



Australian Technology Park: Waste Management and Minimisation Strategies

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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	4
GLOSSARY.....	7
1 SCOPE OF THE REPORT.....	8
2 INTRODUCTION.....	8
3 BACKGROUND	8
4 METHODOLOGY.....	9
5 EXISTING WASTE ARRANGEMENTS AT THE ATP	9
5.1 APPROACH	9
5.2 SOLID WASTE REMOVAL	9
5.2.1 Residual waste stream	10
5.2.2 Paper and cardboard recycling.....	10
5.3 TRADE AND HAZARDOUS WASTE REMOVAL	11
5.4 CLEANING CONTRACTORS	11
5.5 COSTS ASSOCIATED WITH THE EXISTING SYSTEM.....	11
5.6 LIMITATIONS OF THE EXISTING SYSTEM.....	12
6 WASTE SURVEY.....	13
6.1 APPROACH	13
6.2 RESULTS.....	13
7 WASTE AUDIT	14
7.1 APPROACH	14
7.2 RESULTS.....	15
7.2.1 Solid waste stream	16
7.2.2 Recycling	19
7.2.3 Trade and hazardous waste	20
8 STRATEGY WORKSHOP.....	21
8.1 APPROACH	21
8.2 RESULTS.....	21
9 WASTE MANAGEMENT AND MINIMISATION STRATEGIES	23
9.1 APPROACH	23
9.2 RESIDUAL SOLID WASTE REMOVAL.....	23
9.2.1 Pacific Waste Management (PWM).....	23
9.2.2 Cleanaway	24
9.2.3 Collex Waste Management	24
9.3 RECYCLING	24
9.3.1 Paper and cardboard recycling.....	24
9.3.2 Commingled recyclables.....	25
9.3.3 Plastic Recycling	25
9.3.4 Food and garden organics and shredded paper.....	25
9.3.5 Aluminium cans	26
9.4 TRADE WASTE REMOVAL.....	27
9.5 CLEANING CONTRACTOR REQUIREMENTS.....	27
9.6 CONTRACTORS CONTACTS.....	27
9.7 ASSESSMENT OF WASTE MANAGEMENT AND MINIMISATION COSTS	28
9.8 IMPLEMENTATION STRATEGY FOR THE PREFERRED WASTE MANAGEMENT AND MINIMISATION OPTION.....	33
9.8.1 Decision making process.....	33
9.8.2 Contract requirements.....	33
9.8.3 Recycling services infrastructure requirements.....	34

9.9	NEXT STEPS	34
9.9.1	Communication and education strategies.....	34
9.9.2	Monitoring.....	34
10	RECOMMENDATIONS.....	35
11	REFERENCES.....	35
	APPENDICES	37

EXECUTIVE SUMMARY

In 1995, the NSW Government legislated for a waste minimisation target to reduce waste going to landfill by 60% by the end of the year 2000. Waste minimisation can potentially decrease the amount of waste to landfill by approximately 80%, using readily available means. This project examines ways in which a similar reduction could be achieved at the Australian Technology Park (ATP) and put the ATP at the forefront of waste reduction in NSW.

The ATP waste minimisation project was undertaken in seven main stages. These were to:

- describe the existing waste management system provided at the ATP;
- conduct a waste survey with participating tenants;
- conduct a 24 hour waste audit;
- analyse the audit results;
- conduct a workshop with tenants to brainstorm strategies for waste minimisation;
- develop waste management and minimisation options for the ATP; and
- develop and implement communication and education strategies for cleaners and tenants.

The existing waste arrangements at the ATP consist of the recycling of paper and cardboard, the disposal of the residual solid waste to landfill and the collection and disposal of grease trap waste to the Sydney Water Wastesafe system. The residual waste disposal, the cardboard recycling, and the grease trap collection and disposal is undertaken by *Rethmanns Waste Management*, and the paper recycling is undertaken by *Visy Recycling*. *Prestige Property Services* are the cleaning contractors, and are responsible for removing the waste from the tenants' offices and transporting it to the communal waste areas. The limitations of the current solid waste management system at the ATP include the lack of recycling services and the poor location of the communal waste facilities.

The total cost of the current arrangements for solid waste management is approximately \$31,560 per annum, comprising waste collection and disposal and recycling. Cleaning services cost approximately \$120,000 per annum.

After initial consultation, sixty out of a total of eighty eight tenants participated in a waste survey which aimed to gather information to help in the development of waste minimisation strategies for the ATP, and included questions regarding purchasing policies, current waste practices, willingness to participate in the waste audit, strategy workshops and training. A number of issues and suggestions were brought up, including the need for improved recycling services and information on the current waste services by ATP management, and that the ATP be a showcase for innovative technologies.

The 24 hour waste audit was conducted for the whole of the ATP on Wednesday July 5th. Both weights and volumes were recorded and a number of case studies were used to provide examples of waste streams from different types of working environments (e.g. catering and office).

Approximately 520 kg/day (9.8m³/day) of waste were produced which was predominantly paper, cardboard, food and other compostable materials. If all of the recyclable/compostable material in the ATP residual waste stream was taken out then approximately 90% by weight and volume could be treated in this way, thus considerably reducing the amount of waste to landfill.

A one-hour workshop was conducted to consult tenants as to what types of strategies they would like considered for waste minimisation at the ATP. The comments raised by the tenants covered areas relating to ATP management (e.g. lack of recycling services), infrastructure needs (separation of wastes at source), education and communication waste collection and costs (e.g. costs saved to be put back into the system).

Once the audit and workshop results were fully analysed, a package of strategies to achieve effective waste minimisation was developed. The package included:

- development and description of waste management and minimisation options;
- development of a list of contacts and other details of appropriate waste minimisation contractors;
- estimation of the costs of each of the options;
- the estimation of waste reductions achievable by weight and by volume;
- Cost Benefit Analysis of options; and
- development of recommended options.

The analysis of options showed that substantial cost savings could be made and environmental benefits achieved with the implementation of the preferred waste management option. The preferred option (option 4) included:

- an extensive recycling system;
- vermiculture (processing by worms) of food and green organic waste;
- a reduced cost option for collection and disposal of residual waste;
- high cost savings for the entire system; and
- large reductions in the amount of waste disposed of at landfill and achievement of more than 60% reduction of waste to landfill, consistent with the NSW Government target.

A number of recommendations were made. The key recommendations were as follows:

- Establish a worm farm for the processing of food organics, garden organics and shredded paper.
- Establish infrastructure for the recycling services for PET, HDPE, glass and aluminium as described in Option 4.
- Apply for membership with SCRAP as soon as possible and utilise the free paper recycling services and the cardboard recycling services to allow for a more consistent paper and cardboard pickup service.

- Provide training to cleaners and tenants as soon as possible on the required waste management practices to ensure a smooth transition from the current system.

The preferred option for waste management and minimisation at the ATP could allow for reductions of waste to landfill of up to 84 per cent (114 tonnes) by weight and 79 per cent (2,038m³) by volume. The implementation of this option could also achieve savings of \$13,260/annum when compared to the currently operating system.

GLOSSARY

Organics:	Organics refers to green (garden) waste and food waste.
Residual waste:	Residual waste is the waste remaining, once the materials to be recycled have been removed, that is disposed of at a landfill site.
Source separation:	Source separation refers to the separation of waste into separate waste streams to allow for easier collection for recycling purposes.
Vermiculture	Processing of food and garden organics by worms.
Waste collection:	Waste collection refers to the collection of waste by the waste contractor from the communal waste areas.
Waste disposal:	Waste disposal occurs at a landfill site or transfer station after the waste has been collected and transported.

