Report For

Bio-remediation Of Polluted Waters

Sungai Bintangor, Kuching, Sarawak

With

AquaClean™ and BioAktiv

Remediation Products

Project Proponent :-

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INTRODUCTION

Sg. Bintangor is situated at the heart of Kuching City. The river is about 650 metre long and 12m to 15m wide, forming as a tributary of the Sarawak River. It passes under a protocol road in Kuching and flows through Kpg. Masjid in Satok before joining the Sarawak River.

During high tide, the Sarawak River Barrage at Sg. Sarawak is closed to prevent the ingress of seawater. The water in Sg. Bintangor is relatively stagnant when the Barrage is closed. During heavy rains, the Barrage is opened to prevent flooding. On dry days, the water may even back-flow from Sg. Sarawak when the Barrage is closed as water level in Sg. Sarawak rises faster than Sg. Bintangor because of rainfalls around the Catchment Area. However, during heavy down pour and at low tide, the flow in Sg. Bintangor can be quite fast and the water is discharged within a few hours. The average depth of the water range from 0.5 to 1.5m.

The river emits an unpleasant odour which is clearly noticeable at the protocol road located above the river. The pollutants, including solid wastes, untreated waste-water from septic tanks, animal & fish entails, household garbage, oily & greasy scum and food remnants from surrounding food eateries & workshops, paint a repulsive sight which adversely affects tourism. In addition, the dirty waters support the breeding of harmful insects, such as mosquitoes in the surrounding areas, creating serious health and hygiene concerns.

A clean river water is of paramount importance to blend in with the newly-developed Sungai Bintangor river banks. At a recent survey of the Catchment Area of Sg. Bintangor, we found that the main pollutants came from the four locations at source areas. These are from the food-courts & restaurants, hotels, lodging houses, sewage from housing estates & shop-houses, etc, the Sarawak General Hospital, private hospitals, nursing home & clinics, Army & Police Barracks and the many make-shift food stalls along Jalan Nanas, Jalan Rubber, Jalan Satok and Jalan Kulas. One of the worst polluters is of course, the Wet Market at Jalan Satok where a lot of animal and fish blood, entails and oily leftovers and vegetable & fruits wastes are simply flushed down the drains without any form of filtration or via suitable grease traps. Although most of the larger wastes are collected in rubbish bins provided by City Hall, most of the smaller and wet, untreated & unfiltered wastes, oils and greases are washed down the culverts and storm drains, eventually ending up at the weir area of Sungai Bintangor, contributing to the pollution of the Sarawak River. Most of the time the weir area is covered in an ugly layer of smelly, dirty and unsightly layer of greasy scum.

