



Eastern Treatment Plant

2004/2005 Annual Monitoring Report to the Environment Protection Authority

EM 35642

August 26 2005

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PREAMBLE

The Eastern Treatment Plant, at Bangholme, treats about 42% of Melbourne's sewage, servicing about 1.5 million people in Melbourne's south-eastern and eastern suburbs. It uses physical and biological processes to treat the sewage to a secondary level before the treated effluent is discharged under an EPA Victoria licence via a 56 kilometre pipeline into Bass Strait. This treatment method produces sewage sludge or biosolids, biogas and treated effluent.

When the plant opened in 1975, it was a world leader in sewage treatment. Improvements have been undertaken since then and the plant has continued to serve the community well. However, works are now needed to ensure that the plant is able to work well for the long-term and improve and protect the marine environment.

In 1997, Melbourne Water commissioned CSIRO to undertake a major, two-year, study on the effect of the discharge of treated effluent on the marine environment at Boags Rocks where the Eastern Treatment Plant's outfall is located. The study, which was completed in 1999, recommended reducing the level of ammonia in the effluent, reducing the volume of freshwater being discharged at Boags Rocks and undertaking long term microbiological testing at the outfall.

All these recommendations are being acted upon and Melbourne Water is planning to upgrade the Eastern Treatment Plant. The upgrade is designed to improve and protect the marine environment. The upgrade will mean that the effluent is further treated and disinfected to a tertiary standard. Ammonia levels will also be reduced by over 75%.

The plant operates under an EPA discharge licence (No. EM35642). A licence requirement is for Melbourne Water to provide an annual summary of our operation of the premises including the results of our monitoring programs, a summary of any works that have occurred, details on trade waste received and endeavours to further increase reuse of effluent. These are presented in this report.

MONITORING RESULTS

DISCHARGE TO WATER – PERFORMANCE LIMITS

The following results represent samples taken from the final effluent sample point and flow measurements at the Eastern Treatment Plant from 1 July 2004 to 30 June 2005.

EPA Victoria Discharge Point Results – Final Effluent Compliance at Trueman's Road Sample Point

Parameter, Units	Median		90 th Percentile		Maximum	
	Licence Limit	Result	Licence Limit	Result	Licence Limit	Result
BOD ₅ (mg/L)	NS ⁵	28	NS ⁵	52	NS	74
CBOD ₅ (mg/L)	20	5	40	8	NS	31
Suspended Solids (mg/L)	30	15	60	28	NS	42
pH (pH units)		7.4	NS	7.6	6 - 9	6.3-7.6
Ammonia as N (mg/L)	NS		NS		NS	
Total Combined Nitrogen (mg/L)	30	17.5	NS	22	40	26
Total Phosphorus (mg/L)	NS	26.5	NS	30	NS	40
Anionic Surfactants (mg/L)	NS	6.1	15	8.4	NS	11
Cadmium (mg/L)	0.4	0.3	0.7	0.4	NS	0.7
Chromium (mg/L)	NS	0.0001	0.005	0.0001 ¹	0.01	0.0002 ¹
Copper (mg/L)	NS	0.005	0.075	0.010	0.15	0.013
Lead (mg/L)	NS	0.013	0.05	0.019	0.1	0.027
Mercury (mg/L)	NS	0.001 ¹	0.05	0.002 ¹	0.1	0.004 ¹
Phenol (µg/L)	NS	0.00005	0.0005	0.000050	0.001	0.0001
Toluene (µg/L)	NS	0.5	NS	0.5	100	0.5
Benzene (µg/L)	NS	0.5	NS	1	50	1
PAH's total (µg/L)	NS	0.5	NS	0.5	25	0.5
ETP Final Effluent Flow (ML/day) ³	NS	4	NS	4	15	4
Outfall Flow (ML/day) ⁴	NS	379	NS	384	NS	610
Total Residual Chlorine (mg/L)	540	399	NS	553	770	635
E.coli (org/100mL)	NS	0.05	NS	0.2	1.0	0.31
Dissolved Oxygen (mg/L)	200	21	1000	70	NS	300
	NS	6.6	NS	7.4	>6.0	6.8-7.4

Notes to Table:

¹ All results found to be less than the detection limit were taken as half the limit of detection (LOD) i.e. <8 = 4.

² Total Poly Aromatic Hydrocarbons (PAH's) are calculated using the sum of the following PAH's: (acenaphthylene, anthracene, 1,2-benzanthracene, 3,4-benzofluoranthene, benzo(k)fluoranthene, 1,12-benzoperylene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluorene and indeno(1.2.3-cd)pyrene.

³ ETP outflow data corrected for median daily internal plant usage. The flow data is measured at the Eastern Treatment Plant.

