4. PROPOSED DEVELOPMENT

This section provides a description of the proposed RIRP and the activities proposed to be undertaken. Plant layouts and process related design information has been provided by AP Business & Technology Consultancy, associated services, architectural and landscaping design was provided by ARMAT and Algory Zappia & Associates.

4.1 INTRODUCTION

REMONDIS is seeking approval for the construction and operation of the proposed RIRP which would be able to process up to 100,000 tpa of C&I waste and 50,000 tpa of food and green waste. The RIRP would process C&I waste and SSOM kerbside collected in the Metropolitan Sydney area with the objective of maximising resource recovery and minimising landfill disposal.

Approval is being sought for the development including ancillary facilities such as a weighbridge, administration offices, car parking, workshops and associated facilities. The RIRP comprises the following main areas:

- Weighbridge;
- Internal Access Road;
- Administration Office;
- Car Parking;
- Commercial and Industrial Resource Recovery Facility (CIRRF) and
- Source Separated Organic Resource Recovery Facility (SSORRF).

Figure 4.1 shows the layout of the RIRP and Figure 4.2 shows the layout on the site at 1 Grand Avenue Camellia. An area to the west of the site, as shown on Figure 4.2 will not be used for the proposed development but will continue existing activities under the management of Billbergia the land owner. Perspectives 1 and 2 illustrate the appearance of the facility. Figure 4.2 shows the portion of the site zoned Environment Protection. No development for the purposes of operation of the facility is proposed within this area other than any works required to enhance the area and/or to meet the objectives of SREP 28.

It is proposed that the RIRP would operate 24 hours per day, seven days per week to allow maximum flexibility for receival of waste. There would be three shifts per day with 40 staff working on the morning shift (6am to 2pm), 20 staff working on the 2nd shift (2pm to 10pm) and 5 staff working on the night shift (10pm to 6am). The waste streams will be sourced from within the Greater Sydney Metropolitan Area and delivered by collection contractors.

Billbergia as part of the site construction works will undertake all works associated with provision of services including connection to stormwater. A Site Work Plan including a Safe Work Method Statement has been prepared by Billbergia for these works in accordance with the SMP which includes OEH requirements (refer Appendix D).

REMONDIS will be responsible for the construction of the facility including a platform on which the facility will be located. The purpose of the platform is to restrict disturbance of the existing site cap. This approach was developed based on discussions with government agencies with respect to the need to minimise disturbance to the existing site capping.

REMONDIS has commissioned *AP* Business & Technology Consultancy and ARMAT with the design of the plant layouts and treatment processes and Algory Zappia & Associates to undertake the design of associated services, the architectural and landscaping design. Design information used to prepare the description of the project provided in this section has been provided from this design work.

4.2 RIRP DESCRIPTION

The proposed RIRP will receive both C&I and food/green waste. All vehicles will enter the site through the existing gates on Grand Avenue North before proceeding along the site access road to the weighbridge. A gatehouse is located at the weighbridge which will be staffed at all times. Having passed through the weighbridge vehicles will then proceed in a clockwise direction along the site ring road. The site administration office and car parking are located adjacent to the site entrance. Additional car parking is provided adjacent to the Environment Protection Zone on the northern boundary of the site. Trucks will proceed to either the CIRRF or the SSORRF depending on the load being delivered or collected. The CIRRF is located on the eastern side of the site while the SSORRF is located on the western side of the site closer to the site entrance and adjacent to the site offices.

The main building complex includes the waste delivery and pre-treatment facilities for the CIRRF and SSORRF plants, all equipment, compost tunnels and associated hallway and product storage and handling areas. The building complex is fully enclosed and equipped with an integrated air and water management system. A Process Water Tank (closed) is provided for each facility as part of the leachate management system and a biofilter is provided for each facility as part of the air management system. Rain water tanks are located adjacent to the north eastern side of the SSORRF.