Fig. 1 General View Of Weir Area Before Treatment

Fig. 2 General View Of Sg. Bintangor Before Treatment

Fig. 3 Untreated Greasy Source Water from wet market

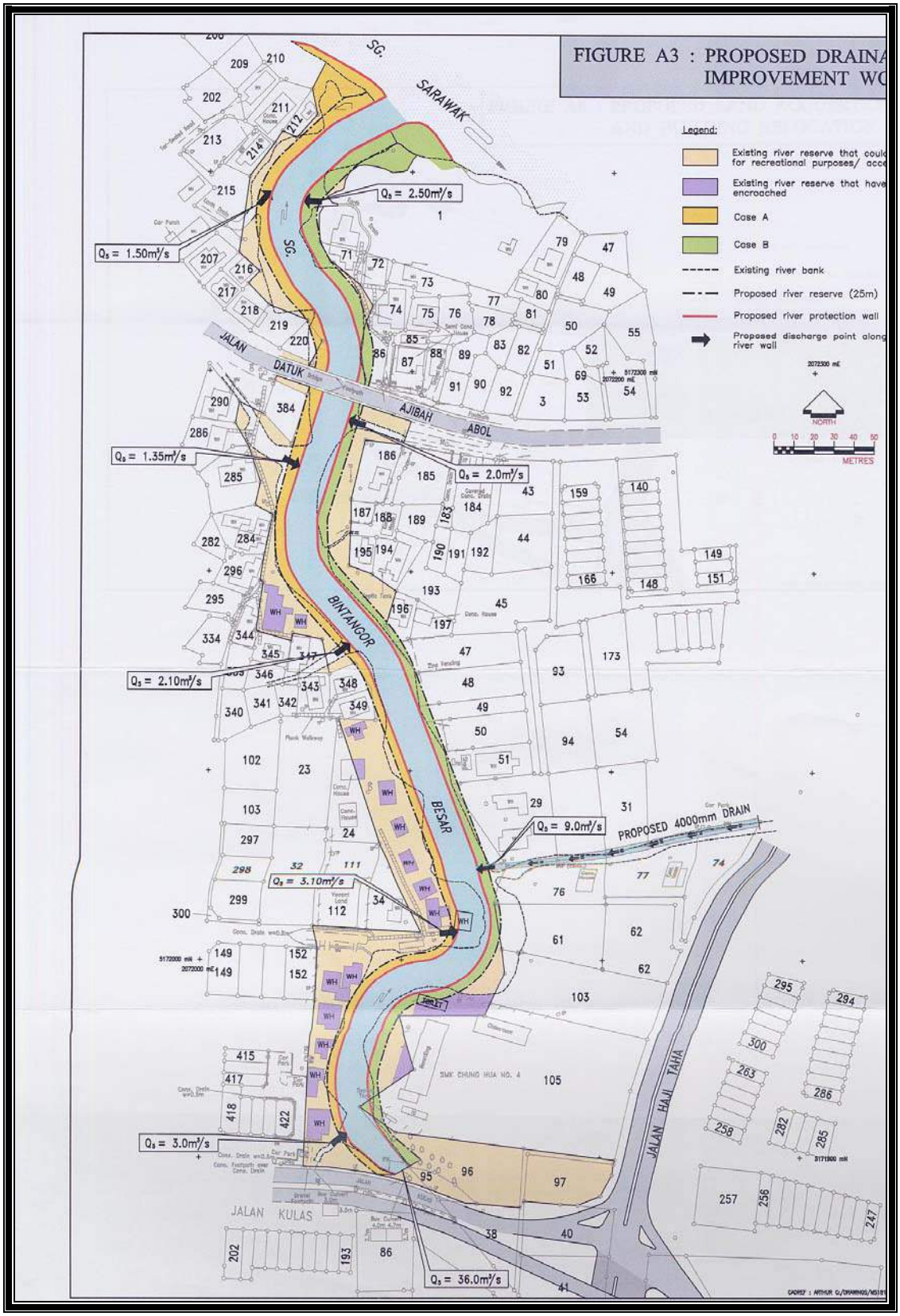

Fig. 4 Map Of Sg. Bintangor

AQUACLEAN BIO-REMEDIATION PROGRAMME

A weir has been constructed at the upstream section of Sg. Bintangor near the road bridge to trap solid debris. The weir maintains the water level upstream at about 1.5m depth consistently and prevents the inflow of water from Sg. Sarawak. The water upstream the weir serves as an ideal location for the incubation of AquaClean bacteria. Sometimes during high tide, the incoming water back-flows over the weir and at ebb tide, some floating debris and greasy scum trapped on the weir and not removed regularly by the contractor, is carried over the weir and into the Sarawak River. At certain times during ingress of waste-waters into the Sg. Bintangor at high tide, the blackish water at the river mouth emits a foul smelling odour. This is because of untreated waste-waters from other tributaries discharging into the Sg. Sarawak. To prevent this Bad Odour at the Sg. Bintangor river mouth, all waste-waters from tributaries discharging into the Sg. Sarawak need to be properly treated in the same manner as the Sg. Bintangor. If this can be done, we will eventually get a clean, non-smelly and healthy Sg. Sarawak.

Any form of bioremediation takes about three weeks to two months from inoculation to achieve the optimum bacteria population. Although some bacteria will stay on the riverbed and sludge at the bottom, most bacteria remain suspended in the water digesting the suspended organic waste as it flow along the river. The established bacteria colonies can be almost completely sweep away during a heavy rain. In order to retain as much bacteria as possible in the river, we installed our unique cost-effective biomedia at the weir area and at strategic locations along the river. Fig 5 & 6 shows our biomedia under construction and installation in progress. The biomedia is be installed on rectangular bamboo frame of 5m x 1m x 0.5m high. The media is wound around the bamboo frame at 15 cm apart. The frame uses about 70m length of the biomedia per cubic meter of frame volume. The biomedia's function is similar to biofilter in a fish tank or pond, the organic wastes are blocked by the media and serve as nutrient to AquaClean bacteria. The most important function of the media is act as home to the microbe and helps to hold the microbe along the river even during heavy rain. The media will be fully clogged up without the use of AquaClean and BioAktiv remediation. Experience has shown that our remediation technology is able to maintain the media relatively sludge-free over long period of time.

AquaClean remediation effectively increases many-fold in the presence of biomedia, along with sufficient biostimulation. Our technology consisting of a complex bioaugmentation program utilizing AquaClean's bacteria culture, along with BioAktiv biostimulation, in our unique and cost-effective bacteria

media frame, is able to deliver the best natural bioremediation technology available today.

Fig. 5 Biomedia Frame under construction

Fig. 6 Installation Of Biomedia

Inoculation was done on 1st December, 2006. This is followed by a daily maintenance dosing initially. An appropriate amount of BioAktiv power was mixed with water and sprayed over the treatment zone along with AquaClean on selected days during the treatment.

Maintenance dosings were initially done at the weir area. It was found that too much untreated greasy wastes and polluted water reached the weir area without any treatment. The dosing was switched to include the source points upstream as shown in fig 3 to allow some form of treatment before the water reaches the weir area from 20 Dec 2007.

Appendix 1 tabulates the dosings schedule for AquaClean and BioAktiv and records major observation of changes during the treatment.

WATER PARAMETER MEASUREMENT AND OBSERVATION

The water along the Sg. Bintangor on a dry day appeared heavily polluted along the whole river before treatment. A water sample taken on 31 Oct 2006 records the following parameters :

	At the weir	At river mouth
• pH	6.6 @ 27^{o}C	7.3 @ 27^{o}C
• COD	721 mg/l	213 mg/l
• BOD	249 mg/l	83.3 mg/l
• TSS	1350 mg/l	763 mg/l
• TN	111 mg/l	126 mg/l
• Odor	Very strong	strong

There are several inlets to Sg Bintangor. Water quality is also highly affected by storm water. Although some water samples were taken at various locations during the treatment period, no systematic analysis is feasible.

