MONTHLY REPORT 2

20 September to 19 October 2002

By GGDMA Miners Environmental Officer

GENCAPD Project

The following report is based on work conducted together in the field with the GGMC tailings management team: Mr Ronald Glasgow (Engineer, Mines Division) and Mr Kierion Husbands (Geotechnician, Environment Division), whilst based at the Falls Top Barima River GGMC Mining station camp, and travelling to the following backdams: Kamwatta Creek [Eyelash], Tiger Creek, Arakaka Creek, 26 Mile and Five Star.

PROGRESS MADE ON ACTIVITY PLAN [DRAFT]

In the light of the seriousness of the situation in the NWD, there may be a need to revise plans for the next location. Mr Peter Hutson (GGMC Engineer) has just returned to Eyelash. He will replace Mr Glasgow and, with a mandate and budget to hire excavator hours, he will be attempting some remedial works as well as closed-circuit systems. He will also be conducting an experiment on the use of alum to encourage settlement of diluted tailings pond slurry, which, due to constant flux created by the creek flowing through old pits, is not settling out of suspension.

Mr Shields agreed with the focus on the Mahdia area, the North West District, and on the Puruni River area. However, the Commissioner has pointed out that the focus for now should be on areas where communities are directly affected by mining activity. In this way, it has been suggested that the Kurupung and Mazaruni areas should be one of the three focus areas, instead of the Puruni area.

It is of vital importance that agreement between GGDMA, GGMC and GENCAPD regarding who is responsible for the Miners' Environmental Officer [MEO], be established, as this is still lacking. It is envisaged that this meeting between **Mr Shields, Mr Benn** and **Mr Ayalew** can first iron out responsibility for the MEO. Once this has been agreed upon then the MEO will look forward to discussing more closely the future work plan.

A memorandum was sent 18 October to Mr Shields (GGDMA), Ms Livan (GGMC) and Mr Legesse (GENCAPD) setting out a number of questions requiring immediate resolution and action regarding logistical issues: mobility (transport) in the field and field assistance.

FIELD TRIPS: OBSERVATIONS & COMMENTS

SWOT ANALYSIS

A rapid SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was conducted in the field by the MEO in association with GGMC officers Mr Glasgow (Engineer, Mines) and Mr Husbands (Geotech, Environment).

Please refer to ***Appendix 1:*** *SWOT Analysis of the on-going implementation of the tailings management project by GGDMA/GGMC*

POSITION STATEMENT

A position statement from the MEO has been prepared, based on observations made over the last 2 months.

Please refer to ***Appendix 2:*** *Draft Position Statement: Tailings Management in the Small-Medium Scale Gold and Diamond Mining Industry in Guyana.*

FIELD TRIP ITINERARY

20/09 – 22/09	Tailings Mgmt @ Kamwatta Ck [Eyelash]
23/08	Tailings Mgmt @ Tiger Ck
24/08 – 29/08	Tailings Mgmt @ Arakaka
30/09 – 05/10	Tailings Mgmt @ Kamwatta Ck [Eyelash]
06/10 – 12/10	Tailings Mgmt @ Five Star backdams
13/10 – 15/10	Follow-up TM @ Eyelash
16/10 – 17/10	Travel back to G/T
17/09 – 18/10	Project administration and reporting in office

See MEO Consultant's diaries for details of daily activities.

WORKSHOPS FACILITATED

TITLE: Tailings Management & Closed-Circuit systems
PLACE: Clad Adams camp, Powisparu backdam, Five Star, NWD
DATE: Thursday, 10 October 2002
TIME: 7:00 – 9:00 pm
ATTENDEES: Miners from Powisparu backdam
NUMBER: 30 miners

LIST OF NAMES [INCOMPLETE]:

1. Gavin Blacks [Dredge owner x 4]
2. Rawle Joe
3. Bryan Joseph [GM Clad Adams x 2]
4. Denzel Elliot
5. Dexter Cameron [Dredge owner x 1]
6. George Scott [Dredge Owner x 1]
7. Troy McAulay
8. Jarvis Primus
9. Irwin Ramsay
10. George Rouche
11. Samella Joseph
12. Kurth Rodney
13. Godfrey David
14. Godfrey James
15. Kurt McKenzie
16. Laurence Husbands
17. Harold Bennett
18. Nolan Markus
19. Terrence Bowman
20. Anthony Williams

WORKSHOP OUTLINE:

5 min	Introduction and Welcome	[R.Glasgow, GGMC]
20 min	Why Tailings Management	[R. Glasgow]
20 min	Closed Circuit & Water Recycling	[**C. Curnow**, MEO]
20 min	Water Quality measurements	[K.Husbands, GGMC]

MEETINGS HELD

Various meetings and discussions with individual dredge owners and GMs.

