. Fire extinguishers will be kept on site and in all heavy equipment to aid in fighting the spread of a small fire. Mining equipment and water trucks can be diverted to help fight grass fires should initial containment fail. Warning signs will be posted around the permit boundary until final reclamation is achieved and accepted by BIA.

The operator will comply with all other applicable federal, state, and local laws and regulations with regard to fire, health, and safety. Work place safety will be explicitly regulated by 30 CFR 56 – Mine Safety and Health Administration Safety and Health Regulations for small non-metal mines.

PNA will comply with BNSF flagging requirements and existing agreements and lease conditions during movement of slow-moving equipment across the railroad tracks. All non-essential crossings of the mainline track will be eliminated. All material stockpiles for haulage to local markets will be south of the mainline track as shown in Figure 3. Non-PNA staff, trucks, or equipment will be explicitly prohibited from crossing the mainline track.

Two houses exist within a few hundred feet of the north project boundary. During production operations, a chain link fence will be constructed along the north boundary of the permit area to mitigate the attraction or curiosity of persons or animals wandering into the mining area. A 5-wire perimeter fence is also a condition of the original BIA Sand and Gravel Permit. Gates will remain locked at all times when not in use. The project area is remote, with only a minimal number of people living with two miles. Should trespassing become a problem, a permanent structure (berm, trench, fence, etc) will be constructed to further discourage unauthorized uses.

Development and production operations in the north extreme of V-179A that could impact nearby residences will be of limited scale, and will be conducted with respect to neighbors. If noise complaints necessitate, berms will be constructed within the north 50-foot setback zone to protect the residents from noise impacts. Noise standards will adhere to state and federal guidelines.

Settling ponds will have sloped sides that allow for emergency egress / ingress. The final reclaimed pit walls will be sloped to no greater than 2H:1V which should help minimize any undue hazards.

4.9 PROTECTION OF CULTURAL RESOURCES

If any evidence of cultural and/or archaeological resources are encountered during any aspect of site work, the Cultural Resources department at the Yakama Indian Nation, as well as BLM and BIA officials, will be notified immediately. Activities that would

disturb or impact such resources will be ceased until the resource can be cleared, or further mitigation procedures determined.

A monitor from the Yakama Nation will be invited to be present during topsoil removal. An archaeological and cultural assessment has been conducted for V-179A. Further details of this assessment can be found in the Environmental Assessment completed for the mine and reclamation plan.

PNA, Halstead, and the Yakama Nation Cultural Resources Program have reached an agreement on an expanded buffer zone for the Tribal cemetery in the northeast corner of V-179. The boundaries of this protection area are shown in Figure 3 and Figure 4 in Appendix I. In addition, a 3.6 acre area bounded in the south and east by the Tribal cemetery, on the west by the present northern access road, and on the north by the northern boundary of V-194, has been set aside from mining pending investigation of potential cultural resources, as well the potential effect of erosion on this area and the Tribal cemetery. Further discussion of this topic, including provisions for ongoing maintenance and monitoring, can be found in the Environmental Assessment. The entire cemetery protection area will be fenced by a 5-wire fence.

During periodic memorial services at the cemetery, production operations that could impact these activities will be stopped for the duration of the service. Furthermore, it was agreed that the present northern access road would be maintained as an access to the Tribal cemetery to the extent shown in Figure 4.

5.0
LIMITATIONS AND ASSUMPTIONS

5.1 LIMITATIONS

The observations, interpretations, and recommendations presented in this mine and reclamation plan are based on the assumption that the conditions do not vary from those found during the course of related investigations at the subject site. Changes in the conditions of the subject property, neighboring properties, or changes in applicable standards can occur with the passage of time, whether they result from natural processes, legislation, or the broadening of knowledge. Accordingly, the observations and findings presented in this plan may be invalidated by changes outside of the control of PNA. Whenever this occurs, PNA will promptly prepare and submit appropriate plan modifications to BLM for administrative action. The Company shall also prepare appropriate modifications required by BLM any time it is evident (through inspection, monitoring, and/or consultation with other concerned agencies and affected interests) that conditions warrant plan modification, or that previously unforeseen circumstances or impacts are occurring, including those to adjoining lands, residences, highways, the Columbia River, or physical or biological environmental resources.

5.2 ASSUMPTIONS

The volume calculation methods as described previously are derived from industry standards for determining the volume of irregular earthworks. However, for these values to be entirely valid, a number of assumptions had to be made about the input data:

Swell factors and tonnage factors are consistent across the deposit, or their variations are at least accounted for amongst the different cross-sections.

Issues that appear in metal mining reserve estimates will not be a problem (or are at least easier to quantify) with an aggregate deposit. These can include wall rock dilution, processing recoveries, unforeseen impurities, etc.

Each of these will be discussed below.

5.2.1 MATERIAL PROPERTIES

For the current study, the tonnage factor and swell factor are based on one bulk sample collected in March, 1998. Terrace gravel deposits generally will not vary widely in terms of material properties. Subsequent estimates, derived from further sampling (if deemed necessary) would either stay the same, incorporate these different values into different pit zones (if the variation was definable), or establish an error range. It is PNA's opinion that the samples taken are sufficient to characterize the site.

6.0
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APPENDIX V

SEPTEMBER 1999 TEST PIT RESULTS

TEST PIT DESCRIPTIONS

HOLE	DEPTH (ft)	DESCRIPTION
WDOE	0 - 1	Soil, Brown
	1 - 27	Clay, Brown, Boulders
	27 - 42	Sand, Gravel, Gray, Boulders
	42-179	Sand, Gravel, Dark, Gray
	170 - 207	Boulders, Gravel, Sand, Gray
	207 - 445	Basalt, Fractured
V179A-1	0 - 20	Overburden. Top of ridge pushed in with Cat for home site excavation, or slide from north of SR 14.
V179A-2	0 - 6	Overburden with dirt and cobbles
	6 - 8	Basalt with 4” to 12” boulders, seams of dirt and sand
	8 - 10	Sand seam with 1 ½” to #4 gravel
	10 - 12	Sand and dirt seam with 4” to 8” basalt
	12 - 20	Mason sand
V179A-3	0 - 6	Overburden
	6 - 16	Basalt with 4” to 12” boulders. Seams of dirt and sand.
	16 - 20	Mason sand
V179A-4	0 - 5	Overburden
	5 - 16	Basalt with 4” to 12” boulders. Seams of dirt and sand.
	16 - 20	Mason sand
V179A-5	0 - 3	Overburden
	3 - 21	Basalt 4” - 18”. Some larger boulders 48” to 60”. Dirt and sand seams.
	21 -	Mason sand
V179A-6	0 - 4	Overburden
	4 - 18	Basalt 4” to 18”. Mostly 4” to 12”. Some larger boulders. Dirt and sand seams.
	18 - 20	Mason sand
V179A-7	0 - 7	Overburden
	7 - 9	Basalt, river rock. Mixed ½” to 6”.
	9 - 20	Small grain sand.
V179A-8	0 - 7	Overburden
	7 - 9	Basalt, river rock. ½” to 18”
	9 - 20	Sand
V179A-9	0 - 1	Overburden

	1 - 6	Basalt 4” to 18”. Dirt and seams.
	6 - 8	Brown sand, “blow sand”
	8 - 20	Mason sand
V179A-10	0 - 2	Overburden
	2 - 9	Basalt 4” to 18”. Dirt and sand seams.
	9 - 20	Mason sand