⁴ Calculated Total Outfall flow is the actual flow to the Outfall. Includes local South East Water Treatment Plant inputs and (average per quarter) recycled water usages.

⁵ NS = No specified limit

Dioxin and Furan Analysis

During December 2004 and June 2005, samples for the Trueman's Rd site were taken and analysed for Polychlorinated dibenzo-p-dioxins (PCDD's) and Polychlorinated dibenzofurans (PCDF's). The result gives a combined international toxic equivalent (I-TEQ), in pg/L, as detailed below. Eastern Treatment Plant does not have a licence limit for this parameter.

Sample Site	December 2004 I-TEQ (pg/L)¹	June 2005 I-TEQ (pg/L)¹
Trueman's Road	5.6	2.4

¹ All values are reported as the middle bound, including 1/2 LOD's

Effluent flow to the outfall

Daily and monthly median and maximum flows (ML/day) were measured during 2004/05. Monthly median and maximums are shown below. The total outfall flows for 2004/05 are as follows:

Description	Flow (ML)	Comment
ETP Outflow	137,797	Total outfall pump station flow minus internal plant use
Calculated Outfall flow	145,336	Boags Rocks Outfall flow (ETP plus South East Water treatment plant flows, less water recycling)

Month	Median (ML)	Maximum (ML)
July 2004	392	443
August 2004	415	522
September 2004	484	594
October 2004	346	469
November 2004	548	610
December 2004	387	521
January 2005	313	402
February 2005	426	580
March 2005	364	409
April 2005	308	422
May 2005	330	417
June 2005	337	410

DISCHARGE TO WATER- AESTHETICS

Eastern Treatment Plant complied with all aesthetic aspects for the discharge Licence during 2004/05. The main activities in monitoring aesthetic conditions during 2004/05 were:

- Regular Beach inspections by Melbourne Water personnel and community members in the vicinity of the Boags Rocks outfall
- Reporting the finding of the beach inspections internally to the Managing Director, EPA Victoria and South East Water
- The South Eastern outfall was shutdown once during the financial year 2004/05 and inspected for litter. The findings of this shutdown were reported to the EPA Victoria.

DISCHARGES TO LAND

The following results detail the quality of effluent discharged to land at the Eastern Treatment Plant (for irrigation purposes) as sampled from the final effluent sample point and the Eastern Treatment Plant reuse sample point from 1 July 2004 to 30 June 2005.

Discharge to Land Results

Parameter	Unit	Median	90 th Percentile
<i>E.coli</i> ¹	Org/100mL	45	295
Electrical Conductivity ²	µS/cm	905	929
BOD ₅ ²	mg/L	42	65
CBOD ₅ ²	mg/L	5	10

Notes to Table:

¹ Sample taken from the reuse sample point

² Sample taken from the final effluent sample point

BACTERIOLOGICAL MONITORING - BEACH SAMPLES

Samples of receiving waters were taken throughout the year at six locations along the Gunnamatta and St Andrews beaches as detailed below:

- No.1 At the first bluff (Bellisleptia) east of the discharge point;
- No.2 At Gunnamatta West beach opposite the amenities block;
- No.3 At Gunnamatta West beach opposite the Surf Life Saving Club house;
- No.4 At Gunnamatta East beach approximately 350 metres east of sample point No.2;
- No.5 At Le Lievres beach 110 metres west of the discharge point;
- No.6 Rye back beach - main swimming area.

The results, presented as a 42-day geometric log mean and 80th Percentile, are as follows:

Geometric Log Mean Results for *E.coli* - Beach Samples

42-day Period ends:	Geometric (Log) Mean (org/100mL)¹ SEPP (Waters of Victoria) Objective: <200 org/100mL					
	No.1	No.2	No.3	No.4	No.5	No.6
12-08-2004	5.5	1.5	1.9	2.0	1.6	1.0
22-09-2004	2.7	1.1	1.1	1.1	2.0	1.0
3-11-2004	1.9	1.4	1.4	1.8	7.4	1.3
14-12-2004	4.3	1.8	1.8	1.1	9.5	1.7
28-01-2005	2.6	1.4	1.9	1.6	13.3	1.5
09-03-2005	2.2	3.8	1.3	1.4	34.5	1.6
19-04-2005	2.4	1.1	1.1	1.0	3.3	2.7
03-06-2005	1.9	1.4	1.6	1.9	2.6	1.1
27-06-2005	8.4	2.3	4.0	2.4	1.4	1.9

Notes to Table:

¹ samples of zero *E.coli* were assumed to have a level of 1.0 to determine the geometric mean**80th Percentile Results for *E.coli* - Beach Samples**