NETWORKING

Spent the entire month in the field, building relationships with a number of dredge owners and/or operators in the Kamwatta Creek [Eyelash] area, Tiger Creek, Arakaka, 26 Mile and the Five Star areas.

Some of the more fruitful relationships so far developed, while not bringing the desired results in terms of conversion to the closed circuit system of tailings management and the recycling of water, are:

1. **Paul Rodrigues**: Was going to implement a closed-circuit system using old excavated pits that we had identified with him in his claim, however he is now shifting operation to Arakaka
2. **Nagahiro** (Brasilian with excavator): Was going to do something similar for us and showed great enthusiasm, however, when his excavator broke down twice within the period of a week, and his production levels were low, he decided to cut out and move as well, to a new area near Eyelash.

3. **Francisco Sousa Martins** (Brasilian): Moved into a new area where old pits could be used for closed-circuit system. Advised him to divert creek around workings and keep pits isolated. This was inadvertently ignored.
4. **Assis** (Brasilian): Has established (as of 15 October) a quasi-closed circuit system, discharging into old pits and recycling water from same pits back to jets. However, as already alluded to, there is escape from the reservoir pits to Kamwatta Ck and the creek enters his reservoir pits to a certain degree.

LITERATURE REVIEW

Documents listed in the August-September report are still being reviewed, however, being in the field has prevented a concerted effort in this regard.

The closed-circuit system, as advocated by as yet unknown Brasilian source, has been studied extensively in the field: results are still pending, however, it appears that the practical side can be achieved. In order for this to happen, a serious amount of pre-mine planning is required, not to mention the resolution of the associated issues laid out in the Position Paper (see ***Appendix 2***).

APPENDIX 1: SWOT ANALYSIS OF THE ON-GOING IMPLEMENTATION OF THE TAILINGS MANAGEMENT PROJECT BY GGDMA/GGMC

STRENGTHS	WEAKNESSES
• Approx. 90% of dredge owners in Eyelash, Tiger Ck, Arakaka, Big Ck, 26 Mile & Five Star have been individually approached. • Greater awareness amongst those contacted of the environmental impacts. • Greater willingness to modify their operations. • Background turbidity levels known in most creeks of abovementioned backdams. • Turbidity levels known from all backdams. • Several operators in Eyelash were willing to implement closed-circuit systems, however only 3 were suitable for the purpose of experimentation in the short term: **Nagahiro** (Brasil), **Francisco Sousa Martins** (Brasil), **Assis** (Brasil) and **Paul Rodrigues**. Each of these had systems in place to allow for closed circuit and 100% recycling. Sousa Martins' operation was a new one with previously worked old pits separate and isolated from bottom side flow of Kamwatta Ck, so pre-mine planning was possible. Assis actually established a quasi-closed-circuit system (as of 15 Oct) and on-going studies are being made with his operation..	• Lack of ability by GGMC and GGDMA MEO to implement proposed solutions. • Lack of incentives to encourage miners to change/modify their operations (i.e. equipment like extra pipes and gravel/slurry pumps to allow recycling, as well as compensation for lost production in land sacrificed by jumping out, boring down again, etc.). • Mines officers are not working in tandem with tailings management team to ensure integrity and uniformity of information, and neither are they able to conduct follow-up and monitoring of areas. • Inability to rely on operators to comply with requests: Two of the 3 operators in Eyelash originally willing to establish closed-circuit systems and recycle all water, are still not in a position to do so 2 weeks after original verbal agreement. P. Rodrigues will be shifting operations to Arakaka. Nagahiro has been plagued by excavator breakdowns and will be shifting anyways once repairs have been made. • Most dredge owners are willing to comply with recommended/suggested solutions only when constant GGMC presence is felt. Most feign intention to cooperate, only to rescind on their word. Whether this is due to unwillingness or ignorance is sometimes difficult to ascertain • Insufficient workshops are being run. More are required in any given backdam and more need to be conducted in the backdam itself to facilitate increased attendance rates. • Visual educational material regarding tailings management is lacking. The MEO has started developing some material.
OPPORTUNITIES	**THREATS**