Results of subsequent water samples taken are tabulated below :

Date	COD (mg/l		BOD (mg/l		Remarks
	Inf.	Eff.	Inf.	Eff.	
14 Dec 06	88.4	18.5	20.1	4.1	Influent point is at the weir area and effluent point is near the river mouth.
3 Jan 07	9353	24.6	4421	6.3	Influent point taken at raw source 1km upstream from the weir area and effluent point near the river mouth. There are other influent sources of much lower polluted water entering the weir area
Date	**COD (mg/l**		**BOD (mg/l**		**Remarks**

	Inf.	Eff.	Inf.	Eff.	
16 Jan 07	716	25.8	253	11.8	Influent sample was taken at Satok area, effluent sample taken at river mouth
5 Feb 07	3753		1191		Sample taken at source (Fig 3)
5 Feb 07	73.2	18	9	3.5	Influent sample taken at weir area and effluent sample taken at river mouth

Date	TSS (mg/l		TN (mg/l		Remarks
	Inf.	Eff.	Inff.	Eff.	
14 Dec 06	57	30	9	10.6	Influent point is at the weir area and effluent point near the river mouth.
3 Jan 07	2400	57	224	9.5	Influent point taken at raw source 1 km upstream from the weir area & effluent point near the river mouth.
16 Jan 07	588	41	43.7	17.9	Influent sample was taken at Satok area, effluent sample taken at river mouth
5 Feb 07	4175		161		Sample taken at source (Fig 3)
5 Feb 07	13	11	11.2	37	Influent sample taken at weir area and effluent sample taken at river mouth

Appendix 2 attached the water sample test report.

There are multiple influent water sources and the sample taken on 3 Jan 2007 was from the source point upstream which is the most polluted source. It is found that the water along Sg.Bintangor has improved during the treatment. It was reported in The Borneo Post on 10 January 2007 that Housing Minister Dato Sri Abang Johari Tun Openg stated that he had received report indicating BOD in Sg Bintangor had dropped from about 300 to 74.

The most significant observation during the treatment is that, bad odour disappeared within weeks of treatment. Bank Simpanan National, Lembaga Kemajuan Ikan Malaysia, Chung Hua Middle School No 4 and a nearby resident, Mr Johny B Mohd Rosli was so satisfied with the elimination of bad odour and had written letters of appreciation to Ochem East Sdn Bhd. These letters are attached in appendix 3.

The layer of greasy scum at the weir area had also reduced significantly during the treatment. However, as most of the greasy wastes were discharged directly at the wet market without any effective grease traps, scum are still seen at the weir area when the discharge is too much. The only way to prevent greasy wastes at the weir area is to construct suitable grease traps at source.

Fig. 7 Progress Photos Taken In December, 2006

CONCLUSION

The early elimination of Bad Odour and the drastic reduction of surface scum are the first indication of AquaClean and BioAktiv remediation in progress.

The dosing locations were switched to selected source locations about 1km upstream the weir area from the 20th December, 2006 and this has proved to be a right decision as the extremely high pollutants were reduced drastically by the time the polluted water reached the weir area. The remediation works continue to take place along Sg. Bintangor and we have achieved a very effective level of degradation of polluted wastes along the river by the time the water reached Sg. Sarawak. This is clearly reflected in the various water samples taken at the river mouth which meet the regulatory requirement at all time.

The very bad odour at source points especially at Jalan Satok & Jalan Kulas, the weir area and at effluent point near the Sarawak River has noticeably disappeared. The BOD, COD, TSS, DO parameters have all improved drastically - way beyond regulatory requirements and aquatic life-forms are commonly seen along the whole river particularly at the weir area. Tiny bubbings are seen at the weir area indicating continuous bacterial

action. All these signs indicate that the previously most polluted river in Sarawak is now a healthy and clean river.

However, in order to maintain this improved standard, a maintenance schedule to continue dosing the source points as well as the weir area must be put in place and we strongly propose that the minimum dosing of 5 gallons of AquaClean ACF-32 twice per week be continued for at least another three to six months. BioAktiv dosing should be done once every two weeks at 20kg per dosing. This is because of the high level of pollutants coming into Sg. Bintangor at source points especially from the Jalan Satok and Jalan Kulas areas. Apart from these two main polluting sources, we also have lots of pollutants coming into Sg. Bintangor from the Sarawak General Hospital, the Police HQ & Barracks, the Army Barracks, housing estates, clinics, nursing home, lodging houses, hotels, shop houses, restaurants, food-stalls, schools, church, government departments, etc.

In our efforts to maximize the effectiveness of the bioremediation process, we have been dosing one to two gallons of AquaClean ACF-32 per day at the large grease trap situated behind Hartz Chicken Restaurant at Jalan Satok. The drains along this area are also dosed as and when necessary. The degraded food wastes, especially oils and greases in the grease trap would be exposed to a daily dose of bacteria culture and whatever overflows from this grease trap would contain a huge amount of ACF-32 to continue to battle the food greases and oils from the many night food-stalls along Jalan Satok where no form of grease traps whatsoever can be found. The food wastes are simply washed down the storm drains day in and day out.

Off and on, we still notice a layer of oily scum (not smelly anymore), at the weir area but fortunately not as bad as before our biological treatment. This unsightly scenario can easily be solved by regularly servicing the various collection traps installed near the weir area. We notice that the oily scum appear whenever floating debris get trapped at the inlet to the waste collection devices.

The planned introduction of hydrophonics using selected flower-bearing plants at strategic locations along the river will also enhance the AquaClean bacterial cleansing function as the mass root systems of these plants act as an excellent filtration system in further purifying the waste-water in the river. One of the unique functions of AquaClean is its ability to increase the fertilizer value of the waste-water being treated and therefore no other forms of fertilizers are needed.

