

EXECUTIVE SUMMARY

Jamaica Pre – Mix Ltd. has proposed dredging of marine aggregate from the mouth of the Yallahs River in St. Thomas. It is anticipated that approximately two million tonnes per annum would be dredged from water depths ranging from 5m to >40m and that the aggregate be discharged to a small wharf to be built at the mouth of the Yallahs River. Preliminary investigation has revealed that there is a strong possibility that significant volumes of sand and gravel are present offshore the proposed project area, comparable to the land-based deposits currently being extracted at Yallahs.

A first in Jamaica, this operation will run for 20 years extracting approximately 43 million metric tonnes (mt.) from an available reserve of almost 84 million mt. A mixture of “drag-line” and hydraulic dredging technologies will be employed to bring the material onshore for crushing and sorting.

In addition to a Quarries License, a license from the Beach Control Authority (currently part of the National Environment and Planning Agency [NEPA]) is necessary for this operation, as well as an environmental permit. As part of these applications, an Environmental Impact Assessment (EIA) is essential. This EIA report meets this requirement of NEPA.

Two different extraction methods have been explored by Jamaica Pre-Mix Ltd. for the mining operation. The first is the use of a closed-bucket dragline to be situated at the shoreline, and the second is a hydraulic dredge. Due to operational considerations, the dragline method can only effectively be employed within a distance of up to 500 metres from shore. Because of this limitation, the dragline method is suitable for use in deposits relatively close to shore. Some reserves are located more than 500 metres offshore and the long cycle time for each dragline operation makes this method uneconomical. In some of these cases, as appropriate, a combination of hydraulic and the dragline system will be used and in some the hydraulic dredge only will be used to extract and convey the aggregate material onshore to settling ponds. Mining will take place at depths greater than 5 m, and the final slope will not be steeper than 1:20.

Summary of Environmental Impacts:

Coastal Dynamics

A detailed impact assessment of the proposed mining operations has been carried out for sediment transport and hydrodynamic characteristics. The assessment has relied on a number of computer models that have investigated:

- Alongshore sediment transport impacts;
- Cross-shore sediment transport impacts;
- Shoreline response impacts; and
- Impacts on the prevailing current patterns.

The investigations have shown that the impacts of the proposed mining, over the near term and long-term periods (i.e. up to 10 years) are limited. Specifically, these impacts have been defined as:

- Less than 1% change in the alongshore sediment transport;
- A maximum decrease of 13% in the potential onshore transport rate during a typical storm;

Water Quality Impacts

Present Impacts

Water quality at the time of sampling with respect to suspended sediment was good and obviously well below the 10mg/l proposed ambient standard for coral reefs. Impact from the Yallahs River on turbidity/TSS appeared to be insignificant at the time of sampling. A value of 16mg/l in surface water near the river mouth was offset by values of 0 below the surface. This indicates that sediment load from fresh water was minimal and did not extend to the lower reaches of the water column.

Predicted Impacts

Recent experience suggests that temporary levels of TSS arising from the proposed operation could be more than 100 times background levels. Disturbed material can be expected to dissipate ½hr after a dredging event.

Ecological Impacts

The establishment of docking facilities onshore adjacent the river delta will call for the removal of vegetation. As noted above however, the area is already highly disturbed and the species of flora to be affected are not of significant ecological or commercial importance. As indicated earlier in this report, the establishment of docking facilities will be subject to a separate Permit and License application and subsequent environmental examination .

The most significant impacts anticipated by development activities at this site relate primarily to the increase in turbidity levels (suspended solids) in inshore waters. The area already experiences severe turbid events when the river is in spate due to rainfall inland. These plumes of turbid water do not necessarily move in a westerly direction with the prevailing winds. They are often maintained offshore Yallahs river by counter currents and contribute to turbid waters for several days after rains have ceased in the area or in the river's watershed. It could be expected that dredging activities would increase both the frequency and duration of these turbid events. It is likely that resuspension of

sediments by dredging activities will be confined to periods when the weather is calm (for the purpose of operating the dredging equipment safely). High flow rates of water coming out of the river should therefore not be available to carry disturbed sediments as far downstream as compared to the occasions when the river is in spate. It is anticipated that the reefs to the east and west of the river should not therefore be as highly impacted by the lateral movement of suspended sediments as one would initially expect.

The species of flora and fauna seen are those capable of tolerating relatively high loads of suspended solids without the creation of significant mortality in their local populations. Given their occurrence on reefs adjacent the proposed dredge site it would be reasonable to conclude that they are already acclimatized to high sediment levels in the water column. No flora and fauna were seen at the site itself that would be negatively impacted by dredging activities. Fish pots were observed set in an apparently random manner throughout this area. There are no reports from the fishermen at Cow Bay that their catches are decreased either in quantity or quality by episodes of flooding from the Yallahs River. Boating activity in the immediate vicinity of the dredging operations would mean some loss of fishing grounds to the fishermen. There is no reef substrate directly offshore the river delta. Traps presently in this area are assumed to be catching fish & shellfish in transit from one reef area to another e.g. between Grants Pen and Cow Bay reefs.