• To continue follow-up work with the various established relationships, with the view to establishing demonstration sites highlighting the function of the closed-circuit system, the correct way of recycling of water and the effective isolation of mine operations from ALL creek/river flows.
• Investment in small- medium scale mining industry by GGMC and GGDMA to:
  o Improve exploration methods/techniques.
  o Provide modified gravel/slurry water pumps so as to facilitate water recycling.
  o Provide credit/concessions for excavator and other equipment purchase necessary for efficient tailings management.
  o Provide rapid filtration systems for pumping slurry (this is an alternative or complementary action to the use of slurry pumps).
• With knowledge so far gained, there continues a solid base for building a common approach to tailings management nation-wide.
• Facilitated field days at demonstration sites.
• More workshops in the backdam on a regular basis.
	• Lack of human resources to do necessary follow-up. More MEO-type positions required.
	• Continued pollution of tributaries and rivers with highly turbid water (>1100 NTU).
	• If Mines Officers are not aware of their additional environmental extension and monitoring duties, then mixed messages will continue to interfere with the overall objective of tailings management: i.e., To improve water quality and associated environmental parameters.
	• Inability and/or unwillingness of many dredge owners to comply, as they continue to seek profits (or to simply cover costs as is the case in 'subsistence' mining) at all costs, including those to the environment.
	• Most operators are what may be termed 'subsistence' miners, and as such have very limited means (capital and assets) to make the relevant operational modifications.
	• No research into practical function of the closed circuit theory for hydraulic mining

APPENDIX 2: POSITION STATEMENT

TAILINGS MANAGEMENT IN THE SMALL-MEDIUM SCALE GOLD AND DIAMOND MINING INDUSTRY IN GUYANA

All backdams so far visited by the MEO in the NWD have a central and limiting factor: the fact that the creek has never been isolated from the work grounds from the outset. As a direct consequence of this poor environmental planning the creek continues to flow through all old pits, whether backfilled or not. As such any further backfilling of old pits will fail to address river system water quality downstream. Until each and every operation from the top of the catchment downstream has constructed adequate diversion channels for the creek so as to ensure 100% isolation from the work grounds, then any attempts at backfilling, linking old pits and recycling water from these pits in a closed-circuit system appraoch, will be condemned to failure.

The creek that passes through old pits acts to both dilute the slurry and keep it in constant motion and circulation. The "dilution effect" noted in all instances (Arakaka, Eyelash, Tiger Creek, Big Creek and Five Star) increases the distance between colloidal particles in suspension (pers.comm. Peter Hudson, September 2002) and therefore decreases their ability to attract each other as per cation exchange capacity and clay domain (plate-like charged structures) attraction. Without this attraction, large enough particles capable of settling out of suspension are prevented from forming together. In this way the slurry takes longer to fall from suspension i.e., suspended material settlement time is prolonged.

The effect of constant motion due to creek flow is self evident: the kinetic energy of the circulation currents prevents colloids from sinking. It can also re-suspend colloidal material back into the water column.

The closed-circuit system relies on isolation from the creek/river. With adequate settlement space and time, water can be recycled once two or three pits have been backfilled (and not overfilled) and subsequently connected via shallow-linking channels, designed to "skim" of the supernatant from each successive pit (refer to diagram of Brasil closed-circuit system distributed within GGMC)

Another limiting factor in the successful attainment of the closed-circuit system, is the size of each work pit, with special attention being paid to the first one.