With a clean, non-smelling and the sweet fragrance from the flowers in the river, we will at last, be able to achieve our YB Dato Sri Abang Johari's aim to make Sg. Bintangor the "Little Venice" of Kuching. Sungai Bintangor, from one of the dirtiest rivers in Malaysia, will eventually become the most beautiful river in this region and it will be a well-sought tourist attraction. With its clean and non-smelling water, Sg. Bintangor would attract recreational activities especially aquatic activities and angling.

Appendix 1 Dosing Schedule and Record of Major Observations

Date	ACF32 (gal)	BioAktiv (kg)	Remarks
1-Dec-06	30	50	Inoculation dosing along the complete river.
2-Dec-06	10	20	
3-Dec-06	10		
4-Dec-06	10	20	
5-Dec-06	10		
6-Dec-06	10		
7-Dec-06	10	20	
8-Dec-06	7		On the 8th day, 90% of the whole weir area was covered in a grayish and wrinkled layer of bubbling scum indicating positive microbial action. On the 9th day, bad odour reduced, surface scum at weir area reduced by 50%.
9-Dec-06	7		
10-Dec-06	7		
11-Dec-06	7		
12-Dec-06	7		
13-Dec-06	7		
14-Dec-06	7	20	By 14th day, bad odour has completely disappeared, water after the weir turned greenish and cleaner, greasy scum reduced drastically.. Lots of small bubbles were seen all over the weir area. Small fishes and marine creatures were seen swimming along the river and especially in the weir area.
15-Dec-06	7		
16-Dec-06	7		
17-Dec-06	7		
18-Dec-06	7		
19-Dec-06	7		15 gallons of ACF-32 were dosed at three source points further upstream from the weir area because of very bad and smelly FOG in the storm drains over several days
20-Dec-06	7		
21-Dec-06	7	20	
22-Dec-06	4		
23-Dec-06	4		Water at weir area remain cleaner with noticeable aquatic life-forms and there was an absence of smell.
24-Dec-06	4		
25-Dec-06	4		
26-Dec-06	4		
27-Dec-06	4		
28-Dec-06	4	20	
29-Dec-06	4		
30-Dec-06	3		State Minister of Housing, Y. B. Dato Sri Abang Johari commented in the local press that the rehabilitation of Sg.Bintangor was a success after just over 30 days.
31-Dec-06	3		
1-Jan-07	3		
2-Jan-07	3	20	From the 2nd to the 14th January we reduced the daily dosing rate to two gallons - i.e. 1 gallon each at the two source points because the weir area was clear of floating scum and the drains around the source points were still greasy & oily. On the 4th January we applied two kgs of BioAktive Powder each to the two source points to improve the Oxygen Demand in the waste-water and the rest were sprinkled in the weir area. Another water samplings were taken at source points and the effluent point on the 16.1.07. Please refer to the various water analysis reports from an independent laboratory in Kuching. The results are very encouraging.
3-Jan-07	3		

Date	ACF32 (gal)	BioAktiv (kg)	Remarks
4-Jan-07	3		
5-Jan-07	3		
6-Jan-07	3		
7-Jan-07	3		
8-Jan-07	3		
9-Jan-07	3	20	
10-Jan-07	3		
11-Jan-07	3		
12-Jan-07	3		
13-Jan-07	3		
14-Jan-07	3		
15-Jan-07	3		From the 15th January till the 28th February, 2007 the normal dosing rates were maintained together with the application of BioAktiv Powder as scheduled.
16-Jan-07	3	20	
17-Jan-07	3		
18-Jan-07	3		
19-Jan-07	3		
20-Jan-07	3		
21-Jan-07	3		
22-Jan-07	3		
23-Jan-07	3	20	
24-Jan-07	3		
25-Jan-07	3		
26-Jan-07	3		
27-Jan-07	3		
28-Jan-07	3		
29-Jan-07	3		
30-Jan-07	3	20	
31-Jan-07	3		
1-Feb-07	3		
2-Feb-07	3		
3-Feb-07	3		
4-Feb-07	3		
5-Feb-07	3		
6-Feb-07	3	20	
7-Feb-07	3		
8-Feb-07	3		
9-Feb-07	3		
10-Feb-07	3		
11-Feb-07	3		
12-Feb-07	3		
13-Feb-07	3	20	
14-Feb-07	3		
15-Feb-07	3		
16-Feb-07	3		
17-Feb-07	3		
18-Feb-07	3		
19-Feb-07	3		
20-Feb-07	3	20	
21-Feb-07	3		

Date	ACF32 (gal)	BioAktiv (kg)	Remarks
22-Feb-07	3		
23-Feb-07	3		
24-Feb-07	3		
25-Feb-07	3		
26-Feb-07	3		
27-Feb-07	3		
28-Feb-07	3		
Total	**403**	**330**	

Appendix 2 Water Sample Test Reports

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Directors : Datin P.K. Wong MRSH, MBIM, F.Inst.Pet., Dip NIOA
Marcus K.F. Kam B.E.(Hons), M.Sc., C. Chem, MRACI, MBA

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1130/07
Sample Description	:	Three (3) Samples of River Water
Sample Marking	:	As Below
Date Sample Received	:	05/02/2007
Date Sample Reported	:	24/02/2007
Page	:	1 of 3

RESULTS OF ANALYSIS

Parameters	Water Sample Taken From Sg. Bintangor; River Mouth (Effluent Point) on Sunday; 04/02/2007 at 3.00pm. (Sunny Day, Low Tide)	Test Methods
pH Value	7.2 @ 26.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	4.1	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	18.0	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	3.5	APHA 4500-O C, 5210B
Suspended Solids, mg/l	11	In-house method based on HACH-Method
Total Nitrogen, mg/l	37.0	*APHA 4500-Norg B
Odour	Weak	*In-house method based on APHA 2150B