The facilities have been designed so that entry to the buildings for waste delivery is on the southern side of the site. The composting tunnels and bioflilters are located on the northern side of the site. Vehicle entry to both plants is via rapid shutting roller doors. All trucks will reverse into the facility allowing departure in a forward direction.

The site boundaries on the southern, eastern and western sides will be enclosed by a fence. The northern boundary of the site along the Parramatta River is bounded by a concrete wall and chain mesh fence.

4.3 FACILITY CONSTRUCTION

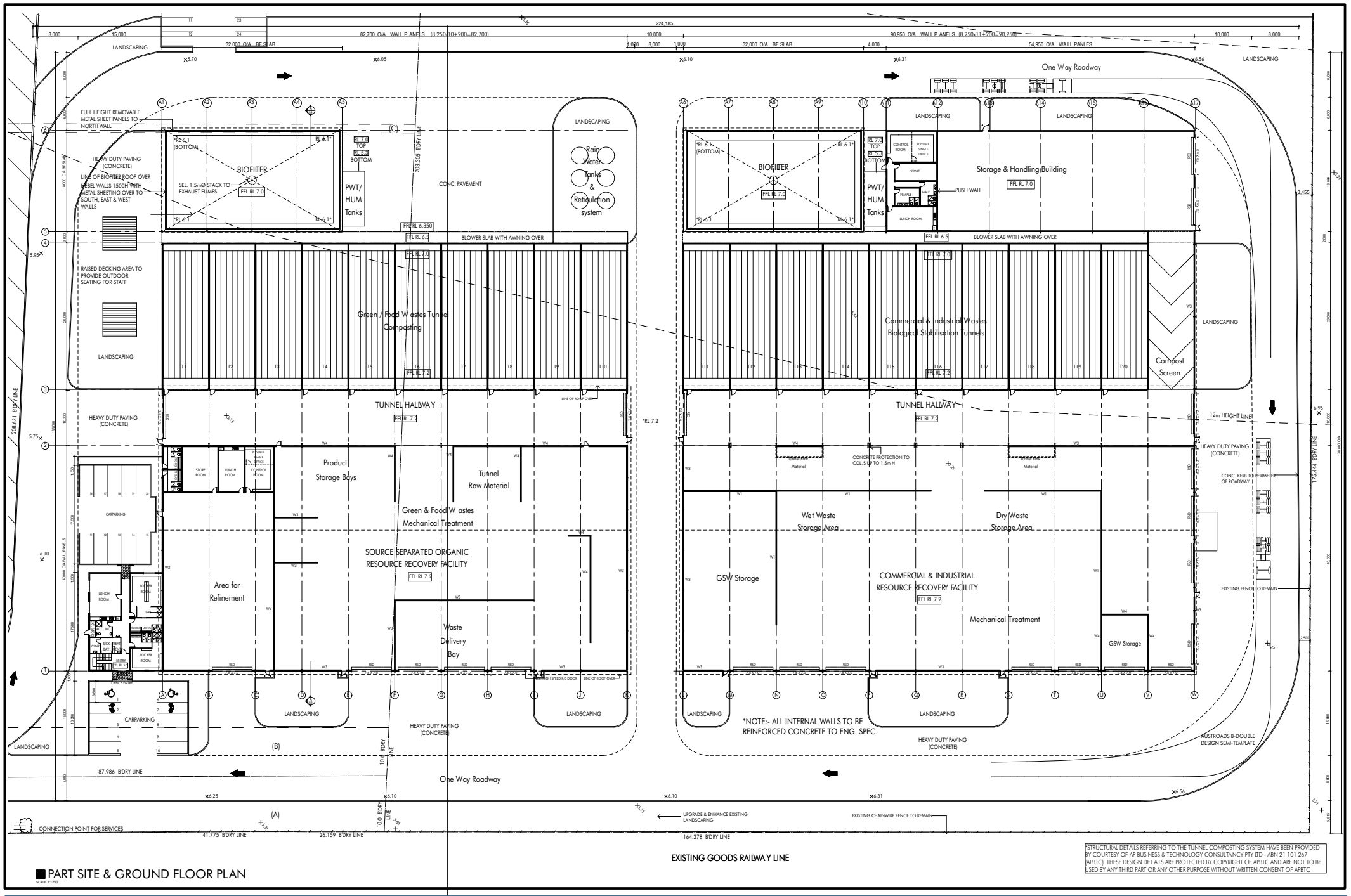
Construction of the facility will involve:

- Provision of site services including stormwater;
- Construction of a platform on which the facility will be located; and
- Construction of the facility.