42-day Period ends:	80th Percentile (org/100mL) SEPP (Waters of Victoria) Objective: <400 org/100mL					
	No.1	No.2	No.3	No.4	No.5	No.6
12-08-2004	10	2	2	8	2	0
22-09-2004	4	0	0	0	2	0
03-11-2004	2	2	2	2	8	0
15-12-2004	10	4	0	0	36	4
28-01-2005	9.6	1.2	2.8	3.2	54.8	1.4
09-03-2005	2	12	0	2	74	2
19-04-2005	5	2	0	0	13	4
03-06-2005	4	1.6	2	1.6	4	1.6
27-06-2005	11.6	6.8	11.2	8.4	1.6	3.6

ENVIRONMENTAL IMPACT MONITORING***Soil Monitoring***

Melbourne Water last undertook the full round of soil sampling in 2001 with two areas re-sampled in March 2003 due to anomalous results. No soil sampling was performed in the 2004/05 year with the next full round due in June 2006.

Groundwater Monitoring

Groundwater monitoring for the Eastern Treatment Plant was conducted by URS during November 2004 and May 2005. The scope of work included:

- Measurement of standing water levels
- Measurement of field parameters pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), reduction/oxidation potential (redox),
- Laboratory analysis for total dissolved solids (TDS), total organic carbon (TOC), total nitrogen (total N), calcium, magnesium, potassium, sodium, bicarbonate, carbonate, sulphate and chloride

The May sampling round included all available bores, while the November sampling, as per previous years includes only background bores, down gradient bores and three new bores established along Patterson River.

The salinity concentrations as TDS at the Eastern Treatment Plant reference bore from December 2003 to May 2005 vary from 1,500 mg/L to 2,580 mg/L. According to the State Environment Protection Policy (SEPP) – Groundwaters of Victoria, 1999, which classifies the groundwater on its beneficial use based on TDS concentrations, the groundwater flowing onto the site falls into Segment B.

Waters in Segment B are to be protected for the following applicable beneficial uses:

- Maintenance of Ecosystems;
- Potable Mineral Water Supply;
- Agriculture, Parks and Gardens;
- Livestock Drinking Water,
- Industrial Water Use,
- Primary Contact Recreation; and
- Buildings and Structures.

Consequently, the groundwater quality is assessed and compared against:

- ANZECC Livestock Drinking Water Guidelines – (Livestock Drinking Water 2000); and
- Australian Water Quality Guidelines for the Protection of Aquatic Ecosystems – Marine Waters (2000).

Because the Patterson Lakes area is the receiving marine water body, the objectives used are the 95% level of protection trigger values for marine waters.

Based on the findings of this report the following conclusions are made:

- Standing Water Levels (SWLs) have decreased since the November 2004 monitoring event by between 0.2 and 1.2m. Standing water levels and flow directions are generally similar in both aquifers.
- In both shallow and deep aquifers, the flow direction is generally from the north-east to the south-west of the site, although there is a groundwater mound below the emergency holding basin, as well as the sludge drying pans to the north of the site.
- The majority of bores reported slight to moderate increases in TDS for the May 2005 monitoring round, however all concentrations were within the range of historically reported results. All samples contained concentrations of TDS below the adopted ANZECC (2000) guidelines for Stockwater.

- The concentration of sulphate in the May 2005 monitoring event exceeded the adopted ANZECC 2000 Stockwater guidelines (1,000 mg/L) in 6 bores. The bores with exceedences are located in the vicinity of the stock grazing area and the sludge drying pans to the north east of the site and have remained fairly similar to the November 2004 monitoring round. Concentrations in all other perimeter bores are generally within the range of historical results.
- The concentration of Total Nitrogen as N in groundwater for May 2005 were generally similar to the May 2004, but are increasing slightly. Further monitoring will confirm whether these increases become a trend over time. All other bores underwent small fluctuations in concentrations of Total Nitrogen as N, however most other concentrations were <10 mg/L.
- The concentrations of TOC have generally increased slightly across the site since May 2004. The background concentrations have previously been <30 mg/L and is confirmed with MW70 containing 4 mg/L. Two notable increases in TOC were reported in MW57 - 171 mg/L and MW61 - 116 mg/L. All other concentrations were within the range of previously reported results.
- The adopted investigation guideline values for copper have been exceeded in twenty four (24) bores. The adopted investigation guideline values for zinc have been exceeded in twenty five (25) bores. There were no exceedences reported for nickel. Concentrations of heavy metals detected in the May 2005 monitoring round have increased since November 2004 with the majority of bores containing metals exceedences being located in the vicinity of the sludge drying pans and may therefore be related to site activities, pipe works and infrastructure. All samples contained concentrations below the ANZECC 2000 Stockwater guidelines. There was no exceedence of the adopted nickel guideline concentration (0.07 mg/L).
- Overall the groundwater is considered to be oxidising to mildly reducing and is fairly brackish. Conditions have not changed significantly since the previous monitoring event.