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CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1130/07
Sample Description	:	Three (3) Samples of River Water
Sample Marking	:	As Below
Date Sample Received	:	05/02/2007
Date Sample Reported	:	24/02/2007
Page	:	2 of 3

RESULTS OF ANALYSIS

Parameters	Water Sample Taken From Weir Area of Sg. Bintagor on Sunday; 04/02/2007 at 2.30pm; (Sunny Day, Low Tide)	Test Methods
pH Value	6.8 @ 26.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	2.2	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	73.2	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	9.0	APHA 4500-O C, 5210B
Suspended Solids, mg/l	13	In-house method based on HACH-Method
Total Nitrogen, mg/l	11.2	*APHA 4500-Norg B
Odour	Weak	*In-house method based on APHA 2150B

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CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1130/07
Sample Description	:	Three (3) Samples of River Water
Sample Marking	:	As Below
Date Sample Received	:	05/02/2007
Date Sample Reported	:	24/02/2007
Page	:	3 of 3

RESULTS OF ANALYSIS

Parameters	Water Sample Taken From Source (Influent Point No. 3) on Sunday; 04/02/2007 at 2.00pm. (Sunny Day, Low Tide)	Test Methods
pH Value	6.2 @ 26.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	0	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	3753	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	1191	APHA 4500-O C, 5210B
Suspended Solids, mg/l	4175	In-house method based on HACH-Method
Total Nitrogen, mg/l	161	*APHA 4500-Norg B
Odour	Extreme	*In-house method based on APHA 2150B

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TAN KHENG CHEW
B.Sc., (Hons). AMIC
Regional Manager

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CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1025/07
Sample Description	:	One (1) Sample of Drain Water
Sample Marking	:	As Below
Date Sample Received	:	16/01/2007
Date Sample Reported	:	24/01/2007
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	Influent Water Sungai Bintangor (Source Point No. 3, Satok) Tuesday; 16/01/2007; 10.45am; Dry Day	Test Methods
pH Value	6.4 @ 20.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	0	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	716	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	253	APHA 4500-O C, 5210B
Suspended Solids, mg/l	588	In-house method based on HACH-Method
Total Nitrogen, mg/l	43.7	*APHA 4500-Norg B
Odour	Strong	*In-house method based on APHA 2150B

(*) Not SAMM Accredited

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

THE ABOVE ANALYSIS IS BASED SOLELY ON THE SAMPLE (S) SUBMITTED BY THE CLIENT

Chemlab CHEMLAB
Teknologi Kimia · Chemical Technology · 化学工艺

CHEMICAL LABORATORY (MALAYSIA) SDN BHD (27822-K)

Lot 8605-8806, 3rd Floor, Pending Court, Jalan Kwong Lee Bank, 93450 Kuching, Sarawak, East Malaysia
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ASSAYERS, ANALYTICAL CHEMISTS, MICROBIOLOGISTS AND INDUSTRIAL CONSULTANTS

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Directors : Datin P.K. Wong MRSH, MBIM, F.Inst.Pet., Dip NIOA
Marcus K.F. Kam B.E.(Hons), M.Sc., C. Chem, MRACI, MBA

AKREDITASI SAMM MALAYSIA
ISO/IEC 17025
TESTING
SAMM NO. 172

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1026/07
Sample Description	:	One (1) Sample of River Water
Sample Marking	:	As Below
Date Sample Received	:	16/01/2007
Date Sample Reported	:	24/01/2007
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	Effluent Water Sungai Bintangor (River Mouth) Tuesday; 16/01/2007; 11.15am; Dry Day; Low Tide	Test Methods
pH Value	6.9 @ 22.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	0.5	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	25.8	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	11.8	APHA 4500-O C, 5210B
Suspended Solids, mg/l	41	In-house method based on HACH-Method
Total Nitrogen, mg/l	17.9	*APHA 4500-Norg B
Odour	Weak	*In-house method based on APHA 2150B

(*) Not SAMM Accredited

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

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Directors : Datin P.K. Wong MRSH, MBIM, F.Inst.Pet., Dip NIOA
Marcus K.F. Kam B.E.(Hons), M.Sc., C. Chem, MRACI, MBA

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1000/07
Sample Description	:	One (1) Sample of Drain Water
Sample Marking	:	As Below
Date Sample Received	:	03/01/2007
Date Sample Reported	:	15/01/2007
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	Influent Source Point 1, Harts Chicken Buffet Restaurant Culvert - Sample Taken On 30.12.2006 At 3.00pm, (Dry Day After Heavy Rain On 29.12.2006)	Test Methods
pH Value	4.8 @ 25.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	3.0	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	9353	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	4421	APHA 4500-O C, 5210B
Suspended Solids, mg/l	2400	In-house method based on HACH-Method
Total Nitrogen, mg/l	224	*APHA 4500-Norg B
Odour	Extreme	*In-house method based on APHA 2150B

(*) Not SAMM Accredited
Disclaimer: BOD_5 @ 20°C analysis exceeding holding time of 24 hrs.