1 SCOPE OF THE REPORT

The objectives of this report are to provide:

- an analysis of the current waste management system at the Australian Technology Park (ATP);
- the results of a waste survey and audit conducted with ATP tenants;
- the outcomes of a waste minimisation strategy development workshop held with ATP tenants; and
- recommended waste management and minimisation strategies for the ATP.

This report is the final report for the ATP waste minimisation project and is to be used as a resource on which to base possible future changes to the current waste management system at the ATP.

2 INTRODUCTION

Each year in Australia every individual generates over one tonne of waste, and a large proportion (over 80%) of this could be easily recycled, reused, or composted (Central Coast Waste Board, 1999).

In 1995 the NSW State Government legislated a waste minimisation target which aims to reduce waste going to landfill by 60% by the end of the year 2000 (based on 1990 per capita levels). The decision to work towards a 60% reduction in waste to landfill was prompted by the very apparent 'waste crisis' which was occurring in Sydney at the time. The waste crisis is still apparent and has arisen from:

- an increase in the generation of waste associated with increased production and consumption levels;
- a shortage of suitable landfill sites in Sydney;
- the need to minimise landfill area due to the environmental impacts (land, water and atmospheric) of currently operating landfill sites;
- increasing shortage of resources; and
- the potential for waste products to become valuable resources.

Given that waste minimisation programs can potentially decrease the amount of waste to landfill by approximately 80%, this project examines ways in which a similar reduction could be achieved at the ATP. This would put the ATP at the forefront of waste reduction in NSW.

3 BACKGROUND

The Australian Technology Park, located in Redfern, is managed and owned by the Sydney Harbour Foreshore Authority. Built as locomotive workshops in 1887, the ATP now houses approximately 88 tenants involved in a range of research, managerial, and commercial activities.

Following discussions between the Institute for Sustainable Futures (ISF), the Southern Sydney Waste Board (SSWB) and the ATP, funding was provided by the

SSWB to conduct a review of existing waste management and minimisation practices within the ATP, and to develop a number of waste management and minimisation strategies. Funding was also provided by the ATP to develop and implement communication and education strategies for tenants and cleaning contractors, and for the implementation of selected waste management and minimisation strategies as provided in the report.

4 METHODOLOGY

The project was undertaken in seven main stages (refer to Table 1). The specific approach taken for each stage is described in the relevant report sections below. Stage 7 will be considered in a separate report as funding is being provided by the Australian Technology Park.

Stage	Description
Stage 1	Describe the existing waste management system provided at the ATP
Stage 2	Waste survey conducted with participating tenants
Stage 3	24 hour waste audit
Stage 4	Analysis of audit results
Stage 5	Workshop with tenants
Stage 6	Develop waste management and minimisation options for the ATP
Stage 7	Develop and implement communication and education strategies for cleaners and tenants.

TABLE 1: Major stages of the ATP waste minimisation project.

5 EXISTING WASTE ARRANGEMENTS AT THE ATP

5.1 Approach

A review of current waste management practices was undertaken to provide baseline information. This data was then used to develop waste management and minimisation strategies aimed at diverting waste from landfill. As part of this process it was necessary to look at the entire waste spectrum, from generators (tenants and Park staff) through to transport and cleaning contractors. Finally, an analysis of current waste management costs and limitations of the existing system were explored

5.2 Solid waste removal

The existing waste arrangements at the ATP consist of recycling of paper and cardboard and disposal of the residual solid waste to landfill.

5.2.1 Residual waste stream

The residual solid waste is stored in five 3m³ skips that are situated in the Bay 16 waste compound and behind the National Innovation Centre (NIC) (See Appendix A for the ATP site map). The skips are provided by the waste collection and disposal contractor, Rethmann Waste Management. Table 2 shows the pick-up schedule.

Location	Bin Type	Pick-up schedule
NIC	2 x 3m ³ skip	Weekly x 3: Monday, Wednesday, Friday
Bay 16 Compound	3 x 3m ³ skips	Weekly x 4: Monday, Tuesday, Wednesday, Friday

TABLE 2: Location and pick-up schedule for the collection of residual solid waste by *Rethmann Waste Management*.

The agreement with the waste contractor is on a month by month basis. Termination of the contract may only occur if reasonable notice of 4-6 weeks is given. It was noted on a number of occasions that the skips were often not full at the time they are emptied.

Two tenants, the Roads and Traffic Authority (RTA) and the Ambulance Service of New South Wales have a separate joint waste pickup arrangement that is managed by the RTA. This is a daily pick up that is undertaken by the company, *Pacific Waste Management*.

5.2.2 Paper and cardboard recycling

Cardboard is collected for recycling by *Rethmann Waste Management* from three 3m³ cages (see Table 3).

White office paper and mixed paper is stored in 240L blue bins provided by Visy Recycling. Most of the bins are located in the Bay 16 waste area. There are two bins that are sometimes situated behind the NIC. These are however, often full resulting in much of the recyclable paper being disposed of in the residual waste stream and taken to landfill.

Location	Bin Type	Pick-up schedule
NIC	1 x Cardboard Cage	Weekly x 1: Tuesday
Bay 16 Compound	2 x Cardboard Cage	Weekly x 2: Tuesday, Wednesday
Bay 16 Compound	240 litre VISY recycling bins	Weekly x 1: Thursday

TABLE 3: Location and pick-up schedule for the collection and recycling of paper and cardboard.

As with the residual waste stream contract, the agreements with the recycling contractors are on a month by month basis and termination of the contracts may only occur if reasonable notice of 4-6 weeks is given.

5.3 Trade and hazardous waste removal

The ATP's current commercial trade wastewater permit which commenced on 27/01/00 was issued by the Sydney Water Corporation (Sydney Water) for the ATP as a 'commercial property or small business producing mainly residential types of substances in its trade waste' (Sydney Water Corporation, 2000). It provides the requirements and conditions for the ATP to discharge trade wastewater into the sewer.

There are four grease traps and three cooling tower systems situated on the ATP site. Three of the four grease traps are currently in operation. These are two 3,000L traps and one 1,500L trap. The Sydney Water permit requires the grease to be pumped out from each of the operating traps every 26 weeks from the date nominated in the permit.

When signing the tradewaste permit, the ATP became part of the Wastesafe system. As part of the permit a book of dockets is given to the ATP's nominated contractor, Rethmann Waste Management, to keep track of the waste collected from the grease traps. The dockets also show how often the grease trap must be emptied (i.e. every 26 weeks). When Rethmann empties the grease trap the docket is handed in at a Wastesafe depot, where the date of disposal and amount of waste disposed is recorded.

In addition to the grease trap waste, hazardous waste is removed from the Ambulance Service site, in special containers, by Pacific Waste Management.

5.4 Cleaning contractors

The cleaning contractors for the majority of the tenants at the ATP are *Prestige Property Services* (Prestige). Two tenants the RTA and the Ambulance Service of New South Wales have a separate joint cleaning service arrangement that is managed by the RTA. Their cleaning contractor is *GD2000*. The Institute for Sustainable Futures, as a part of the University of Technology (UTS), also has a separate cleaning arrangement that is provided by the UTS cleaners, *Prestige Property Services*.