Construction hours will be restricted to 7am to 6pm Monday to Friday, 8am to 1pm Saturdays with no construction work on Sundays or public holidays.

4.3.1 Site Services

The proposed works involve excavation of service trenches for installation of site services. The excavation works will generally be 1m to 3.7m below existing ground levels (refer Appendix D). Geotechnical investigations carried out over the past 10 to 15 years indicate that parts of the site



■ PART SITE & GROUND FLOOR PLAN

SCALE 1:1250

FIGURE 4.1 RIRP LAYOUT

SOURCE : ALGORY ZAPPIA & ASSOCIATES 2010

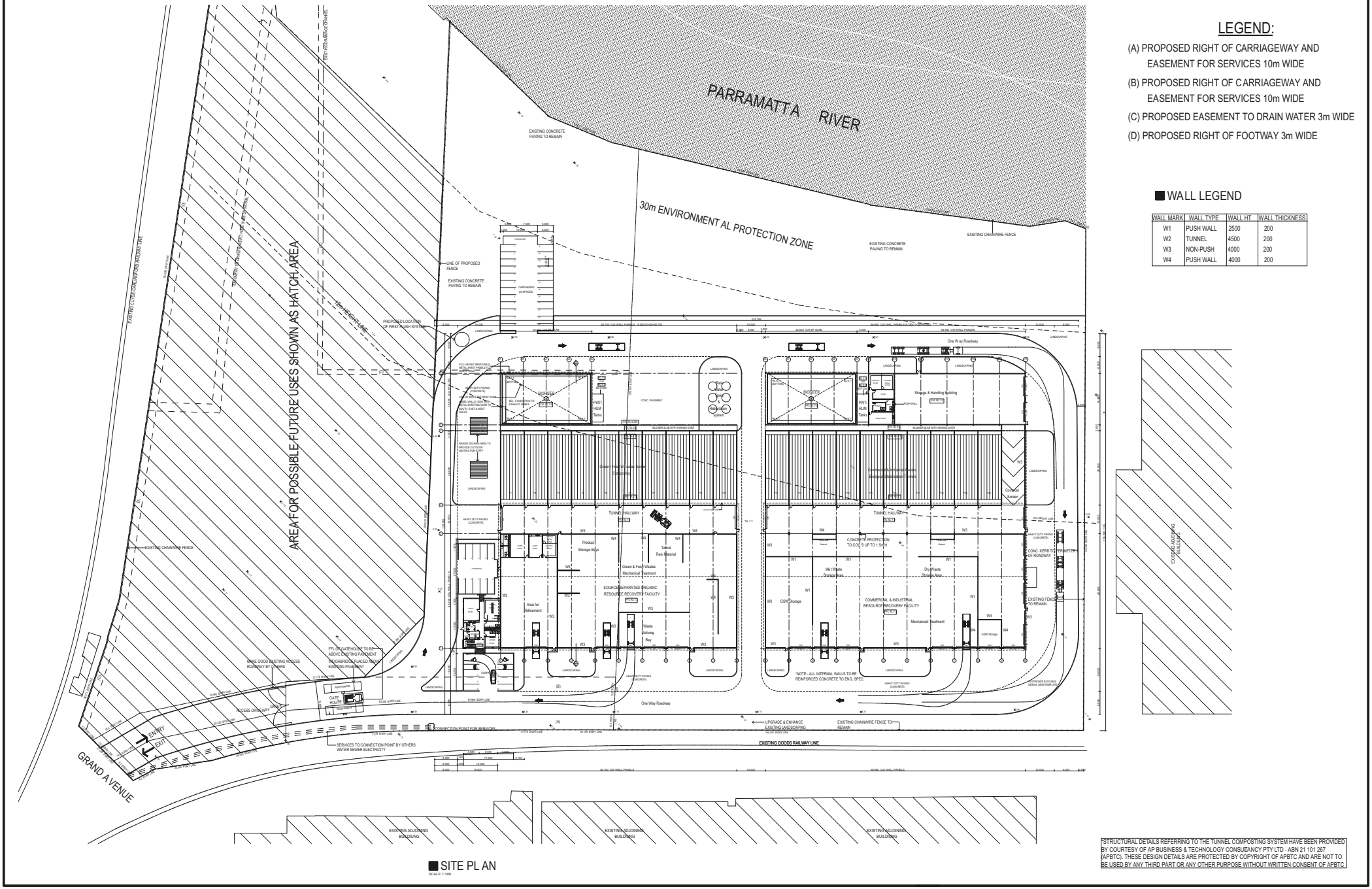


Figure 4.2 **RIRP Layout on Site**

Source : ALGORY ZAPPIA & ASSOCIATES 2010

PERSPECTIVE 1 –VIEW OF THE SITE FROM THE SITE ENTRY

PERSPECTIVE 2 –VIEW FROM NORTH ADJACENT TO THE PARRAMATTA RIVER

have been filled with asbestos waste. The investigations show that the buried asbestos is generally limited to the western portion of the site nearest to the railway line. The site has been capped with a layer of impermeable material and is under the protection of a legally binding SMP. The SMP generally prohibits excavation below the capping layer without the written approval of OEH.

The service trenches will be excavated to extend the services from the boundary at Grand Avenue North to the perimeter of the proposed buildings/lease area. The works include trenches for stormwater, sewer, electricity and potable water. The excavation and laying works will be carried out by Billbergia as part of its commitment to providing services to the REMONDIS lease area. Excavation of any contaminated soil will be carried out as recommended by the SMP. A Safe Work Method Statement has been prepared for the works (refer Appendix D). The work will be supervised by a licensed asbestos removal carrier. In addition an occupational hygienist will be engaged to prepare an air monitoring program for the proposed works.

