



DRAFT REPORT

SEWARD QUARRY

MINE ENGINEERING & MANAGEMENT PLAN, PHASE I SEWARD, ALASKA

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1.0 EXECUTIVE SUMMARY

Kenai Peninsula Borough (KPB) owns a 30 acre parcel in the vicinity of Seward that contains an existing quarry into an exposure of graywacke rock. KPB requested the assistance of Hattenburg Dilley and Linnell, LLC (HDL) in determining the suitability of the rock for quarrying operations, the quantities of various produced stockpiles of materials, and analysis and recommendations for the marketing of the types of rock products that could be produced.

During several site visits in August and October 2009, HDL geologists and survey teams examined, sampled and surveyed the rock outcrops within the 30 acre site. Rock outcrops in the quarry were examined and measured for structural geological data (rock mass data and discontinuity orientations) and approximately 1,200 to 1,500 pounds of rock was gathered from stockpiles and transported to the HDL soil testing laboratory.

Rock samples were put through a series of laboratory tests including LA Abrasion loss, Degradation loss, Sodium Sulfate Soundness, and Specific Gravity (including both surface-saturated dry and apparent values, and absorption). The results were compared against specifications and minimum test values for rock products intended for use on both Alaska Department of Transportation and Public Facilities projects (airports and highways), and U.S. Army Corps of Engineers projects (coastal breakwaters, ports and harbor facilities).

Test results reveal a very strong, blocky and competent graywacke rock. Structural geologic data indicates favorable characteristics which will maximize the size of the rock product obtainable when coordinated with standard quarrying blasting methods.

Taken together, the field investigation and laboratory analyses indicate that the Seward Quarry graywacke is suitable for the following marketable rock products:

1. All grades of riprap (DOT&PF highways and airports specifications) from Class I through IV (smallest to largest);
2. Shore protection rock products (US Army Corps of Engineers);
3. Armor stone (DOT&PF airports spec);
4. Various gradations of crushed aggregate including base course; surface course; aggregate for asphalt concrete pavement, concrete, cover coat and surface treatment, filter blanket and subbase (DOT&PF highway and airport specs);
5. Various graded materials including selected material types A, B, and C (DOT&PF highway specs); porous backfill; and gabion backfill.

Additional markets for the Seward Quarry may include many other construction products based on high quality aggregate (such as soil cement or emulsified asphalt treated base course).

1.1 CONCLUSIONS

1. Site contains in excess of one million cubic yards of recoverable rock (see Section 9.0). Note that this overall quantity is not broken down into specific riprap sizes.
2. Quality tests indicate the rock will meet specifications for processed rock products currently specified for federally-funded highway, airport, and harbor facilities.
3. Large riprap stone may be the most valuable product available from the site, but production techniques allow only approximately 10 to 30% riprap recovery, generating 70 to 90% other potential products. These other potential products include crushed aggregate and differing select materials for construction purposes (see Section 11 in the report body), with the ad valorem premium of 100% fracture, a requirement of many rock products.
4. The site contains several moderately-segregated stockpiles of classifiable riprap, which are readily available for selection and loading. Volume estimate for Material Pile #1 (Figure 3) is between 1,600 to 1,800 cubic yards of predominantly Class IV riprap sizes. Material Pile #2 is estimated to contain between 40,000 and 44,000 cubic yards of predominantly Class I and II riprap sizes.
5. Currently the site exhibits the unfavorable results of uncontrolled development and blasting, foremost of which are:
 - unstable and potentially unsafe quarry faces;
 - extensive backbreak into the exposed rock in the quarry faces, as a result of overblasting;
 - unstable timber and soil exposed at the top of the quarry faces, which ravel down the slopes;
 - loose rubble accumulations which make for difficult access to the face and the toe at the quarry floor;
 - lack of benches to facilitate equipment access to mid-slope zones for drilling and blasting.
6. Mitigation of these unfavorable site conditions can be designed into a blasting and management plan.
7. Site has no current permits to continue extraction operations, other than the KPB permit.
8. For comparative valuation, the Southcentral Region of the Alaska Department of Natural Resources charges a royalty rate of \$3.00 per cubic yard for rock from state lands on the Kenai Peninsula. Royalty rates are very different than commodity market prices; royalty basically gives the buyer the right to extract a resource. The complete process of extracting, processing and transporting the useable product is what constitutes the market price.
9. KPB can elect to operate the Seward Quarry under either a royalty structure, or manage it as a production facility marketing various rock commodities.
10. Royalty structure involves minimal investment by KPB, where oversight and management costs and responsibilities are left as the responsibility of the contractee. There is a strong possibility that the existing unfavorable site conditions will continue or worsen. Under this structure, the source may not produce optimal quantity and quality of material.

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11. The production facility scenario would require a comprehensive management plan and active oversight, but the unfavorable site conditions could be mitigated and minimized. Investment costs will be high in comparison to royalty structure above, but rock products can be produced on demand and sold on site to meet the buyers' specification, resulting in a market rate much higher than royalty.
12. Sale of rock commodities is inconsistent on an annual basis; it is more usually associated with large-scale construction usage, which is variable and intermittent and usually dependent on governmental capital funding budgets. Several pending or planned projects are noted in Section 12 and Appendix D.

1.2 RECOMMENDATIONS

1. A comprehensive engineering and management plan should be designed and implemented to maximize the resource production, improve safety and stability during (and between) active uses, and facilitate reclamation of the site.
2. Additional testing might confirm the rock meets specifications for Alaska Railroad ballast products.
3. Additional clearing and leveling of lowland acreage will be necessary to accommodate processing and stockpiling of the total resource, including rock of various gradations, overburden, and timber.
4. Unfavorable site conditions should be remedied through the blasting design and oversight recommendations in the management plan.
5. Permit applications should be initiated to bring the site into compliance with federal, state and local requirements for this type of resource extraction operation.