Prestige cleaners are responsible for removing waste from the tenant's offices and transporting it to one of the communal waste areas. GD2000 cleaners are required to collect waste from the offices and take it to the RTA waste area on a daily basis. They also take the 240L bins to the kerbside for daily collection by Pacific Waste Management (PWM).

5.5 Costs associated with the existing system

Table 4 shows the approximate costs for waste collection and disposal provided by Rethmann (excluding RTA and the Ambulance Service), and costs for the cleaning contractor.

Waste service	Weekly cost (approx.) (\$/week)	Annual cost (approx.) (\$/week)
Residual waste pick up and disposal (at \$12.15/m ³)	\$510	\$26,500
Cardboard pickup and recycling (\$6/m ³)	\$90	\$4,700
Visy paper recycling (at \$15 per collection)	\$15	\$780
Grease trap cleaning and waste removal by <i>Rethmanns</i> (at \$0.04/L)	\$12	\$600
Costs of processing of grease trap waste by Sydney Water (at \$0.10/L)	\$58	\$3,000
Total (waste services)	\$677	\$35,160
Cleaning contractor	\$2,300	\$120,000
Total	\$2977	\$155,160

TABLE 4: Approximate costs for the existing waste services provided by *Rethmanns' Waste Management* and cleaning services provided by *Prestige Property Services*.

5.6 Limitations of the existing system

There are a number of limitations that have been identified in the existing waste management system at the ATP. These include:

- no provision for the recycling of glass, plastic or aluminium for tenants;
- infrequent paper collection leading to significant volumes of paper being disposed of in the residual waste stream;
- the main waste compound in Bay 16 is not centrally located for the Park; and
- no transport is provided for the movement of the waste bins from around the park to the communal waste areas.

Discussions have recently been held between Andrew Gowanlocke (ATP groundsman) and Steve Montgomery (ATP manager) regarding the purchasing of a vehicle for the transporting of the waste bins to the communal waste areas and details are being provided to Steve by Andrew on the costs. The ATP manager has indicated that there is a strong possibility that a vehicle will be purchased.

6 WASTE SURVEY

6.1 Approach

This stage of the project required contacting each of the ATP tenants. The aim of this was to describe the project and how waste minimisation could help each tenant as a business, to identify an appropriate contact at each tenancy, and determine which tenants were willing to participate in the waste survey.

Once this was completed, those tenants who agreed to participate were then individually visited to complete the survey. Sixty tenants participated in the survey. A database was designed to store the results of the survey. A copy of the survey can be found in Appendix B.

The survey of ATP tenants was adapted from a survey designed by the Southern Sydney Waste Board for their *Lakes Business Park Challenge Project* and aimed to gather information from each participating tenant to assist in the development of waste management and minimisation strategies. This included, for example, questions regarding purchasing policies, current waste practices, costs of waste disposal/recycling, willingness to participate in a workshop to brainstorm ideas for waste management strategies for the ATP, and general business details.

6.2 Results

Following initial consultation with the ATP tenants, 60 tenants agreed to participate in the waste survey. The survey was conducted by ISF staff and covered the following relevant information, including:

- type of business;
- number of employees;
- types of waste produced;
- estimated volumes of waste produced;
- current waste minimisation activities;
- ATP services used;
- ATP services required; and
- whether interest was shown for participation in the waste audit, strategy workshops and training.

A list of tenants whom participated in the survey can be found in Appendix C.

The majority of tenants (71%) who participated were small businesses, with 10 or less employees. Twelve (20%) of the participants were medium sized businesses, with 11 to 50 employees and five (9%) of the participating tenants were large business, employing over 50 people. Two of these five were educational institutions. Although a full copy of the survey results is contained in Appendix D a number of points that were brought up by tenants are to be noted, as follows:

- many of the small offices stated that they considered the small amount of waste that they generated to be so small that waste minimisation practices were not worth worrying about;

- the main influences on changes in waste generation were staffing levels, seasonal periods and the number of functions required of the catering services;
- most of the participating tenants didn't have a waste management plan or policy and only five of the sixty participating tenants knew what the NSW waste reduction to landfill target was;
- many responses were received stating the need for a communal recycling facility, improved recycling services, clearly marked bins and separate bins in offices for recycling;
- not enough information is provided to tenants on the waste facilities that are currently provided; and
- a number of comments were made stating that the ATP, as a centre for innovation, should showcase the latest technologies. The change in the Park management was seen as a positive step to achieving a more serious effort to provide a more effective waste management system.

7 WASTE AUDIT

7.1 Approach

The aim of the solid waste audit was to determine the weights and volumes of the specific waste streams being generated at the ATP and whether they were being recycled, reused or disposed of at landfill. The audit component of the project was comprised of two stages; pre-sorting and sorting.

Before sorting could take place, communications were undertaken with each of the participating tenants to allow for the easy distribution of individually named garbage bags and to arrange for the collection of waste by the cleaners for the 24-hour audit. Each of the tenants were contacted by letter and by phone to confirm their participation in the audit and explain procedures for the waste collection. (see Appendix E for a copy of the letter that was sent out).

Before the sorting and weighing procedure commenced, each person to be involved in sorting the waste was provided with the necessary information to successfully classify the waste in accordance with the *Australian Waste Database* material composition codes. This included a description of the classification codes, examples of waste categories for difficult to classify codes (e.g. types of recyclable plastics and compostables) and information on occupational health and safety requirements. Waste tracking sheets were provided (see Appendix F) and training was provided on the best procedure to follow. Protective clothing was provided to adhere to occupational health and safety guidelines.

Sorting and weighing of the waste took place in a designated area of the ATP (see Appendix A) on Wednesday July 5th. The weight and approximate volume of each of the waste types was recorded on waste tracking sheets. The volumes were calculated by determining the percentage fullness of the containers that were used for weighing the waste. These were either 18L or 55L containers. The percentage fullness was then used to calculate the number of litres of waste. Weights and volumes were first recorded for the 24 tenants whose waste for the previous 24 hours had been collected for analysis as case studies. The case studies were used to provide examples of waste

streams from different types of working environments (e.g. catering and office environments). This was followed by the recording of weights and volumes for the remaining ATP waste stream.

Trade waste on the ATP site (i.e. grease trap waste) was assessed in accordance with the *Sydney Water Corporation Confirmed Commercial Trade Wastewater Permit* for the ATP that commenced on the 27th January, 2000 and Sydney Water's Trade Waste Policy. An assessment of the amount of tradewaste generated at the Park was conducted in collaboration with staff from the Sydney Water *Wastesafe* system. The waste itself was not collected.

The results of the audit were entered into a database designed for the project. Results of the sorting procedure were recorded on a tenant by tenant basis for those tenants who were happy to participate as case studies. This was followed by a detailed analysis and description of each of the waste streams that exist for the ATP as a whole. The data was then used in the development of appropriate waste management and minimisation strategies.

7.2 Results

The following provides the results of the 24 hour audit for the ATP as a whole. The data incorporates the waste generated from the individual case studies and the remaining waste stream. The figures also include the weights and volumes for the paper and cardboard that is recycled. Figures 1 and 2 show the waste being sorted. Results for the individual case studies are in Appendix G.



FIGURE 1: Waste sorting



FIGURE 2: Waste sorting

7.2.1 Solid waste stream

Table 5 and Figures 3 and 4 show the results of the 24 hour waste audit of the ATP held on Wednesday July 5th, 2000.