The disposal of wash water from the onshore processing of the dredged aggregate has the potential to create some problems. Fishers downstream of Yallahs River are concerned about the potential for this “mud” to smother the reefs on which they fish.

The nearest marine conservation area is located at the Port Royal Cays – some distance away and dredge activities at the Yallahs River are not expected to impact on this conservation area. The main boat traffic in this area relates to commercial fishing activities by local fishermen. These fishing beaches are 2-3 km on either side of the Yallahs delta (at Cow Bay and Grants Pen Beach on the western edge of the town of Yallahs) and ought not to be impacted by any dredge equipment in the area.

Examination of marine charts of the area does not reveal the presence of any submarine communications cables which could be damaged by dredge equipment.

The reefs at Cow Bay are used intermittently by local dive clubs for scuba diving expeditions. They already regard this site as a low visibility dive and should not be negatively impacted by dredging activities to the east as long as the integrity of the reefs in this area is maintained. Shallow reefs noted midway between the river delta and Yallahs town are also acclimatized to high sediment loads and are also accustomed to high wave energies. They should not be significantly impacted further by dredging activities.

Socio Economic Impacts.

Socio-economic impacts included construction and post-construction impacts. Construction impacts were those perceived during the construction phases of the development and were essentially short term in nature. Post construction or operational impacts were those perceived to occur during the life of the development and were essentially long term in duration.

A: Construction Impacts

Construction related SIA impacts included employment and income, transportation, and health. There were no perceived land use impacts as the proposed site was offshore and compatible with the designated and existing use of the land. Similarly, there were no perceived archaeological, housing, educational, or solid waste impacts.

Employment Impacts

A general approach was utilized based on the information provided by the client to assess the employment and income impacts from construction activities. Employment/income impacts would normally include:

- . the number of jobs created during construction;
- . the number of jobs filled locally; and
- . the forward and backward linkages created with other local and regional suppliers/industries.

Construction activities were valued at approximately J\$100m, with some 50 to 100 jobs being created during construction. The number of jobs expected to be filled locally was expected to be significant.

The assessment of forward and backward linkages was difficult to quantify without an input-output analysis, which was beyond the scope of this SIA/EIA. However, backward linkages positively impact both directly and indirectly all formal and informal sectors that contributed to the production of the gravel; e.g. plant materials and equipment sales. Forward linkages included the incremental and cumulative positive benefits from increasing the supply of gravel locally and nationally, and the indirect spin-off. Within the sub-industrial sector, forward and backward linkages accounted for a multiplier effect of 1 direct job to 3.8 indirect jobs. Hence, a range of 240 to 480 jobs would be created during the construction period. The proposed undertaking would therefore potentially impact employment in a positive, direct, significant and short-term manner.

Transportation Impacts

Potential impacts relating to transportation would be limited to construction supplies being transported by road, which were expected to be negligible given that a wharf would be constructed to transport the aggregates, and would therefore be the most likely mode of transportation for heavy materials and supplies. Hence, while there were existing negative issues relating to the present state of roads in the area, potential impacts on the roads as a result of the proposed development would be incremental and limited.

Health

The level of health related an impact associated with the proposed development requires further investigation. Based on the information obtained from residents in the study area, the existing high levels of dust and noise, were not only nuisances, but also affected their health and well being. Any incremental, albeit minimal increases to the existing levels as a result of the proposed development, would result in the increased cumulative levels of dust and noise, and would be detrimental to the local population.

B: Post-Construction/Operational Impacts

Post construction or operational impacts include health, national development, employment and community development.

Potential health impacts would be the same as those in the construction phase

On the national level, the production of sand and gravel continued to be critical in the construction and building sub-sector. In 2001, an estimated 2.2 million tonnes of sand and gravel were produced nationally, an increase of 5% over the previous year. Notwithstanding the current level of production, the proposed development would significantly change the level of demand and supply of sand and gravel. Further, that the proposed undertaking would be able to provide sand and aggregates for an estimated period of 40 years.

While the initial annual output was estimated at 1,000,000 tonnes per year, by Year 2, the amount of aggregates that would be produced by Pre-Mix Limited, would be almost equivalent to the present total sum of all aggregates produced nationally. At that level of operation, the Economic Rate of Return was calculated at 20%.