The work area will be limited to the line of trenching for the stormwater pipes and the incoming services (refer Figure 4.3). The SWP has been reviewed by OEH who have advised that all excavated material during trenching must be classified using the OEH Waste Classification Guidelines before being transported off-site for disposal. This requirement is included in the Statement of Commitments (refer Section 8). Pipe embedment material comprising clean sand and gravel will be imported to site and compacted around the pipes and services. The cap is to be restored using selected road base product, compacted and rolled into place.

The construction period will be 6 to 8 weeks with approximately 80 truck loads of contaminated soil to be removed from site over a 20 day period. Once the excavated material is removed there will only be deliveries to site. Four to five staff will be on site at anyone time to carry out the excavation and pipe laying works.

4.3.2 Construction of Platform

A geotechnical review of the site has been undertaken by CES (refer Appendix E). The review identified the potential for differential settlement within the fill material below the existing site cap with the possibility that voids may have formed as a result of this settlement. The potential for the cap to subside into the voids once the platform is constructed was also identified.

As a result of the findings of the geotechnical review a geophysical survey of the site has been undertaken using Ground Penetrating Radar to identify and locate any existing voids and areas within the site that are susceptible to ground subsidence (refer Appendix E). Due to the presence of storage containers and other material associated with the current use of the site it was not possible to survey the entire area. The results of the survey have identified areas with potential voids (refer Section 7.1 and Appendix E). The Ground Penetrating Radar survey will be completed prior to commencement of construction activities to allow treatment of the area within the development footprint prior to construction of the platform.