Code	Description	Weight (kg/day)	Volume (L/day)	Weight (tonnes/annum)	Volume (m ³ /annum)
A01	Paper – Newsprint	1.5	14	0.4	3.5
A05	Paper – Package board	6.9	96	1.8	25
A06	Paper – Liquid paper containers	9.5	251	2.5	65
A08	Paper – Printing & writing paper	113	1688	29.0	439
A09	Paper – Mixed paper	17	374	4.5	97
A10	Paper – Cardboard	91	3502	24	910.5
B	Organic – Compostable (includes soiled paper)	37	930	9.7	242
B01	Organic – Compostable food / kitchen	116	558	30	145
B02	Organic – Compostable garden	25	111	6.5	29
C01	Other Organic – Wood	0.83	2	0.22	0.52
C02	Other Organic – Textile / rags	4.5	36	1.2	9
D01	Glass – Packaging / glass containers	22.5	71	6	18.5
E01	Plastic – 1 PET	18.6	419	5	109
E02	Plastic – 2 HDPE	12.6	459	3	119
E04	Plastic – 4 LDPE	7	484	2	126
E05	Plastic – 5 Polypropylene	2	62	0.45	16
E06	Plastic – 6 Polystyrene	10	353	2.7	92
E07	Plastic – 7 Other	10	175	2.7	45.5
F01	Ferrous – Steel packaging	4	45	0.99	11.6
F02	Ferrous - Other	0.73	20	0.19	5
G01	Nonferrous – Aluminium	8	141	2	37
G02	Nonferrous – Other	0.35	4	0.09	0.91
H03	Special – dry cell batteries	0.13	1	0.03	0.26
H07	Special - medical	1	55	0.3	14
I01	Earth Based – Ceramics	0.26	1	0.07	0.13
Totals		520	9852	135	2560

TABLE 5: ATP solid waste stream.

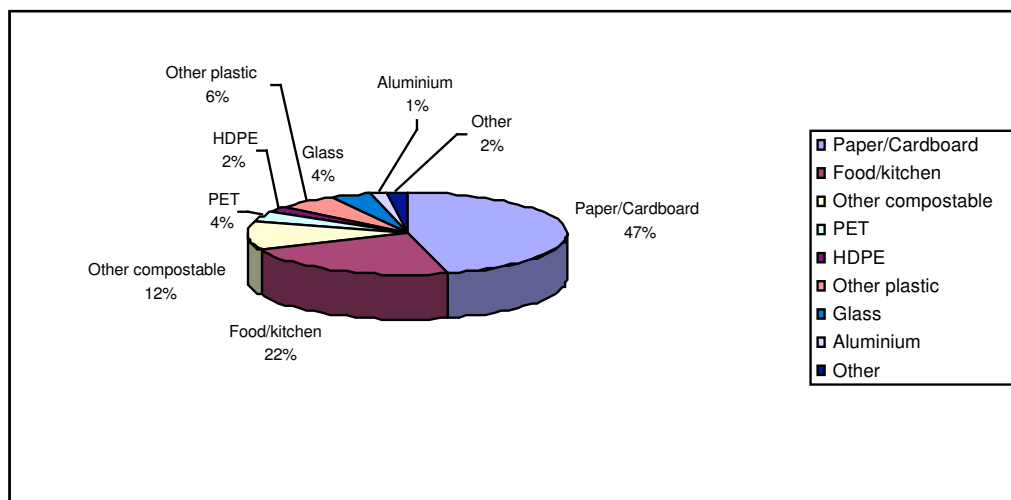


FIGURE 3: ATP solid waste stream composition by weight.

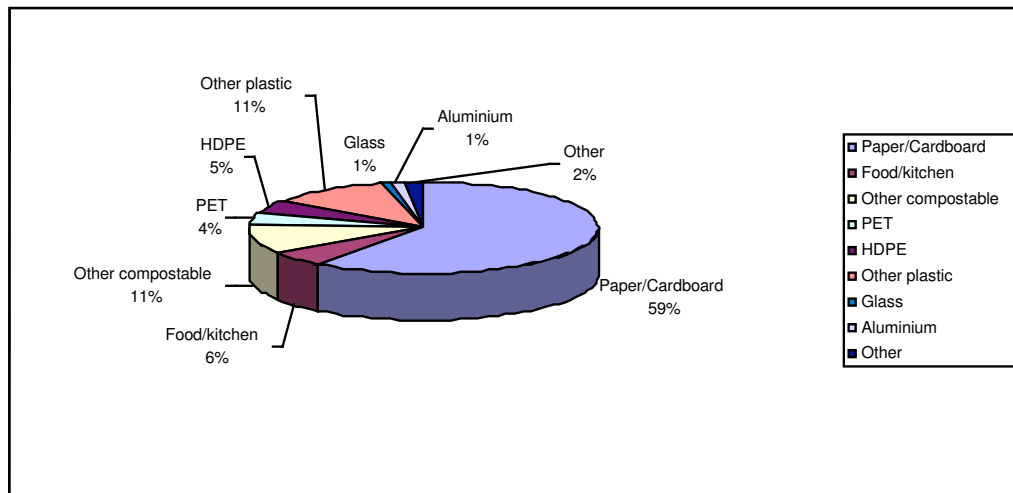


FIGURE 4: ATP solid waste stream composition by volume.

As shown in Table 5 and Figures 3 and 4, paper and cardboard is the largest percentage of the solid waste stream at the ATP, both by weight (47%) and volume (59%). Of note, is that approximately 30% of the paper in the solid waste stream was from one of the medium size businesses. This high percentage is due to business activities requiring the testing of different printing and writing papers for the market (all of which is recycled).

The case studies detailed in Appendix G show that paper is the highest percentage (approximately 30% or higher) of the waste stream in each individual case, apart from the cafés/catering companies. This consistency, irrespective of business size, is likely to be the result of each of the businesses at the Park operating in office environments.

Of the 22% food and kitchen waste by weight (6% by volume), approximately two thirds of this was waste generated by the cafes/catering services.

The third highest proportion of the waste stream, other compostable matter (12% by weight, 11% by volume) consisted primarily of paper soiled by food scraps that were in the general waste bins of each office. More detailed information on the main components of the waste stream follows.

There was one tenant that was not willing to participate in either the waste survey or audit, therefore the results would slightly underestimate the total waste stream. It was also not possible to extrapolate the amount of waste that this tenant may have produced since they did not complete the waste survey.

At the time of the waste audit, the Conservatorium High School was not in term time, thus the amount of waste they were likely to have produced was determined by extrapolations based on information that was provided by *School Communities Recycling All Paper (SCRAP)*. The case study provided in Appendix G for the Conservatorium High School details how the waste streams by weight and volume were determined.

7.2.2 Recycling

Currently at the ATP, paper and cardboard are the only items that are recycled from the solid waste stream. Table 6 shows the current recycling rates of paper and cardboard from the ATP total waste stream, and the percentages that could be achieved if all of the paper and cardboard currently directed to landfill was recycled.