There were two notable changes in redox potential since the November 2004 monitoring event.

MW45 recorded a redox value of 98 mV indicating an oxidising environment. This is a change from all previous results, since May 2001, which have been indicative of an reducing environment.

MW53 reported a reducing redox value of -34 mV, in contrast to all previous results, since May 2001, which have been indicative of an oxidising environment.

The low contaminant loads migrating off-site indicate that very little or no adverse impact on the receiving water environment is expected.

Receiving Water Monitoring Program

Monitoring the Receiving Environment 2004 – 2005 Summary

The current phase of the receiving water monitoring program for the Eastern Treatment Plant (ETP) effluent discharge undertaken by the CSIRO commenced in Jan 2005 and is currently underway. The program was developed by CSIRO and Melbourne Water and approved by the EPA.

The program includes:

- Coordination and management of an environmental monitoring program,
- Analysis of collected data, interpretation of results,

- Assessment of compliance with regulatory objectives and
- Evaluation of effectiveness of the management improvement programs.

The monitoring program builds on conclusions of the two previous phases of monitoring reported in June 1999 and June 2004. Collectively the monitoring programs provide a means of quantifying future environmental improvements in response to enhancement of treatment processes and flow reduction via recycling. The current program is in its early stages and current status is outlined below.

Effluent Toxicity Testing	<ul style="list-style-type: none"> • Program (<i>Nitzschia</i>, <i>Hormosira</i> & Scallops) • To date two sampling events 21/3/05, 14/6/05
Water Quality Compliance	<ul style="list-style-type: none"> • Statistical analysis of effluent chemistry, and beach/receiving water sampling • ongoing
Contaminant Accumulation	<ul style="list-style-type: none"> • with reference site and inclusion of <i>Boccardia</i> • scheduled for late 2005
Platform Algal Surveys (presence/absence)	<ul style="list-style-type: none"> • 6 surveys with photographic records of survey sites, and more extensive statistical analysis • 1st survey completed
Intertidal Platform Mapping (remote sensing)	<ul style="list-style-type: none"> • satellite imagery, with change mapping methodology developed previously, focus on nearby platforms (Boags Rocks to Cape Schanck) • Scheduled for Nov'05
Subtidal Reef Inspection (diver assisted & remote video)	<ul style="list-style-type: none"> • survey of the inner reefs parallel to shore and a line perpendicular to 3km, with analysis as developed previously • not undertaken due to unfavourable weather. Scheduled for Sept 05
Data Management, Reporting & Coordination	<ul style="list-style-type: none"> • statistical analysis, investigation and review, data management and storage. • Data loading commenced

Recreational Water Quality

Melbourne Water has a continuing program of sampling of the beach and surf zones at a number of sampling points. Marine samples for recreational water quality in swimming (shoreline) and surf zone have been taken monthly in winter (April to November) and fortnightly during summer (December to March) from June 2000 to date (60 data points). Parameters tested are TDS, EC, E coli, enterococci, and ammonia. The program was initiated to assess microbial quality of the receiving water and to assess health risk to bathers via WHO and Australian guidelines.

PLANT MONITORING

The following details the monitoring of raw sewage undertaken at the Eastern Treatment Plant in 2004/05, in parallel with the monitoring of final effluent for licence compliance.

Raw Sewage Monitoring

Parameter, Units	Median	90th Percentile	Maximum
BOD ₅ (mg/L)	310	460	580
Suspended Solids (mg/L)	360	570	570
PH (pH units)	7.0	7.3	7.3
Ammonia as N (mg/L)	34.5	39	40
Total Combined Nitrogen (mg/L)	58.5	74	83
Total Phosphorus (mg/L)	13.5	18.4	24
Anionic Surfactants MBAS (mg/L)	5.7	8.2	130
Cadmium (mg/L)	0.0005	0.0008	0.0015
Chromium (mg/L)	0.038	0.06	0.076
Copper (mg/L)	0.11	0.14	0.20
Lead (mg/L)	0.0075	0.012	0.018
Mercury (mg/L)	0.0002 ¹	0.0003 ¹	0.0003 ¹
Phenol (µg/L)	1.5 ¹	31 ¹	65 ¹
Toluene (µg/L)	2.5 ¹	4 ¹	10 ¹
Benzene (µg/L)	0.5 ¹	0.5 ¹	1 ¹
PAH's total (µg/L)	4 ^{1,2}	4 ^{1,2}	4 ^{1,2}

Notes to Table:

¹1/2 Limit of Detection Values used. All results found to be less than the detection limits were taken as half the given value i.e. <2 = 1.