It is proposed to treat identified voids using a localised grouting technique which would be undertaken by a specialist grouting contractor. Grouting would involve drilling a small diameter hole(s) (typically <50mm) into the void and injecting liquid grout. The grout would be pumped into the void until the void is filled and the grout allowed to harden. Grouts used for such an application are typically cement based or polysynthetic grouts. Targeted grouting would allow contaminated fill to remain insitu and minimise disturbance to the site capping. A Site Work Plan and Safe Work Method Statement would be developed in accordance with the requirements of the SMP. The Safe Work Method Statement would address health and safety issues, environmental management and construction quality.

A Subsidence Monitoring Program would also be implemented to regularly monitor movements of the earth platform and structures constructed at the site. A Generic Subsidence Management plan is included in the Geotechnical Review included in Appendix E.

Design Criteria

The objective of the platform design is to avoid the penetration of the site capping for the construction of the main buildings and structures associated with the proposed RIRP.

Figure 4.4 shows the elevation of the site and proposed structures. The existing site capping is at approximately RL 5.3. This will form the base for the lowest structure of the development being the humidifier pits associated with the biofilters. The final floor levels will be:

- Biofilter basement (RL 6.1);
- The rear of the tunnels (RL 7.0); and
- The main building floor level (RL 7.2).

The main building concrete apron would fall off in order to connect between the main building and the access road (RL 6.3). The fall will accommodate controlled stormwater drainage and collection and desired minimal falls for operation requirements (heavy vehicular traffic).

Appendix E comprises a preliminary design for the platform. The design has taken into account the results of the geophysical survey and includes use of a geogrid to assist with the spreading of loads reducing the risk of differential settlement. Shallow pad or strip footings could potentially be founded in the engineered fill of the platform. An evaluation of a shallow footing concept has been undertaken by Engineering and Management Services (refer Appendix E). The evaluation concluded that the shallow footing concept is a valid substructure option.

The geotechnical review concluded that with the treatment of the voids and construction of the platform in accordance with the recommendations included in the report that an allowable bearing pressure of 125 KPa should be adopted for footing design. The evaluation undertaken by Engineering and Management Services concluded that in the highly loaded areas of the facility the Design Bearing Pressure will be lower than the recommended maximum allowable pressure of 125 KPa. In other areas where the building loads are reduced the design bearing pressures will be much lower than 125 KPa. Further platform design criteria will be specified during the design stage and address aspects such as the compaction rate, the spreading, rolling and compaction in layers, the embedding of stormwater and other service lines (power, telecommunication, process water pipelines). The geotechnical review of the site and the GPR survey results (refer Appendix E) will provide the basis for the design specification for construction of the platform.

Type and Volume of Material

To construct the platform over the total area of the development (approx. 3.2 ha) between 45,000 and 50,000 m^3 of fill material will be required respectively comprising 90,000 to 100,000 tonnes. Final compaction will be 98% standard density at optimum moisture content. The fill will be compacted in layers not exceeding 250mm. Imported clean fill material will only be accepted on receipt of a Certificate of Clearance confirming the material is clear of any contamination. Clean fill will be sourced from local sites.

Concrete Barrier

The platform will be sealed with heavy-duty concrete pavement on the compacted sub-base. This applies for all structures such as the main buildings, tunnels, biofilters, aprons and other slabs. It will be constructed to industry standards (ie strength 32-40 MPa, nominal 170-200mm slab thickness). This will accommodate the operational requirements of the facility in association with the geotechnical site conditions. Roads (perimeter road etc.) and car parks will be built using road base material complying with RTA standards. The pavement will be 20mm asphalt pavement on a minimum 100mm unbound well graded aggregate base course (max size 40mm).