	Cardboard		Paper		Cardboard & Paper	
	Weight	Volume	Weight	Volume	Weight	Volume
Percentage of total waste generated	17.5%	35%	28.5%	24%	46%	59%
Percentage of paper and cardboard currently being recycled	85%	85%	44%	35%	60%	65%
Percentage of total solid waste generated currently being recycled	15%	30%	12.5%	8.5%	27%	39%
Percentage of total waste generated that could still be recycled	2.5%	5%	15%	15%	17.5%	20%
Total recycling percentages that could be achieved.	17.5%	35%	27.5%	23.5%	44.5%	59%

TABLE 6: Current and possible recycling percentages for paper and cardboard by weight and volume.

Paper makes up approximately 28% of the solid waste stream by weight, (24% by volume). Currently, 44% of this by weight (35% by volume) is being recycled. This accounts for approximately 12.5% by weight (8.5% by volume) of the solid waste stream that is currently being removed for recycling.

If the remaining recyclable paper was removed from the solid waste stream for recycling, a further 15% by weight and volume, could be removed from the residual waste stream.

Cardboard makes up approximately 17% of the total solid waste stream, by weight, (35% by volume). Currently, 85% of this by weight (85% by volume) is being recycled. This accounts for approximately 15% by weight (30% by volume) of the total waste stream that is currently being removed for recycling.

PET, HDPE, glass and aluminum account for approximately 12% of the total waste stream by weight (11% by volume). Currently none of this material is recycled.

Food and kitchen waste comprises 22% of the waste stream by weight (6% by volume). This would be the equivalent of approximately 27 tonnes of food waste going to landfill each year. It should be noted that the catering that took place on the day of the audit was smaller than business as usual (i.e. waste for only one catering job was collected when some days there may be up to six catering jobs). When food and kitchen waste is combined with the other compostable components of the waste stream (e.g. soiled paper and garden organics) it accounts for approximately 34% of the waste stream by weight (17% by volume). Figure 5 shows a sample of the types of organic wastes that were found within the waste stream.



FIGURE 5: Compostable organic waste in the ATP residual waste stream.

Table 7 summarises the percentages of the ATP waste streams that could be recycled if all paper, cardboard, compostable, glass, PET and HDPE was removed from the residual waste stream.

Waste stream	Percentage of waste stream by weight	Percentage of waste stream by volume
Paper/Cardboard	47%	59%
Organic – Compostable	34%	17%
Glass	4%	1%
PET	4%	4%
HDPE	2%	5%
Aluminium	1%	1%
Totals	92%	87%

TABLE 7: Recyclable components of the ATP waste stream by weight and volume.

As indicated in the above table, it is possible to divert up to 92% of the entire waste stream generated at the ATP away from landfill. If this figure was achieved the ATP could be held up as a model example to other business parks of how to effectively manage waste and capture valuable resources for recycling and/or reuse.

7.2.3 Trade and hazardous waste

Although, the Southern Sydney Waste Board is mainly concerned with the solid waste stream that is generated at the Park, quantities of grease trap waste were determined in collaboration with Sydney Water’s *Wastesafe* personnel (as described in section 5.3).

Table 8 shows the amount of grease trap waste that is produced from the cafés/ catering services provided at the ATP.

	Annual greasetrap waste produced (L/day)	Annual greasetrap waste produced (L/week)	Annual greasetrap waste produced (m ³ /annum)
Santos	11.5	58	3
Grand Central Café	23.0	115	6
Onsite Catering	23.0	115	6
Total	57.5	288	15

TABLE 8: Grease trap waste produced at the ATP.

Quantities of hazardous waste accumulated by the Ambulance Service of NSW could not be determined or extrapolated as access to the area was not achievable for security reasons.

8 STRATEGY WORKSHOP

8.1 Approach

Following the waste audit and a preliminary analysis of the results, a one-hour workshop was conducted to consult the ATP tenants as to what types of strategies they would like to be considered for waste minimisation at the ATP.

A poster was designed to invite each of the tenants to the workshop and encouraged participation with a number of door prizes available (see Appendix H). At the conclusion of the workshop the workshop outcomes were analysed, documented and used in the subsequent development of waste management and minimisation strategies.

Initially, two workshops were planned and advertised for Tuesday July 18th, from 2pm to 3pm and Friday July 21st, from 10am - 11am. As only one tenant registered for the workshop to be held on Friday 21st it was cancelled. Six tenants attended the workshop, and two provided input as they were unable to attend. Each was provided with a copy of the workshop notes once they had been collated.

8.2 Results

The issues that were raised during the workshop covered six key waste management sectors. Table 9 summarises the issues that were discussed. A full copy of the workshop minutes can be found in Appendix I.

Waste management area	Comments raised
ATP management	<ul style="list-style-type: none"> • Lack of knowledge on current practices or where waste services are situated at the ATP. • No communication about the available recycling facilities and their location. No communication that the recycling service for glass and plastic had been removed. When this service had been available the tenants were unaware of this. • Lack of consultation with tenants. • Lack of recycling services.
Infrastructure	<ul style="list-style-type: none"> • Separation of wastes at source (i.e. each tenant needs to). • Currently: lack of services provided. • Need bins for recycling both within tenant areas and in many outside areas. • Communal composting and recycling facilities. • Electric truck to transport 240L waste bins to the main waste compound. • ATP is considered a place where setting up a recycling system would be very easy. • Tenants were not consulted as to where the best place would have been for the communal waste area that was built in Bay 16.
Education	<ul style="list-style-type: none"> • None currently provided. • Considered very important for effective recycling. • Extensive communication of current facilities provided, and again when new facilities are provided in conjunction with appropriate training. • Education of tenants. • Education of cleaners . • Encourage people to bring their own mugs when getting takeaway coffee etc to reduce the use of disposable cups (cafes may be able to provide incentives).
Contracts	<ul style="list-style-type: none"> • Cleaning contract needs to specify the procedure for the collection/separation of recyclables from tenants when facilities are provided. • Provisions in tenancy agreement as to procedures for waste separation and disposal + provide general information on what can be recycled.
Waste collection	<ul style="list-style-type: none"> • Problem with reliable pick up of waste by contractors.
Costs	<ul style="list-style-type: none"> • Costs saved by recycling and composting could be put back into the system for the maintenance and provisions of those services.
Information dissemination	<ul style="list-style-type: none"> • ATP newsletter. • Incubator program: once a month meetings. • Bay 16 monthly meetings.

TABLE 9: Summary of the issues that were raised at the ATP waste minimisation strategies workshop.

9 WASTE MANAGEMENT AND MINIMISATION STRATEGIES

9.1 Approach

Once the audit and workshop results were fully analysed, a package of strategies to achieve effective waste minimisation at the ATP was developed. The package included the:

- development and description of waste minimisation options;
- development of a list of contacts and other details of appropriate waste minimisation contractors;
- estimation of the costs of each of the options;
- the estimation of waste reductions achievable by weight and by volume;
- Cost Benefit Analysis of options; and
- development of recommended options.

A number of waste collection, disposal and recycling companies were contacted to assess whether the existing services, and additional recycling services could be provided to achieve waste reduction consistent with the NSW 60% reduction of waste to landfill target. Additionally, quotes were requested to see whether these services could be provided at a lower cost than those that are currently charged.

The following provides details of those companies/organisations that could provide waste collection and disposal and recycling services for the ATP.

9.2 Residual solid waste removal

A number of quotes have been provided by several waste management companies for the provision of waste collection, disposal and recycling services for the Australian Technology Park. Tables 10, 11 and 12 provide summaries of the services that can be provided. Quotes have been provided to ATP maintenance for further consideration.