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

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TESTING
SAMM NO. 174

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching, Sarawak.
Lab No.	:	KCH-EA/WE/1001/07
Sample Description	:	One (1) Sample of River Water
Sample Marking	:	As Below
Date Sample Received	:	03/01/2007
Date Sample Reported	:	15/01/2007
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	Effluent Point 2, Near River Mouth - Sample Taken On 30.12.2006 At 4.00pm, (Dry Day After Water Flow At About 1 Foot / Second, Heavy Rain On 29.12.2006 Evening)	Test Methods
pH Value	6.7 @ 25.0°C	APHA 4500-H^+. B
Dissolved Oxygen (DO), mg/l	3.7	*In-house (Ref: Operation Manual of Hanna DO Meter model HI 9143)
COD, mg/l	24.6	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	6.3	APHA 4500-O C, 5210B
Suspended Solids, mg/l	57	In-house method based on HACH-Method
Total Nitrogen, mg/l	9.5	*APHA 4500-Norg B
Odour	Weak	*In-house method based on APHA 2150B

(*) Not SAMM Accredited
Disclaimer: BOD_5 @ 20°C analysis exceeding holding time of 24 hrs.

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

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SAMM NO. 024-17-2

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Marcus K.F. Kam B.E.(Hons), M.Sc., C. Chem, MRACI, MBA

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching.
Lab No.	:	KCH-EA/WE/8679/06(a)
Sample Description	:	One (1) Sample of River Water
Sampling Location	:	River Water From Sungai Bintangor
Sample Marking	:	As below
Date Sample Received	:	14/12/2006
Date Sample Reported	:	20/12/2006
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	Effluent Point	Test Methods
pH Value	7.0 @ 27.0°C	APHA 4500-H^+. B
COD, mg/l	18.5	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	4.1	APHA 4500-O C, 5210B
Suspended Solids. mg/l	30	In-house method based on HACH-Method
Total Nitrogen. mg/l	10.6	*APHA 4500-Norg B
Odour	Weak	*In-house method based on APHA 2150B

(*) Not SAMM Accredited

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

THE ABOVE ANALYSIS IS BASED SOLELY ON THE SAMPLE (S) SUBMITTED BY THE CLIENT

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AKREDITASI SAMM MALAYSIA
ISO/IEC 17025
TESTING
SAMM NO. 974-1 干-2

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching.
Lab No.	:	KCH-EA/WE/8679/06
Sample Description	:	One (1) Sample of River Water
Sampling Location	:	River Water From Sungai Bintangor
Sample Marking	:	As below
Date Sample Received	:	14/12/2006
Date Sample Reported	:	20/12/2006
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	Influent Point	Test Methods
pH Value	6.8 @ 27.0°C	APHA 4500-H^+. B
COD, mg/l	88.4	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	20.1	APHA 4500-O C, 5210B
Suspended Solids, mg/l	57	In-house method based on HACH-Method
Total Nitrogen, mg/l	9.0	*APHA 4500-Norg B
Odour	Strong	*In-house method based on APHA 2150B

(*) Not SAMM Accredited

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

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AKREDITASI SAMM MALAYSIA
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Marcus K.F. Kam B.E.(Hons), M.Sc., C. Chem, MRACI, MBA

CERTIFICATE OF ANALYSIS

Company	:	Ochem East Sdn Bhd 336, Lorong Angsana 5A, Lorong Angsana 5, Kuching.
Lab No.	:	KCH-EA/WE/8386/06
Sample Description	:	Two (2) Samples of River Water (No Rain ; Hot Day)
Sample Marking	:	As below
Date Sample Received	:	31/10/2006
Date Sample Reported	:	16/11/2006
Page	:	1 of 1

RESULTS OF ANALYSIS

Parameters	A1 (Inffluent)	A2 (Effluent)	Test Methods
pH Value	6.6 @ 27.0°C	7.3 @ 27.0°C	APHA 4500-H^+. B
COD, mg/l	721	213	In-house method based on APHA 5220C
BOD_5 @ 20°C, mg/l	249	83.3	APHA 4500-O C, 5210B
Suspended Solids, mg/l	1350	763	In-house method based on HACH-Method
Total Nitrogen, mg/l	111	126	*APHA 4500-Norg B
Ordour	Very Strong	Strong	*In-house method based on APHA 2150B

(*) Not SAMM Accredited

TAN KHENG CHEW
B.Sc., (Hons), AMIC
Regional Manager

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LEMBAGA KEMAJUAN IKAN MALAYSIA NEGERI SARAWAK
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JALAN SATOK,
PETI SURAT 2201,
93744 KUCHING.

Ruj. Tuan :
Ruj. Kami : LKIM:(W)P406/762 Jld. 7 (13)
Tarikh : 11 Safar 1428H
1 Mac 2007

Mr. Peter Kuek,
Managing Director,
Ochem East Sendirian Berhad,
336, Lorong Angsana 5A,
Lorong Angsana 5,
P.O. Box 1218,
93724 KUCHING.

Dear Sir,

CLEANLINESS IMPROVEMENT ON DRAIN SMELLS

Refer to above matter as mentioned.

2. For your information, the drain around our office used to be so smelly but after treatment from your company by using AQUACLEAN product, for the past 3 months it seemed that the smell is completely disappeared.

3. We are very satisfied and gives a thanks to your company for their well done job all this while.

Thank you.

Yours faithfully,

(HARON HAJI HOSSEN)
Penolong Pegawai Ehwal Ekonomi,
Bahagian Pentadbiran,
b.p. Pengarah Negeri LKIM Sarawak.

HHH/se.

古晋中华第四中学
Chung Hua Middle School No 4
Sekolah Menengah Chung Hua No 4

P.O. Box 1244 93724 Kuching Sarawak
Jalan Haji Taha 93400 Kuching Sarawak
Tel: 082-243860 Fax: 082-252499
e-mail: kchms4@streamyx.com

Peter Kuek
Ochem East Sdn. Bhd.,
336 Lorong Angsana 5A,
Kuching, Sarawak.