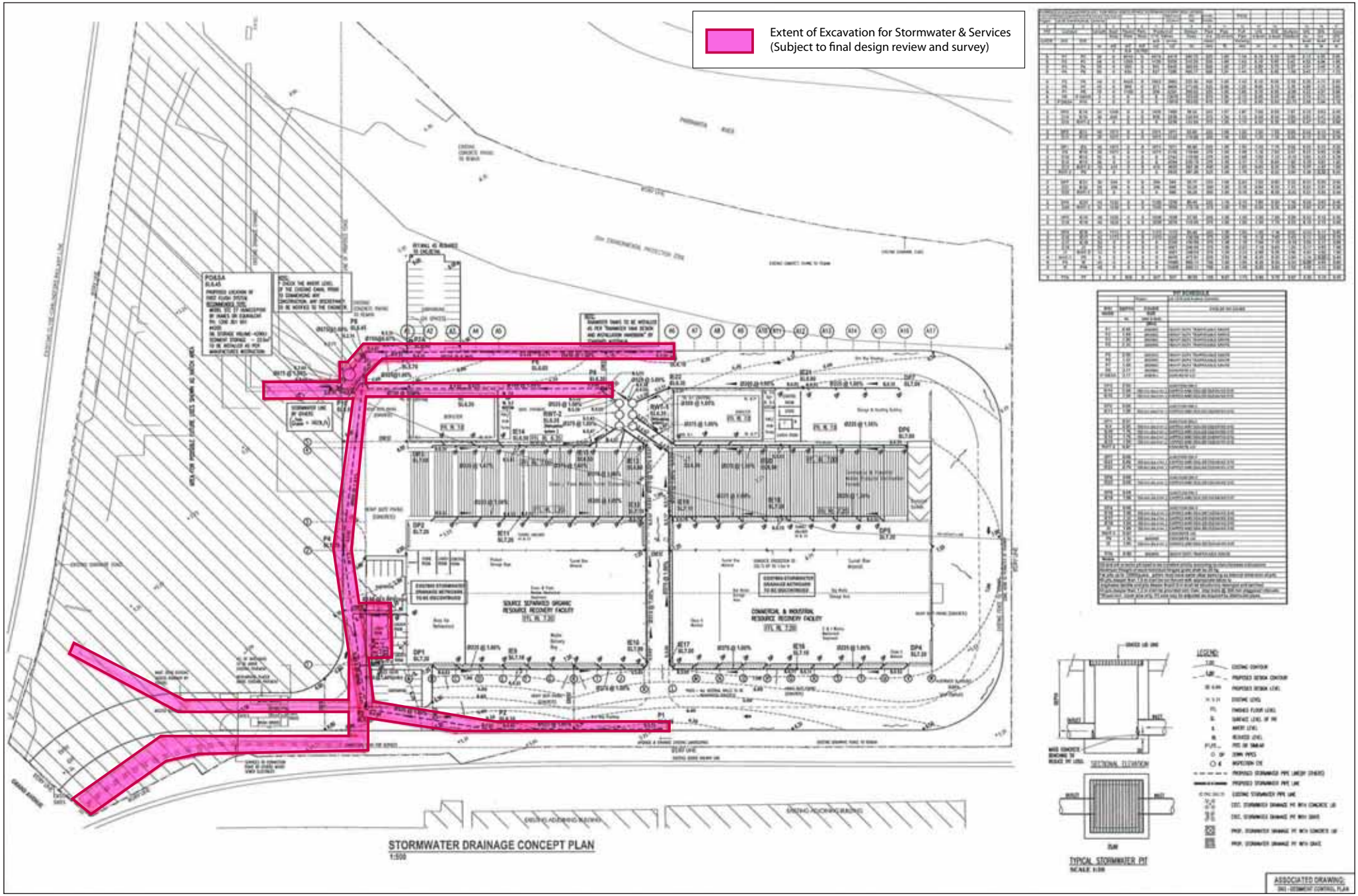


Figure 4.3 **Extent of Excavation Works – Construction**

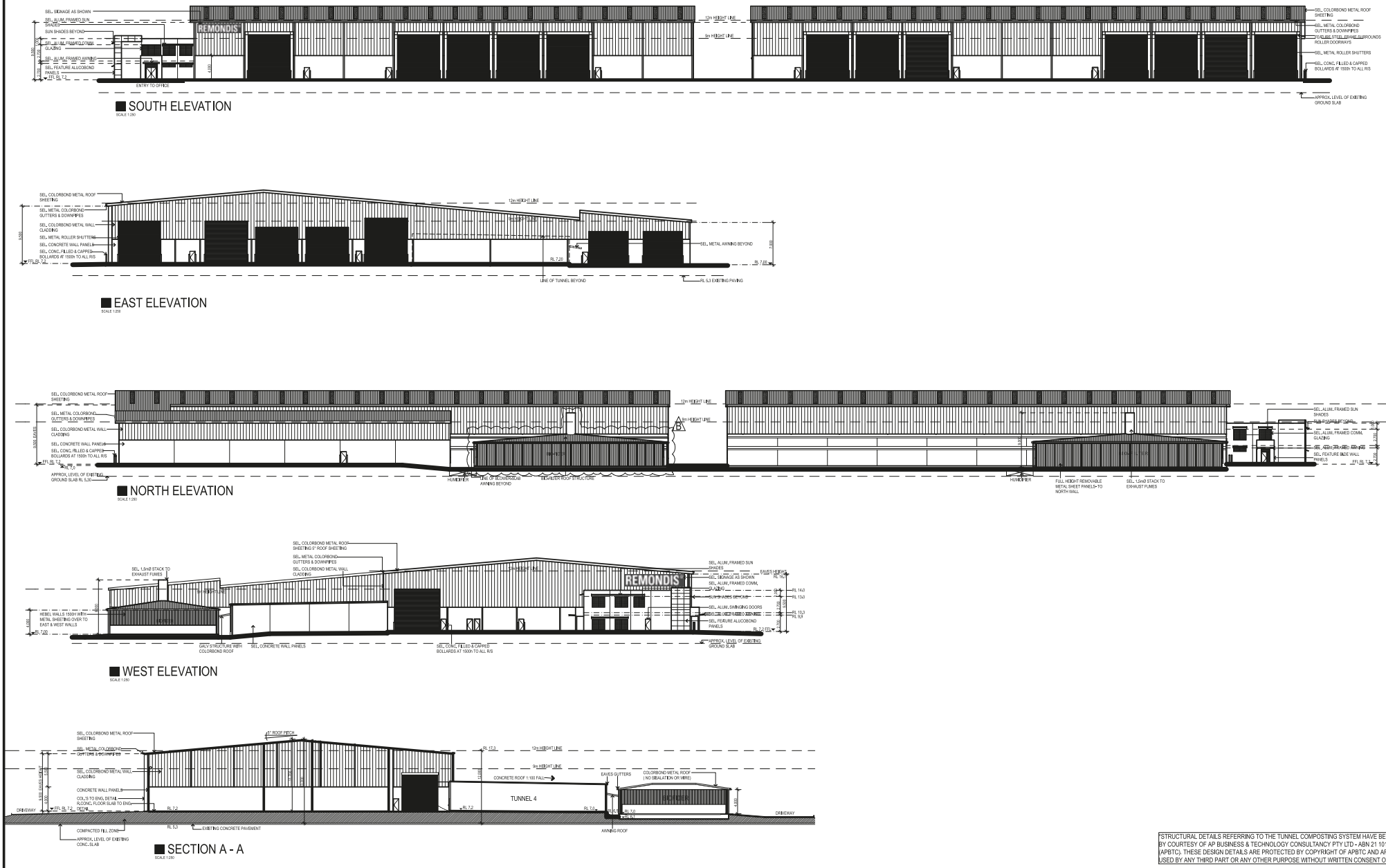


Figure 4.4 **Elevations**

Source : ALGORY ZAPPIA & ASSOCIATES 2010

4.3.3 Construction of Plant

The plant will be constructed over a 12 month period. REMONDIS will commence construction of the plants once construction of the platform and installation of site services has been completed.