9.2.1 Pacific Waste Management (PWM)

Container type	Qty	Size	Frequency	Clearance Charge	Rental Charge
Front lift: residual waste	4	3m ³	3 x weekly	\$24.00 per clearance per container	Nil
240L bin: recycling	N/A	240L	N/A	N/A	\$1 per week per bin
As above: glass recycling by Tony Zammit		240L	1 x weekly	~\$30/month	Rented from PWM as above

TABLE 10: Quote for waste management services by *Pacific Waste Management*

9.2.2 Cleanaway

Container type	Qty	Size	Frequency	Clearance Charge	Rental Charge
Front lift: residual waste	4	3m ³	3 x weekly	\$38.00 per clearance per container	\$2/week
240L bins for the recycling of plastic, glass and aluminium	Variable	240L		Nil	Nil

TABLE 11: Quote for waste management services by *Cleanaway*

9.2.3 Collex Waste Management

Container type	Qty	Size	Frequency	Clearance Charge	Rental Charge
Front lift: residual waste	4	3m ³	3 x weekly	\$36.00 per clearance per container	Nil
Grease trap waste				\$0.03/litre	

TABLE 12: Quote for waste management services by *Collex Waste Management*

9.3 Recycling

9.3.1 Paper and cardboard recycling

School Communities Recycling All Paper (SCRAP) is a non-profit organisation that could provide paper and cardboard recycling services for the Australian Technology Park. Membership to SCRAP is free, and the Sydney Harbour Foreshore Authority, as a government body, is entitled to membership. Paper recycling is provided free of charge. Appendix J contains the application forms for SCRAP membership. These can also be obtained from the SCRAP website at <http://nccnsw.org.au/member/scraper/join/>. SCRAP membership would allow for cost savings and a more efficient system for paper and cardboard recycling. A suitable frequency of pick up schedule is determined before the program starts. It is suggested that a pickup occur once a week for both cardboard and paper. Table 13 shows the costs involved for the SCRAP paper and cardboard recycling system. No costs are incurred for bin rental or insurance.

Container type	Qty	Size	Frequency	Clearance Charge	Rental Charge
240L: paper recycling	As needed	240L	To be agreed upon	Nil	Nil
240L: cardboard recycling	As needed	240L	To be agreed upon	Nil	Nil
3m ³ Skip: cardboard recycling	As needed	3m ³	To be agreed upon	\$16.50 (@\$5.50/m ³)	Nil

TABLE 13: Costs associated with the SCRAP paper and cardboard recycling system

9.3.2 Commingled recyclables

Visy Recycling provides a commingled recycling service. Glass, aluminum and PET can be mixed together and collected. It is taken to Botany for reprocessing. Costs are: \$70 deposit per 240L bin which is returnable at the end of a contract and \$5 collection per bin. If bins were already provided/rented by the residual solid waste collection and disposal company *Visy* would provide stickers for the bins for easier identification for collection.

9.3.3 Plastic Recycling

Donmar Industries could provide a recycling service for all of the PET and HDPE produced within the park. The service costs \$20/month. This provides a service which includes a steel frame with a bag inside (approximately 1.5m³), for the onsite storage of the plastic containers, and a once a month collection service.

9.3.4 Food and garden organics and shredded paper

Enviro – Waste Solutions could provide an on the ground worm farm that would allow for the vermiculture of all of the catering and café wastes (except meat scraps) along with any shredded paper that is currently disposed of from within the Park. Any individual tenants who wish to have their food scraps added to the worm farm could also take their wastes to the area after receiving educational information on the process to be followed.

It is important to note that vermiculture does require ongoing management, although this is not very labour intensive. *Enviro -Waste Solutions* provide free training when they set up a system on maintaining the system correctly, and training will be provided for as long as is needed until the person operating the system fully understands how to maintain the worm farm effectively. Andrew Gowanlocke, the groundsman at the ATP, has indicated that he would be willing to transport the food waste in the appropriate bins from the cafes and catering companies to the worm farm area and be responsible for the low maintenance general running of the system.

Small (80L or 120L) bins would be provided to the cafés and catering companies to hold food scraps to be put through the vermiculture process. If such a system was set up, education of the participating tenants would need to take place before the system was in operation. These bins could be collected by Andrew Gowanlocke when required to be processed at the worm farm.

Table 14 summarises the costs for setting up such a system. Onsite Catering, the Grand Central Café, and Santos Café have all stated that they would be willing to participate in the smooth running of the worm farm operations. These costs are for the establishment of a worm farm capable of processing over 100kg of organic waste a day, and do not include the labour costs for collection and management, which are assumed to be covered by the ATP groundsmans, (Andrew Gowanlocke) salary.

Approximate cost without using ATP materials	\$6000
Approximate cost using ATP materials	\$5,000

TABLE 14: Approximate costs of setting up a worm farm at the ATP.

A sale price has been offered that gives a 50% reduction off the cost of the stock (worms) and a 33% reduction off the waste units. Appendix K contains copies of the full quote and the sale prices. The sale was initially only for units purchased during September, however, this has been extended for this project as contact was initiated with *Enviro-Waste Solutions* before the September sale was advertised.

Setting up a system such as this would allow for the Australian Technology Park to showcase the latest technologies for vermiculture (worm farming), whilst reducing the amount of organic waste going to landfill. The vermicast that is the by-product of the worm farming process is also a high grade compost that could be used throughout the ATP grounds, or taken home by tenants. The liquid that is drained from the worm farm is also a fertilizer that could be used by tenants or ATP maintenance.

Inquiries were made into the use of an in vessel composting unit at the ATP. Discussions were held with Angus Campbell, from the Recycled Organics Unit at the University of New South Wales (UNSW) and a tour was made of the UNSW vertical composting unit. The main advantage of an in vessel composting system like the VCU is that meat can also be added to the system. There are a number of reasons, however, why such a system may not be appropriate for use at the ATP:

- High costs involved (\$10,000 - \$20,000 to set up the system);
- High maintenance requirements; and
- Need for 50% garden organics to be put into the system (Recycled Organics Unit, 2000).

9.3.5 Aluminium cans

Cash for Cans is an organisation that can provide money for aluminium cans that are removed from the residual waste stream. They will provide wool sacks to put the cans into. Each wool sack can take approximately 15kg of uncrushed cans. The pickup service is on an as needs basis and there are no costs involved. ~\$1/kg is paid for the cans. It was suggested that the ATP could use its own bins with a hole in the top because if the wool sacks are left out then people often put general rubbish into them.

At the time the waste survey was conducted, *Wrought Artworks*, one of the tenants at the ATP, expressed interest in making use of the aluminium cans from the waste

stream to use in their artwork. Contact details for Wrought Artworks are included in section 9.6 with the waste contractor and recycling details.

9.4 Trade waste removal

Although the focus of this report is on solid waste, a number of points can be mentioned to reduce the generation and disposal of grease trap waste. If less oil is emptied and stored in the grease trap, then there will be reduced costs. Given that the costs of grease trap waste removal are based on a per litre charge, the managers of cafes/catering companies that have grease traps operating have an interest in reducing the amount of waste that is released to the trap.