28 FEBRUARY 2007

Dear Sir,
Letter Of Appreciation

On behalf of our school teachers and students, I would like to express my appreciation for caring the surrounding environment of the school. There is no odorous smell from Sungai Bintangor. Our students now have conducive environment to study in school.

Thank you very much.

Yours faithfully,

(T' en Nyuk Jung)
Principal

بيڠك سيمفانن ناسيونل
BANK SIMPANAN NASIONAL

Bil. Surat Tuan:
Bil. Surat Kami: BN/SWK412.0 (17)Jld
Telefon: 082-244-749

27hb Februari, 2007
..... *20* .....

Pengarah
Ochem East Sdn. Bhd.
Environmental Management Consultants
336, Lorong Angsana 5A, Lorong Angsana 5
P.O. Box 1218, 93724 Kuching
Sarawak

Tuan

Sungai Bintangor Rehabilitation Programme

We refer to the above-mentioned subject.

On behalf of Bank Simpanan National Sarawak, we wish to thank your Company for the improvement regarding the very bad smell at the Sungai Bintangor and the drains along Jalan Satok areas where our Office is located.

We hope your Company would continue to treat the pollution in these areas with AquaClean products so that cleanliness could be maintained at all times.

Thank you.

Yours sincerely
BANK SIMPANAN NATIONAL

(TAN HAN BANG)
Pengurus Negeri
Sarawak

LAM

9.01.2007

Johny B. Mohd. Rosli
11, Jln Dagok Timor
Kuching.

Manager
Ochem East Sdn. Bhd.
Kuching, Sarawak.

Dear Sir,

RE: Cleanliness Improvement Works at Sg. Bintangor

Refer to above matter as mentioned.

On behalf of Kpg. Dagok Timor and surrounding area of Sg. Bintangor, we give a full satisfaction to the above company as mentioned for the maintenance of the river's cleanliness. So far, the river was clean and there's no more bad and hygienic smell came out from the river.

Kindly, we are very satisfied and give a thanks to the company for their well done job and their very kind attention to us all this while.

Thank you,

Yours truly,

(JOHNY B. MOHD ROSLI)

Creating the Sarawak version of the Venice

KUCHING: THE Sarawak version of the Venice is starting to take shape when yesterday the process of cleaning the Bintangor River by using bacteria was carried out and the result is expected to be visible within the next three months.

The Department of Irrigation and Drainage (DID) carried out the pilot project using the Aqua Clean Integrated Technology which had been successfully applied to treat highly polluted flowing rivers in several countries and this is the first time that the system is used on a saline water.

Sarawak Minister of Housing Datuk Sri Abang Haji Abdul Rahman Johari Tun Abang Haji Openg speaking at a joint press conference with the acting Director General of DID Wong Siu Hieng said that the success of the Bintangor River pilot project would see the Aqua Clean technology being used in the other two highly polluted rivers.

"If this project is successful,we will introduce the bacteria into the Maong River and the Padungan River which eventually help to clean and clear the Sarawak River," Johari said.

He said this after visiting the Bintangor River cleaning and beautification project which would eventually turn the river into the Sarawak version of the Venice where riverine activities such as boating and other recreational activities could be carried out.

Johari who is the State Assemblyman (ADUN) for Satok said that the bacterias used in the river cleaning project were part of the technology use to treat water which was discharged from Satok and the Sarawak General Hospital which flow into the Bintangor River.

"The cleaning and clearing of the Bintangor River using bacteria is part of our plan under the first phase to attract people to use both sides of the river for recreational and leisure purposes," he said.

The second phase of development will be the landscaping of both sides of the river, where the houses will be improved for homestay programmes and the river can be used as a mode of transportation.

"We will then promote the river taxi where people can take ride from the waterfront right up the river into the Bintangor River to Satok,helping to ease the traffic flow in the city. The Village Security and Development Authority will also promote kayaking and canoeing activities along the river.

"In my capacity as the Minister of Housing and also the ADUN for Satok I will try to seek help from Syarikat Perumahan Negera Berhad (SPNB) and try to work with them to see how the houses along both sides of the river can be upgraded according to the local architecture to spur the homestay programme," he said.

According to Wong, the whole cleaning and clearing of the river using the Aqua Clean system costs around RM200, 000.

DID will closely monitor the project in the next three months.

Aqua Clean is a combination of various species of live bacteria suspended in a liquid medium and used for the treatment of industrial, agricultural and residential organically contaminated wastewater.

The Sarawak Venice is expected to materialise after the second phase of development along the Bintangor River within the Ninth Malaysia Plan (9MP) especially with the construction of new a bridge across the river and a RM1 million landscaping.

Johari said that an artistic bridge design would be built to replace the existing bridge to promote the river as a tourist attraction aside from being used as a mode of transportation.

He said that a RM1 million landscaping project carried out by the Kuching North City Hall (DBKU) would turn both sides of the river into another attractive feature.