²Total PAH's are calculated using the sum of the following PAH's:

(acenaphthylene, anthracene, 1,2-benzanthracene, 3,4-benzofluoranthene, benzo (k) fluoranthene, 1,12-benzoperylene, benzo(a) pyrene, chrysene, dibenzo(a,h)anthracene, fluorene and indeno(1.2.3-cd)pyrene. All results were less than the detection limit and were calculated at half the given value i.e. <2 = 1).

DISCHARGES TO AIR**Emission Analysis**

Due to a timing oversight one of the engines in the outfall pumping station was sampled on 9 August 2005. EML Air sampled the gas emissions and tested for Nitrogen Oxides, Carbon Monoxide, Sulphur Dioxide, Hydrogen Sulphide and VOC's.

The following table contains a comparison between the test results and the licence limits in Table 2 of Licence EM 35642, with all results demonstrating compliance.

Parameter	Maximum Rate (g/min)		Maximum Concentration (mg/m ³)	
	Limit	Result	Limit	Result
Sulphur Dioxide	7.5	0.033	40	0.48
Hydrogen Sulphide	0.5	0.0077	2	0.11
Nitrogen oxides	500	110	2600	1700
Carbon Monoxide	300	80	2600	1200
VOC	20	0.51	0.1	0.0075

Given that three of the five outfall pumping engines are likely to be upgraded to convert them to electric drives, Melbourne Water will be effectively eliminating emissions from the outfall pumping station in the future. However, these engines will continue to be in use until Melbourne Water completes the Eastern Green Energy project.

Engine Operation

During 2004/05, sludge gas continued to be used primarily for the operation of the outfall pumping station engines, with use of the power station occurring only for maintenance requirements, testing of the engines and for the few occasions when external supply was not available. Following are the details of the total monthly operation of the engines in the power station and the outfall pumping station during 2004/05:

Operational Hours of Engines in Power Station and Outfall Pumping Station

Date	Power Station Hours Run Per Month	Outfall Pumping Station Hours Run Per Month
July 2003	89	1313
August 2003	150	1391
September 2003	0	1740
October 2003	37	1292
November 2003	50	1860
December 2003	0	1349
January 2003	2	1151
February 2004	33	1641
March 2004	6	1306
April 2004	18	963
May 2004	58	1168
June 2004	150	1170
Total	593	16344

ODOUR MANAGEMENT*Odour complaints received during 2004/05*

The following table details the odour complaints received at the Eastern Treatment Plant during 2004/05. There were a total of 4 complaints received during 2004/05.

Date, Time¹	Address Zone	Likely Source	Observations and Action Taken
28 January, 2005, 23:29	Patterson Lakes, Complaint received via the EPA	Unknown	Complaint of a silage type smell was received via the EPA. Melbourne Water examined plant data and logs, with no abnormal operation detected. The wind direction data indicates that ETP is unlikely to be the source of odour.
23 February, 2005, 17:25	Patterson Lakes, Complaint received via the EPA	Unknown	Complaint of a rotten grass type smell was received via the EPA. Operations visited the site of the odour, and spoke to the complainant. No sewage treatment odour was noted. The wind direction indicates that ETP is unlikely to be the source of odour.
8 April, 2005, 09:30	Patterson Lakes, Complaint received via the EPA	Unknown	Complaint was received via the EPA on 8 th April 2005. Melbourne Water examined plant data and logs, with no abnormal operation detected. EPA patrolled the area and reported no odours attributable to ETP. Wind direction data suggested that the Eastern Treatment Plant is unlikely to be the source of odour.
10 June 2005, 18:50	Pattern Lakes, Complaint via the EPA	Eastern Treatment Plant	Complaint was received via the EPA on 10 th April, 2005 of a bad odour which prevailed on the 8 th and 9 th of April, 2005. As the complaint was received 2 days after the event, a site visit was not conducted. Wind direction modelling for these two days indicated ETP as the likely cause of the odour.

Notes:

¹ Time received by Melbourne Water

Odour Control Initiatives

Odour sources at the plant are constantly reviewed. The following tasks have been undertaken to minimise Eastern Treatment Plant's odour impact:

- Sampling of sump water of the RAS channel odour control plant and a review of operation, monitoring and maintenance, resulting in improvements;
- Odour monitoring using the Nasal Ranger, used to assess odour strength and 'pleasantness';
- Completion of the Odour Management Strategy and consequential presentation to EPA in August 2003
- A detailed odour investigation was completed as part of the Works Approval Submission to determine the likely odour impacts of refurbishing the sludge drying pans South of Thompsons Rd. The modelling showed that there was limited offsite odour impact with the inclusion of the additional sludge drying pans.
- Other works such as odour control plant for the foul air system and optimization of the RAS channel odour control plant are currently in the design stage.