A number of methods can be used by cafés and catering companies to reduce the amount of waste that is collected in the grease trap. These include:

- using water sparingly;
- scraping cooking utensils and plates before washing;
- screening/straining at source;
- disposing of waste oil and grease separately (not down the drain);
- recycling oils, grease and cleaning agents;
- minimising the use of detergent;
- using aluminium foil to collect grease and oil spills around stoves and fryers; and
- using minimal grease and oil for cooking (Sydney Water, 1995).

9.5 Cleaning contractor requirements

There is a need for the cleaning contract to include waste management considerations given that the cleaners are responsible for the collection of waste from the tenants offices and the delivery of the waste to the communal waste facilities.

The education/training of the cleaning staff on any new waste management initiatives that are implemented at the ATP will be required to ensure a smooth transition to a new waste management system. It is essential that all cleaning staff are aware of where to take recyclables that have been segregated and that it is a requirement under their contract.

The contract should include a specification as to exactly where the different recyclable waste types are to be taken and why this is necessary to adhere to the ATP's waste management system, and ensure its effective operation.

9.6 Contractors contacts

Table 15 provides a list of the contractors, organisations and tenants who can provide waste collection, disposal and recycling services for the ATP to allow for a more efficient waste management system.

Organisation	Contact Name	Contact Number
Pacific Waste Management	Scott Ashton	0412 694754
Cleanaway	Warren Holmes	0418 674510
Collex Waste Management	Glenn Nelson	0419 288218
SCRAP	Peter Carroll or Tracy	98251062
VISY recycling	Nick	93164379
Donmar Industries	Don Ralph	97553305
Enviro-Waste solutions	Steve Scott	0410 466585
Cash for Cans	Craig Litchfield	96819511 or 0413 752937
Tony Zammit recycling	Tony Zammit	0414999168
Wrought Artworks	Wendy or Guido	93196190
Sulo bins	NA	43488188

TABLE 15: Contractors contacts

9.7 Assessment of waste management and minimisation costs

The inclusion of recycling within the Park will require substantial changes to the current waste management system. This can be achieved with the appropriate training and commitment of ATP maintenance, cleaning staff and tenants, and the provision of appropriate infrastructure. Changes to the system could also provide substantial cost savings.

Table 16 summarises the costs associated with the various waste management services. Table 17 lists a number of options for consideration by ATP management. The capital and operating costs and estimated benefits of each option has been modelled and is summarised.

Waste or recycling service	Weekly operating costs (approx.) (\$/week)	Annual operating costs (approx.) (\$/week)	Approximate Capital costs
Current system:			
Residual waste pickup and disposal (@\$12.15/m ³)	\$510	\$26,500	
	\$90	\$4,700	
Cardboard pick up and recycling (\$6/m ³)	\$7	\$360	
Paper recycling	\$607	\$31,560	
Total:			
Pacific Waste Management:			
Residual waste pickup and disposal: (@\$8/m ³)	\$288	\$14,976	
	\$11	\$598	
Glass recycling*:	\$299	\$15,574	
Total:			
Cleanaway:			
Residual waste pick up (@\$12.60/m ³)+ glass, PET and aluminium recycling services	\$456	\$23,712	
Collex:			
General waste pick up and disposal (@\$12/m ³)	\$432	\$22,464	
SCRAP			
Paper recycling:	\$0	\$0	
Cardboard recycling (\$5.50/m ³):	\$82	\$4,290	
Cash for Cans:			
Aluminium cans recycling:	(\$35)	(\$1,820)	
Cost for 2 120L bins: \$271.40 + 6 240L bins: \$312.40			\$630
Enviro-waste solutions:			
Cost of setting up worm farm (least cost scenario)			\$5,100
Visy recycling: glass and PET	\$40.00	\$2080.00	
Donmar Industries:	\$5.00	\$260.00	
PET and HDPE recycling service			

*: costs include bin rental

TABLE 16: Summary of costs associated with waste management services that could be provided to the ATP (Parenthesis indicate income).

Option	Description of solid waste management options	Capital costs (\$)	Operating costs (\$/annum)	Total costs (\$/annum)	Savings in first year (\$/annum) based on BAU	Savings in subsequent years (\$/annum) based on BAU	Estimated reduction of waste to landfill (t/annum)*	Estimated reduction of waste to landfill (m ³ /annum)*	Estimated reduction of waste to landfill (t/annum)**	Estimated reduction of waste to landfill (m ³ /annum)**
Business as usual (BAU)	Business as usual: <ul style="list-style-type: none"> Residual waste disposal by Rethmanns Cardboard recycling by Rethmanns Paper recycling by Visy. 	Nil	\$31,980	\$31,980	Nil	Nil	No reduction	No reduction	No reduction	No reduction
Option 1	Cleanaway + SCRAP: <ul style="list-style-type: none"> Residual waste collection and disposal by Cleanaway Glass, PET, and aluminium recycling by Cleanaway Paper and cardboard recycling by SCRAP 	Nil	\$28,000	\$28,000	\$3,980	\$3,980	66 (49%)	1,432 (56%)	83 (61%)	1,790 (70%)
Option 2	Pacific Waste Management + SCRAP + VISY: <ul style="list-style-type: none"> Residual waste collection and disposal by PWM Aluminium, PET and glass recycling by Visy Paper and cardboard recycling by SCRAP 	\$800	\$22,500	\$23,300	\$8,680	\$9,480	66 (49%)	1,432 (56%)	83 (61%)	1,790 (70%)
Option 3	Pacific Waste Management + SCRAP + Cash for Cans + Donmar Industries: <ul style="list-style-type: none"> Residual waste collection and disposal by PWM Glass recycling by Tony Zammit; PET and HDPE recycling by Donmar Industries; Aluminium, recycling by cash for cans; and Paper and cardboard recycling by SCRAP 	\$800	\$18,300	\$19,100	\$12,880	\$13,680	69 (51%)	1,522 (59%)	86 (64%)	1,902 (74%)
Option 4	Pacific Waste Management + SCRAP + Cash for Cans + Donmar Industries + Worm farm <ul style="list-style-type: none"> Residual waste collection and disposal by PWM Glass recycling by Tony Zammit; PET and HDPE recycling by Donmar Industries; aluminium recycling by cash for cans; paper and cardboard recycling by SCRAP; worm farm (least cost scenario) 	\$5,800	\$18,300	\$24,100	\$7,880	\$13,680	91 (67%)	1,631 (63%)	114 (84%)	2,038 (79%)

* Assumption of a 75% uptake rate.

** Assumption of a 100% uptake rate

TABLE 17: Costs and benefits of waste management options for the Australian Technology Park

As shown in Table 17, there are a number of waste management and minimisation options available to the ATP. The costs shown for each of the options take into account a reduction in the number of skips for residual waste disposal from five to four and a reduced collection frequency from the Bay 16 waste compound from four to three days a week. There is potential for the number of skips and/or the frequency of pick-up to be reduced further once a new waste management and minimisation system was in place and the effects of the new system determined.

Each of these options has a number of advantages and disadvantages. Table 18 summarises the primary advantages and disadvantages of the current system and the four options modelled. It should be noted that the capital costs include the costs of purchasing 240L bins to be used for the separated recycling streams. These capital costs could be saved by renting from the waste collection and disposal company.