Johari pouring the Aqua Clean multi purpose formula into the river. PHOTO: MUHAMAT JONI

改造民丹莪河成景點

阿邦佐：開發水上德士

为确保清洁工作更有效的进行，工作人员制作特别架子，让活菌能够在里面繁殖，并发挥清洁河流作用。图为砂房屋部长阿邦佐（右）察看架子模型，并聆听负责人的解说。

（古晋6日讯）砂房屋部长拿督斯里阿邦佐哈里指出，政府希望将民丹莪河改造成为一个新的旅游景点，同时开发水上德士的运作。

他称，古晋有三条河，即浮罗岸河、盐柴港及民丹莪河都严重受到污染，因此，希望通过使用河流生化清洁液技术，可在清洁清洁河流之际，也可消除河内所发出的臭味。

阿邦佐哈里是今午巡视民丹莪河清洁工作进度时，向记者如是说。

他强调，民丹莪河与砂拉越河是连接的，因此，相信该技术能够解决民丹莪河污染问题，也能一并清洁砂拉越河。

阿邦佐哈里说，这个河流清理计划为砂州的先锋计划，预料耗资20万令吉。

他称，一旦民丹莪河清洁工作完成后，就会即刻进行第二阶段的工作，包括美化工作。

此外，砂水利灌溉局代局长黄秀贤说，生化清洁技术所使用的清洁液-液可清（AQUA CLEAN ACF32），其液体中所含的有益活菌将能把严重受污染的河流及其中的废料或细菌清除干净。

"此活菌可在24个小时内繁殖出1千600万个新细菌，所以，通过置入这个液体，将能逐步把河流内有机废料及臭味清除。"

他说，河流清洁工作将为期三个月，而该局将一直监督工作的进展。

他指出，在其他国家，此技术已获证明能有效清洁受污染的河流。

"不过，基于民丹莪河受污染的情况与其他国家有异，因此，该技术的成效暂时尚未能做出定夺。"

阿邦佐哈里（右）把生化清洁液倒入民丹莪河。

CLEANING SUNGAI BINTANGOR: Abang Johari pours the liquid, a component of ACIT to clean up Sungai Bintangor. On his right is Ochem East Sdn Bhd managing director Peter Kuek.

A cleaner Sungai Bintangor soon, says Abang Jo

By Jacob Achoi

KUCHING: The water of Sungai Bintangor will be clearer, cleaner and smell better, and possibly free of bad bacteria as efforts are being made to clean it up.

Housing Minister Dato Sri Abang Johari assured that the water from Sungai Bintangor would turn clearer in three months' time.

He said this was made possible with technology imported from the United States called the AquaClean Integrated Technology (ACIT). Sungai Bintangor is among the three most polluted rivers in the city.

The other two are Sungai Padungan and Sungai Maong.

"We are putting in serious efforts to clean up the river (Sungai Bintangor), and with the technology, I believe that the dirty water will be a thing of the past," he told reporters after witnessing the cleaning of the river yesterday.

Abang Johari said through ACIT, the "good bacteria" will eat up the "bad bacteria", thus creating ecological balance by means of biological process.

A single bad bacteria can multiply to 16 million in 24 hours, he said, adding such scenario required that the river be treated continuously.

Ochem East Sdn Bhd, an environmental management consultant, was given the task to handle the project. This would be an on-going process, he said, adding that ACIT was found to be very successful in countries like Uruguay, and had been successfully applied to highly polluted flowing rivers.

The process, however, will not "kill' non-organic wastes like plastic and other household wastes thrown into the river.

Abang Johari also said that cleaning up Sungai Bintangor with the ACIT was a pilot project, and if found successful will be used to clean other highly polluted rivers like Sungai Padungan and Sungai Maong.

Sungai Bintangor was a potential tourist destination, and many projects like landscaping was in the pipeline to add to its attraction.

A homestay programme was also in the pipeline in villages near Sungai Bintangor, he added.

He assured he was committed to beautify Sungai Bintangor, and was working closely with the Drainage and Irrigation Department and Sarawak Rivers Board, besides the local authority to ensure the success of the project.

■房屋部长拿督斯里阿邦佐哈里亲自把ACIT工艺化学品放进民丹莪河，以进行清洁河水工作。

使用AquaClean工藝
河流不再骯髒

（本报古晋6日讯）随著当局已开始进行清洁民丹莪河的行动，预料该河流将在近期内变得更清洁。

房屋部长拿督斯里阿邦佐哈里表示，该河流将在3个月内变得更清洁，由河流内有机废物所产生的细菌也将被消除，而该河流的臭味也将随之消失。

他表示，当局将使用从美国进口的AquaClean综合工艺清洁该河流。丹民莪河是古晋3条受污染最严重的河流之一，其他两流是浮罗岸河及盐柴港。

阿邦佐哈里是在今天见证了民丹莪河的清洁工作後这麼表示。他说："我们很认真的要清洁此河流。我相信，在使用此先进工艺之後，民丹莪河肮脏的情况即将成为过去。"

他指出，在使用ACIT工艺进行清洁河流之後，"良好细菌"将吞噬"有害细菌"，进而使到河流得到以往的生态平衡情况。

他表示，一只有害细菌能够在24小时内繁殖成1600万只。因此，河流必须经常清洗。

这项清洁河流工作是由Ochem East有限公司所进行，它将是一项续持性的工作。

阿邦佐哈里表示，ACIT工艺在很多国家都被发现在清洁河流方面很成功，包括乌拉奎。它成功使很多高度污染河流回到原来的清洁情况。

他表示，但是，此工艺将不会清除河内的非有机废物，如塑胶及其他家居用品。

他说："使用ACIT工艺清洁民丹莪河是一项试验计划，如果它被发现有效，当局将使用它清洁浮罗岸河及盐柴港。"

具潛能成旅遊景點

阿邦佐哈里表示，民丹莪河拥有潜能成为一个旅游景点。当局也已进行多项计划，包括进行园艺与美化工作。

他表示，此外，当局也将在靠近民丹莪河的村庄设立家庭住宿计划。

他表示，他将与排水与灌溉局及州河流局亲切合作，以美化该河流。