Without prior planning and additional preliminary work in the construction of an initial tailings impoundment structure, the initial bore down pit will always discharge raw/ unsettled tailings directly or indirectly to the creek/river. Even if an adequate tailings management structure is built, many small land-dredge operators tend to remain for extended periods in the first pit (and for that matter in all pits) and thereby outlive the capacity of the previous pit volume. The same applies when they are in the process of backfilling old pits: failure to judge the filling rate and being aware of when to jump out results in pits being filled beyond capacity. Once overfilled a pit no longer functions as a

"tailings" settlement pond, and unsettled tailings will flow out via the discharge point. If this discharge point flows into another old pit with adequate retention volume and sufficient water column height, the contamination is contained, and settlement may take place. In this way improved water quality is a function of increasing settlement time i.e., reducing water body flux and allowing only the clear supernatant to move from one pit to the next or back to the creek as necessary.

The main reason for the failure to reduce pit size, through the practice of jumping out and boring down regularly, is the unwillingness of land-dredge operators to waste the time spent in reaching the relatively thin gold-bearing gravel strata (placer gold). If the overburden is deep (e.g. 2-4 meters) it represents extra time and lost production to jump out, assuming that the gravel that is being worked is producing well. The closed circuit system also represents lost production to the operator insofar as the land between successive pits is seen as being lost from production.

Also noted in all backdams visited is the fact that the entire creek flat from ridge to ridge has been mined. Remedial work now to facilitate a dedicated channel for the creek from catchment top to bottom is therefore made more difficult as all operations have already worked the whole area. Tailings are intentionally thrown without containment on low-lying swamps, with the intention of working the swamp in the future. The dumped tailings speeds up the drying-out process and allows the land dredge to later move into an area, previously inaccessible due to inundation.

It would take at least 4-6 months of concerted and constant effort in each backdam to bring about the desired operational modifications and water quality improvements. This implies extensive work in the following areas:

1. Social facilitation amongst all operators.
2. Sufficient excavator hours for each operator top to bottom.
3. Ongoing education on closed-circuit systems.
4. Extra equipment to permitimplementation of the closed-circuit system (e.g. extra pipes, gravel/slurry pumps, excavators, etc).
5. Collection, collation and interpretation of engineering and hydrological data to effectively design the complex creek diversion channel system.

All of the above implies an integrated approach, working together with all operators in unision – a significant challenge if one understands the sociological nature of the players involved. It only takes the work of a few unwilling miners to undo all gains made.

All work that takes place in these critical backdams on an operator-basis rather than on a more wholistic collective approach, should be considered remedial and a "band-aid" solution. In addition, any quick-fix approach, as has been advocated by some in the form of large dams downstream to handle all tailings, is ill-advised as seasonal hydrological fluctuations are extreme and their parametersunknown. Any structure built without these important inputs will inherently be risky and open to design failure from extreme rainfall and flood events. The consequences of such failure will only exacerbate the water quality problem downstream at some undefined future time. It should also be noted that such a structure

would not in fact be a tailings dam, but rather a structure to dam a creek/river that incidentally contains tailings in its flow – **This is an important distinction**.

In other instances, and looking now more into the long-term, where areas have not yet been opened to mining, procedures should be put in place that require all incoming land-dredge operators to:

1) Conduct adequate exploration using rapid appraisal techniques that do not require jetting down;
2) Submit mine plans, which amongst other things, detail how and where tailings will be contained away from the creek, how the creek will be isolated from the work ground and what measures and capabilities do they possess for recycling all water;
3) Reduce the amount of tailings produced overall through alternative methods of overburden removal, which do not include jetting down, i.e. excavators;
4) Recycle water, with "make-up" water permissible from creek, but with zero unsettled tailings discharge back to creek;
5) Consult with neighbouring dredge operators on a continuous basis so as to avoid site-specific conflicts on tailing right.

Tailings management will require the concerted efforts from many players. There are several concurrent issues to solve. The education of miners, creating awareness and understanding of the new environmental mining standards, and providing technical advice and instruction in the construction of tailing dams, all the while encouraging the move toward the closed-circuit system approach, is certainly, valid, but not the be-all-and-end-all: There are other wider socio-economic and industry investment issues that require immediate attention.

MERCURY

- Incidental information on prevailing practices in backdams is being collated: majority practice dangerous handling and do not use retorts.
- Information on retorts is being disseminated where and when appropriate/convenient.