Biological Odour Control Facility

The Biological Odour Control Facility on the RAS Channel operated throughout 2004/2005. The previous licence limit for odour discharge from this source was removed from the amended licence (March 2004), on the basis that:

- The stack licence requirement was inconsistent with the off-site odour requirement, which is the appropriate control for a large complex multi-source facility, such as the Eastern Treatment Plant;
- A well performing biofilter will have its own inherent odour of approximately 500-1,000 odour units;
- With the proposed replacement of the media, the facility would be expected to continue to exceed the licence parameter, as would any biofilter (due to inherent odour);

USE OF EFFLUENT, BIOSOLIDS AND BIOGAS

WATER RECYCLING

Melbourne Water has made a commitment to increase the amount of recycled water (effluent from Melbourne Water's two sewage treatment plants) to 20% by 2010. During 2004/2005 about 1625 ML of treated effluent was recycled off site to various customers along the South eastern Outfall.

In alignment with current water and sewage arrangements, Melbourne Water is responsible for the treatment and bulk supply of recycled water to retail water companies, which then supply to the end users.

Recycled Water Monitoring

A recycled water monitoring program was undertaken during 2004/05. The following table reports water quality against the requirements of the "Class C" of the EPA Victoria Publication 464.1 "Wastewater Reuse Guidelines":

	<i>E.coli</i> 80th Percentile org/100mL	BOD ₅ mg/L Median	CBOD mg/L Median	Suspended Solids mg/L Median	pH Median (Range)
Class C Limits	< 4000	< 20	< 20	< 30	6.5 - 8
Rising main leaving the Eastern Treatment Plant ¹	150	41 ⁽²⁾	5 ⁽²⁾	18.5 ⁽²⁾	7.5 ⁽²⁾ (6.9 – 7.7)
Ballarto Rd Sample Point (SEO Manhole No. 069)	58	⁽³⁾ -	⁽²⁾ -	⁽³⁾ -	⁽³⁾ -
Range Rd Sample Point (SEO Manhole No. 035)	40	13	⁽²⁾ -	15	7.4 (6.8 – 7.6)
Truemans Rd Gunnamatta (SEO Manhole No. 003)	44	28 ⁽⁴⁾	5	15	7.4 (6.3 – 7.6)

Notes to Table:

- ⁽¹⁾ Eastern Treatment Plant Reuse sample point
⁽²⁾ Measured at the Final Effluent, not other sites
⁽³⁾ E coli only measured at this sample location.
⁽⁴⁾ No reuse customers beyond this point.

In ETP's discharge licence, Melbourne Water reports inhibited BOD (i.e CBOD), which is more appropriate given that the plant is nitrifying to remove ammonia. Therefore, it is reasonable to measure Class C compliance against CBOD, rather than BOD.

Additional Reuse Monitoring

The following tables detail results of additional monitoring undertaken on the final effluent at the Eastern Treatment Plant during 2004/05, in order to improve understanding of effluent quality and the potential to maximise effluent reuse, and ensure compliance with Class C Reuse standards.

Results of additional Reuse Monitoring of Final Effluent

Parameter, Units	EPA Guideline Limit ¹	Median	90th Percentile	Maximum
Total Dissolved Solids (mg/L)	500 – 1500	490	530	550
Sodium (mg/L)	-	100	110	130
Calcium (mg/L)	-	18.5	23	25
Magnesium (mg/L)	-	9.4	11	11
Chloride (mg/L)	-	140	149	150
Potassium (mg/L)	-	20.5	25	30
SAR	-	4.75	5.19	6.2
Alkalinity	-	155	188	190
Aluminium	5	0.26	0.47	0.90
Boron	0.75	0.24	0.41	0.43

Parameter, Units	EPA Guideline Limit¹	Median	90th Percentile	Maximum
Iron	5	0.32	0.39	0.79
True Colour (Pt/Co)	-	80	100	180
Turbidity (NTU)	-	10.5	23	31
Arsenic (mg/L)	0.1	0.002 ²	0.003	0.006 ²
Beryllium (mg/L)	0.1	0.0005 ²	0.0005 ²	0.0005 ²
Cobalt (mg/L)	0.05	0.001 ²	0.002 ²	0.002 ²
Fluoride (mg/L)	1	0.81	0.91	0.94
Lithium (mg/L)	2.5	0.01 ²	0.01 ²	0.01 ²
Manganese (mg/L)	0.2	0.044	0.048	0.055
Molybdenum (mg/L)	0.01	0.005	0.006	0.008
Selenium (mg/L)	0.02	0.0005 ²	0.0005 ²	0.001 ²
Zinc (mg/L)	2	0.054	0.066	0.18

Notes to Table:¹ EPA Publications 168, 464.1² All results found to be less than the detection limit reported as half the LOD i.e. <0.001 = 0.0005.