Options	Advantages	Disadvantages
Business as usual	<ul style="list-style-type: none"> • No infrastructure or other changes needed 	<ul style="list-style-type: none"> • High cost of service • No recycling of glass, aluminium or plastic • No provision of vermiculture unit for food and garden organics • Does not meet the NSW governments 60% reduction to landfill target
Option 1	<ul style="list-style-type: none"> • Free paper recycling service provided • Lower cost of collection and disposal of residual waste that current system • Basic recycling service provided 	<ul style="list-style-type: none"> • Recycling of HDPE not provided • High cost of service provided • No provision of vermiculture unit for food and garden organics
Option 2	<ul style="list-style-type: none"> • Free paper recycling service provided • Low cost of collection and disposal of residual waste that current system • Basic recycling service provided 	<ul style="list-style-type: none"> • Recycling of HDPE not provided • No provision of vermiculture unit for food and garden organics • Change in current infrastructure is required • Does not meet the NSW governments 60% reduction to landfill target
Option 3	<ul style="list-style-type: none"> • Free paper recycling service provided • Low cost of collection and disposal of residual waste • Extensive recycling system provided • Cost benefits associated with aluminium recycling • High cost savings • Large reductions in the amount of waste disposed of at landfill 	<ul style="list-style-type: none"> • No provision of vermiculture unit for food and garden organics • Change in current infrastructure is required • Does not meet the NSW governments 60% reduction to landfill target
Option 4	<ul style="list-style-type: none"> • Free paper recycling service provided • Low cost of collection and disposal of residual waste • Extensive recycling system provided; • Cost benefits associated with aluminium recycling • Recycling of food and garden organics is provided for. • High cost savings • Large reductions in the amount of waste disposed of at landfill in line with the NSW Governments target. 	<ul style="list-style-type: none"> • Change in current infrastructure is required • Decision on worm farm needed as soon as possible to purchase at the least cost possible.

TABLE 18: Advantages and disadvantages of the ATP waste management and minimisation options.

As shown in Tables 17 and 18, each of the options would provide costs savings when compared to the system currently in operation (business as usual). It is suggested that Option 4 be implemented at the ATP as the preferred option.

If Option 4 is implemented at the ATP, a 60% reduction of waste to landfill would be easily achieved consistent with the NSW Government target. The system would put the ATP at the forefront of waste management and could be used to showcase the latest technologies for waste minimisation and reuse of materials. Although there would be a need for new infrastructure at the park, significant cost savings would be achieved despite the new services required. Section 9.8 provides details of the steps that would need to be taken in order to successfully implement the preferred option.

9.8 Implementation strategy for the preferred waste management and minimisation system.

9.8.1 Decision making process

To implement Option 4, there is a need for consideration by ATP management and the maintenance department and a decision from ATP management as to the timeframe for implementation. This decision is required to complete the final stage of the project, communication and education strategies for cleaners and tenants.

Approval is required from the Park owners, the Sydney Harbour Foreshore Authority (SHFA). The ATP General Manager, Steve Montgomery, from SHFA, will be required to make any decisions pertaining to the proposed changes to the current waste management and minimisation system. The proposal will need to be made to Steve by Allan Brzson (ATP Maintenance).

Once a decision has been made, the ATP Maintenance Services Manager, Allan Brzson, will be required to manage any contractual changes from the existing system that are required.

9.8.2 Contract requirements

Reasonable notice of approximately four to six weeks would need to be given to *Visy Recycling* and *Rethmann Waste Management* to terminate the existing contractual arrangements.

New contracts, and/or agreements would need to be entered into with:

- *Pacific Waste Management* for the collection of residual waste and hiring of 240L bins for the collection of glass, PET, and HDPE;
- *Donmar Industries* for the monthly collection and recycling of PET and HDPE;
- *Tony Zammit* for the collection and recycling of glass once a week;
- *SCRAP* for free paper recycling and cardboard collection and recycling services;
- *Cash for Cans*, for the collection and buying of aluminium cans; and
- *Enviro-Waste Solutions* for the construction of a worm farm and associated training of ATP personnel.

9.8.3 Recycling services infrastructure requirements

The provision of new recycling services would require extra rubbish bins to be situated throughout the Park. This includes the need for:

- approximately fourteen 240L paper recycling bins. These would be provided free of charge by SCRAP;
- three 3m³ cardboard recycling cages to be provided by SCRAP;
- three 80L bins for the collection of food scraps by the cafés/catering companies to be provided by *Environ-Waste Solutions*. Once the system was running smoothly, and with appropriate education and signage it would be possible to place 120L bins in the same areas as the 240L glass, plastic and aluminium recycling bins so that any other food scraps could also be collected to be processed in the worm farm.
- approximately twenty-one 240L bins for the collection of glass, aluminium, PET and HDPE. It is suggested that the bins rented from *Pacific Waste Management* be used for the collection of the glass and plastic, and that bins be purchased from *Sulo* for the collection of aluminium cans. The bins that can be provided by *Sulo* are designed so that aluminium cans only can be placed through a hole at the top.
- the purchase of an electric or other cart/truck and trailer and ramp to be used by maintenance staff for the handling and movement of recycling and food waste bins to the central waste areas. This would also provide for more efficiency in the current handling and movement of waste throughout the ATP.

Appendix L contains a site map with details of where the recycling bins could be placed for the smooth operation of the preferred waste management and minimisation option.

9.9 Next steps

9.9.1 Communication and education strategies

Resulting from the recommended options for strategies, it is intended that a number of communication and education strategies be developed and implemented. There are three steps to the process:

- Development and production of appropriate communication and resource materials for tenants and cleaning contractors;
- Implementation of communication and education strategy for tenants; and
- Implementation of communication and education strategy for cleaning contractors.

This part of the project is to be discussed in a separate report and is to be funded by the Australian Technology Park. This requires the ATP to make a decision as soon as possible as to what changes will be made to the current system so that the development of training packages can commence.

9.9.2 Monitoring

It is suggested that ongoing monitoring of the waste streams occur so that the reductions in the amount of waste to landfill that are a result of the new system can be determined.

10 RECOMMENDATIONS

It is recommended that the Australian Technology Park:

- implement the Option 4 waste management and minimisation system to achieve the greatest cost savings, while achieving the 60% reduction of waste to landfill that is consistent with the NSW Government target;
- advise any existing contractors whether their services will be required, and provide the required termination time of 4-6 weeks;
- establish a worm farm for the processing of food organics, garden organics and shredded paper;
- arranges for the ATP groundsman, Andrew Gowanlocke, to be trained by *Enviro – Waste Solutions* for the maintenance of the worm farm;
- establish infrastructure for the recycling services for PET, HDPE, glass and aluminium as suggested in Option 4;
- apply for membership with SCRAP as soon as possible and utilise the free paper recycling and cardboard recycling services to allow for a more consistent paper and cardboard pickup service;
- provide training for cleaners and tenants as soon as possible on changes to waste management practices in order to ensure a smooth transition from the current system, as is consistent with projects objectives;
- purchase an electric cart/truck and trailer and ramp to be used by maintenance staff for the handling and movement of recycling and food waste bins to the central waste areas;
- develop and display appropriate signage to assist in waste education and ensure maximum use of the proposed recycling system. Recycling services also need to be provided at a number of central locations throughout the park to ensure the maximum use of these services;
- produce education packages for cleaners and tenants that provide information on:
 - location of waste services;
 - contract requirements for the removal of recyclables to waste areas; and
 - items that can be recycled; and
- include a clause in the tenancy agreements that requires source separation of recyclables to provide for the easy collection and transportation of the materials by the cleaners to the designated areas.

11 REFERENCES

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