Not only would the Yallahs Delta sand and gravel reserve satisfy the local and national demands, but also have at its disposal, substantial surplus for exports, in shipments varying from of 1,500 to 35,000 tonnes. The exporting of gravel and sand would 'turn on' a multiplier effect leading to the development and expansion of backward and forward linkages and also significant direct foreign exchange earnings. Hence, national development impacts would be positive, direct and indirect, and very significant from the short to the long term.

According to figures obtained from the Client, an estimated 20 full time jobs would be created in order to operate the new facility. By extension, an additional 20 families would therefore have the opportunity for a better standard of living and lifestyle. Post construction employment impacts would therefore be direct, positive, significant, from short to long term.

There were no direct impacts perceived from the proposed development. Indirect benefits include the spin-off effects from employment creation and income generation. However, in the spirit of community stewardship, it was recommended that Pre-Mix Limited invest in the host community and its environment which was its resource base. Suggestions

included comments from the fishing community regarding the development of facilities on the beaches, assistance with social and community infrastructure including maintenance of the local road network and support to schools, and the sponsorship of community groups.

Recommended Mitigation And Monitoring

Water Quality

The mitigation plan must be focussed on containment of the operation to ensure that water quality at Cow Bay and environs is not threatened. A strict monitoring programme within an EMS must verify the effectiveness of containment measures.

The monitoring programme would include the collection of samples weekly within the zone of influence at sites set up for the EIA and possibly additional sites. Turbidity would be determined in the field and samples collected for determination of TSS in the laboratory.

Ecology

Mitigation

The loading facility should be fitted with a mechanism capable of reducing the amount of dust that is lost to ambient air during loading operations.

The potential for dredging and associated vessels to destroy fish traps in the vicinity of the river mouth can be dealt with by relocating them to either side (out of the way of moving dredge & boat equipment) this relocation should not affect their ability to catch these “migrating” fishes / shellfish.

The possible effect of the wash water/mud on nearshore flora and fauna downstream of the river delta would be lessened by the use of settling ponds onshore; the re-use of wash water and its eventual disposal some distance inland through a system of pipes/hoses so that it does not run directly into the sea.

There appears to be adequate land area on either side of the river delta for the creation of settlement ponds from which the water could be pumped for re-use in the washing process. There is also the potential for the creation of a limited amount of fine sediments from the material settling out at the bottom of the ponds should this be collected and washed at a later date.

The potential loss of fishing grounds to fishermen because of dredge vessel activity is of concern. As is the unpredictable effect that increased sediment levels may have on any species of fish or crustacean accustomed to migrating or transiting the dredge area during the course of their normal life cycle. Artificial reefs (made from commercially available reef balls) could be created at both Cow Bay and Top Reef to anticipate and compensate for any losses to the fishermen.

The rehabilitation of the area used for the establishment of the dock/loading facility when dredging operations have been completed must be considered.

Monitoring

It is anticipated that monitoring the substrate composition, sedimentation and salinity levels of the adjacent reef environments would be carried out at six (6) month intervals.

Checks should also be made on the status of the fish catch from the nearby fishing beaches on either side of the Yallahs River delta. Air quality downstream of the loading facility should also be monitored.

These data sets would help to provide early warning signs of any unexpected deterioration of these environments resulting from the dredging activities.

Coastal Dynamics

Mitigation Plans

In general, the mining activities are not anticipated to result in any major negative impacts to the marine environment. The expected changes in seabed bathymetry and profile as a result of mining do not lead to any significant changes in rates of alongshore sediment transport. In addition, neither are cross-shore characteristics significantly altered.

Recommended Monitoring

To ensure that appropriate responses can be made to any significant changes in the shoreline morphology the following programme of monitoring is recommended:

1. Beach profiles should be monitored as follows:
 - Profiles should extend to the west of the groyne by a distance of 1.5 km and to the east they should extend 1.0 km;
 - Profiles should be tied in to back of beach benchmarks;
 - Profiles should be at approximately 200m spacing;
 - Profiles should be measured on a quarterly basis.
2. Beach profiling should start before the commencement of construction.
3. Once every six (6) months, for the first two years of operation, a bathymetric survey should be carried out to allow pre- and post-mining seabed comparisons;
4. Collect sediment samples and carry out grain size analyses. Samples should be collected from both the updrift and downdrift sides of the river. These results will be used to evaluate whether or not there are any changes in sediment size composition that may be attributable to the mining operations.

Socio-economics

Health

Overall, SIA impacts would be positive with the exception of health and related nuisance impacts from dust and noise. Given the absence of technical information to properly assess the extent of dust and noise levels on the health and well being on the communities within the SIA, it was recommended that a noise and dust study be undertaken. Based on the results from the study, the magnitude of negative impacts would be determined, and appropriate mitigative measures developed and implemented.

Residual Impacts

From a socio-economic perspective, residual negative impacts would be related to health, however, as indicated above, we are unable to determine the exact impacts without further study.