BIOSOLIDS

Biosolids Reuse during 2004/05

Biosolids produced at ETP have been used by local soil suppliers, as a constituent in their blended top soils. The blends met the unrestricted use under the EPA's Guidelines for Environmental Management - Biosolids Land Application.

The amount of biosolids beneficially used in 2004/05 was 13,745 dry tonnes, which equates to 56% reuse of annual production. The 2004/05 reuse target and corporate KPI was not achieved due to a limited market and low demand by our key soil-blending customers.

The 2005/06 reuse target and corporate KPI remains 100% beneficial use of annual production. The biosolids inventory as at June 2004 accounts for 889,000 cubic metres of biosolids stored at ETP. The biosolids inventory is in the process of being updated to include the material produced in 2004/05.

Melbourne water has developed a biosolids sampling protocol which will be forwarded to the EPA for approval. This protocol outlines a sampling frequency appropriate for the large stockpiles at ETP. Biosolids sampling is currently being undertaken to provide a total of 151,900m³ of material which has been tested in accordance with the EPA guidelines.

Biosolids agreements with the key soil-blending customers are now complete. They have indicated that they do not wish to extend their current agreements to obtain more biosolids in the short-term. Melbourne Water is currently in discussions with Theiss-John Holland to provide biosolids as structural and non-structural purposes for the EastLink freeway project.

BIOGAS UTILISATION

Biogas has been used primarily in the outfall pump station during 2004/05 to run engines and boilers. The following details the volumes of biogas used in the outfall pump station, boilers and power station, and the volume of biogas flared off for each of the months of the 2004/05 financial year, and for the financial year as a whole.

Volume of Biogas Used and Flared at Eastern Treatment Plant

Date	Volume of Biogas Used (m ³)	Volume of Biogas Flared (m ³)
July 2004	1,137,076	493,463
August 2004	1,235,962	381,334
September 2004	1,162,907	258,100
October 2004	1,227,191	224,009
November 2004	1,054,174	230,719
December 2004	1,201,072	334,342
January 2005	1,118,611	388,014
February 2005	1,064,411	338,710
March 2005	1,255,910	342,239
April 2005	997,150	275,656
May 2005	1,044,236	226,612
June 2005	1,011,744	308,962
Financial Year	13,490,444	3,802,160

TRADE WASTE

The Eastern Treatment Plant receives flow from South East Water and Yarra Valley Water. The following tables detail the top ten dischargers by volume and by risk for South East Water and for Yarra Valley Water respectively.

South East Water Top Ten Dischargers by Volume

Sewer Catchment	Risk¹ Rank	Variation Parameters	Volumes Discharged (ML/annum) 2004/05
Chelsea	1	TDS	287.4
Eummering Creek	1	TDS	253.1
Westall Eummering Creek	1	TDS Ammonia	201.1
Dandenong Valley	3	TDS	198.7
Eummering Creek	1	TDS Ammonia Temperature	193.4
Warren Road	3	TDS	190.7
Corhanwarrabul	4	TDS	129.53
Chelsea	1	TDS	96.6
Elster Creek	1	- ³	89.7
Dandenong Valley	1	TDS Palladium	87.6
TOTAL			1727.8

South East Water Top Ten Dischargers by Risk

Sewer Catchment	Risk¹ Rank	Variation Parameters	Volumes Discharged (ML/annum) 2004/05
Eummering Creek	1	TDS Ammonia	33.5
Eummering Creek	1	TDS Ammonia Temperature	193.4
Westall Eummering Creek	1	TDS Ammonia	201.1
Eummering Creek	1	TDS Fluoride	10.6
Chelsea	1	TDS	96.6
Eummering Creek	1	TDS Ammonia	23.6
Eummering Creek	1	TDS	253.1
Elster Creek	1	- ³	89.7
Dandenong Valley	1	TDS Ammonia	24.7
Chelsea	1	TDS	287.4
TOTAL			1213.7

Yarra Valley Water Top Ten Dischargers by Volume

Sewer Catchment	Risk¹ Rank	Variation Parameters	Volumes Discharged (ML/annum) 2004/05
Gardiners Creek and Box Hill	1	TDS 6000,	1529.9
Clayton East and West	3	Temp 42	285.4
		Nil Required ³	
Eltham	2	SS 20000, Fe	208.1
Clayton East and West	5	650, Mn 35	189.1
Westall	2	Nil Required ³	133.5
		TPH C6 - C9	
		20, Color 15, pH	
Westall	4	6 - 11	86.5
Gardiners Creek and Box Hill	4	TDS 865	59.6
Ringwood	4	TDS 2750	56.2
		TDS 1923,	
Gardiners Creek and Box Hill	3	Color AN42 25	49.1
Westall	2	TDS 3000	45.8
TOTAL			2643

Yarra Valley Water Top Ten Dischargers by Risk

Sewer Catchment	Risk¹ Rank	Variation Parameters	Volumes Discharged (ML/annum) 2004/05
Gardiners Creek and Box Hill	1	NH3 120, pH 6 - 8, TDS 350 kg/day	11.6
Gardiners Creek and Box Hill	1	TDS 6000,	1529.9
Croydon and Ringwood South	1	Temp 42	4.4
Croydon and Ringwood South	1	Nil Required ³	1.7
Croydon and Ringwood South	1	Nil Required ³	1.0
Westall	2	Nil Required ³	133.5
Westall	2	TDS 3000	45.8
		SS 20000, Fe	
Eltham	2	650, Mn 35	208.1
Clayton East and West	2	Nil Required ³	46.4
		Cr (tot) 29, Cu	
Gardiners Creek and Box Hill	2	29, Zn 15	1.5
TOTAL			1983.9

Notes to Tables:

¹ Risk Value of 1 indicates a highest risk discharger.

² Melbourne Water received the above information relating to trade waste from the retail water companies.

³No variation to Trade Waste standards (i.e. based on risk ranking algorithm alone)

PLANT IMPROVEMENT

Progress continued on a number of major projects being undertaken as part of the Eastern Treatment Plant upgrade works program. Key projects include:

- Nitrification/Denitrification Upgrade
- Eastern Green Energy Project
- Sludge drying pan rehabilitation south of Thompson Road

The status of these projects (which are continuing in 2005/06) as at the end of year 2004/05 is as follows:

Nitrification/Denitrification upgrade

Design for implementation of the full ammonia reduction strategy has advanced this year, including of a review of previous concept design work that has led to a decision to bring forward construction of two new aeration tanks, originally scheduled for 2013 to cater for load growth. Bringing forward the works on these new tanks will ensure process stability and reliability in ammonia reduction mode under a broader range of conditions.

Work also progressed on developing the formal business case submission for the project to the Department of Treasury and Finance, with the intention for this to be submitted in early 2005/06.

The project is on schedule for completion of works on the existing tanks and commencement of operation in ammonia reduction mode in 2007, with commissioning of the additional tanks by 2010.

Eastern Green Energy Project

The Eastern Green Energy Project will reduce greenhouse gas emissions and reduce reliance on imported electricity. The key elements of the project are:

- The replacement of inefficient 30-year-old generators with seven new generators to operate continuously and to fully utilise the sludge gas as a renewable energy source.
- The conversion of three outfall-pumping engines to electric motors to facilitate the efficient utilisation of the increased power generating capacity.

The EPA Victoria granted a Works Approval for the upgrade in May 2002. Implementation of the project commenced but had to be put of hold due to industrial relations issues having significant impacts on the plant. Site have since recommenced under an alternative contracting strategy. The project is now due for completion early in 2007.

Sludge Drying Pan Rehabilitation

The EPA granted a works approval for the completion of drying pans 56 – 60, the construction of new drying pans 61 – 63, and the construction of a 3.5 km supernatant return pipeline in April 2005.

The completion of the drying pans 56 – 60 has commenced with approximately 50% of work completed. The contract is currently suspended for the wet period of the year and will recommence October/November 2005.

The designs for both the new drying pans 61 – 63 and the supernatant return pipeline have commenced with construction due to start in November 2005 and February 2006 respectively.

Minor Capital Works completion during 2004/05

The following minor capital works projects were completed during the 2004/05 financial year.

- refurbishment of WAS Tank No. 4
- refurbishment of WAS Tank No. 3
- rehabilitation of drying pans 18, 19 and 20.
- Replacement of air compressor, and
- Control systems upgrades.

Other Capital Works Planned for 2005/06

Works in addition to those described above and scheduled for 2005/06 include:

- Waste Activated Sludge Thickening capacity augmentation works
- Odour reduction works Stage
- Sludge digestion capacity augmentation works

BLUE GREEN ALGAE MANAGEMENT

Visual inspections of all effluent basins are regularly undertaken as part of operational activities. No potential blue-green algal blooms were experienced in the Effluent Holding Basins (EHB's) during 2004/05.

ENVIRONMENT IMPROVEMENT PLAN

Final sign off of the Eastern Treatment Plant's Environment Improvement Plan (EIP) was achieved in April 2005. It has been internally reviewed and endorsed by the Community Liaison Committee. The EIP actions continue to be implemented. The EIP is now available from Melbourne Water's web site. An audit of the EIP will soon take place.