Main Buildings

The main building complex will include the entire waste delivery and pre-treatment facilities for the CIRRF and SSORRF plants. An office and administration centre is located on the western side of the site adjacent to the SSORRF plant. Buildings will be of steel portal-framed construction, fully enclosed and completed with colorbond roof sheeting. All exposed steelwork will be hot dipped galvanized to accommodate the corrosive environment associated with the process activities undertaken within the building. Precast concrete wall panels will form the perimeter cladding of the main building.

All deliveries will be on the southern side of both plants where trucks will enter through rapid shutting roller doors unload and depart the site. Composting tunnels are located on the northern side of both plants with a biofilter located at the rear of the tunnels for each facility.

Tunnels

The CIRRF and SSORRF each comprise 10 composting tunnels. The composting tunnels are reinforced and tight sealed concrete structures of a special concrete mix to resist the high temperature range, corrosive atmosphere and aggressive leachate. Each tunnel will be approximately 5 m high, 8m wide and 26m long. The tunnel floor will be an aeration slab poured onto a working slab, both of which are made from reinforced concrete. Custom design trenches will be cast into the slab in arrays over the length of the tunnel and connected to the ductwork via pipes poured into the slab. The tunnel roof will integrate air ventilation and sprinkler systems. Penetrations in the tunnel roof and back wall will provide for ductwork connection of the aeration system and sprinkler system pipe works. The tunnel doors will be of cool room design with insulation, rubber seal and access door, manual opening and closing mechanism with limit switch control. Concrete foundations and an awning will be provided along the northern side of the tunnels for the installation of fans and the protection of all aeration instrumentation and equipment.

Biofilters

Each facility will include a biofilter, one for the CIRRF and one for the SSORRF. The deodorisation stage comprises a biofilter fan, humidifier and biofilter. The biofilters will be of concrete structure for the filter basement with either a perforated concrete or hardwood grate on support frame over the basement over the biofilter area. The concrete basement will fall towards the connected humidifier chamber via an air distribution inlet channel. The humidifier and connection will be of reinforced concrete with manhole access. The filter bed structure will provide sufficient loading to enable bobcat operation (filter material replacement) and withstand the weight of the filter material layer. The perimeter wall around the biofilter will be structural to retain the filter material and be provided with an opening section to allow bobcat access.

A pitched colour bond roof without insulation will be provided over the biofilter area. The structural support will provide for the installation of the filter sprinkler system. The roof will be fitted with a 1.5 m diameter vertical discharge stack to a height of 9 m. The stacks will be fitted with an exhaust fan to provide initial momentum (refer Figure 4.5).

The biofilters for the proposed RIRP have been significantly improved on the original biofilter design used in the company's Port Macquarie facility which was designed 10 years ago. The Port Macquarie operation processes 6,500 tonnes of Biosolids from waste water treatment plants, 500 tonnes of food waste and 19,000 tonnes of green waste. The SSORRF will process 30,000 tonnes of green waste and up to 20,000 of food waste

Improvements include:

- Humidifier pump and water curtain to ensure fully saturated air and a more consistent exhaust air temperature into the biofilter;
- Biofilter back pressure monitoring, biofilter air temperature monitoring and control; and
- Air inlet relative humidity monitoring and control.

The designer of the biofilter has a manufacturer's guarantee of 125 OU/m^3. Evidence of compliance under 125 OU/m^3 has been provided by the manufacturer for a recent ten tunnel green waste composting operation (refer Technical Report No 4).

Access Road

The access road will provide trucks with direct access to the proposed RIRP from the site entrance. The access road feeds into a ring road around the internal boundary of the site. Trucks arriving on site will follow a clockwise direction on this ring road. Upon getting a ticket from the weighbridge, the truck will proceed to the designated area in the main building complex.

Weighbridge and Car Park

The development will include a weighbridge on the access road to enable the recording of container and truck volumes and numbers. An administration and staff amenities building will be located at the west side of the Main Building. There will be three car parking areas on the site. The car parking areas will be sealed with a two coat bitumen seal with a total of 44 car parking spaces inclusive of 2 disabled car parks. Provision has been made for bicycle parking.

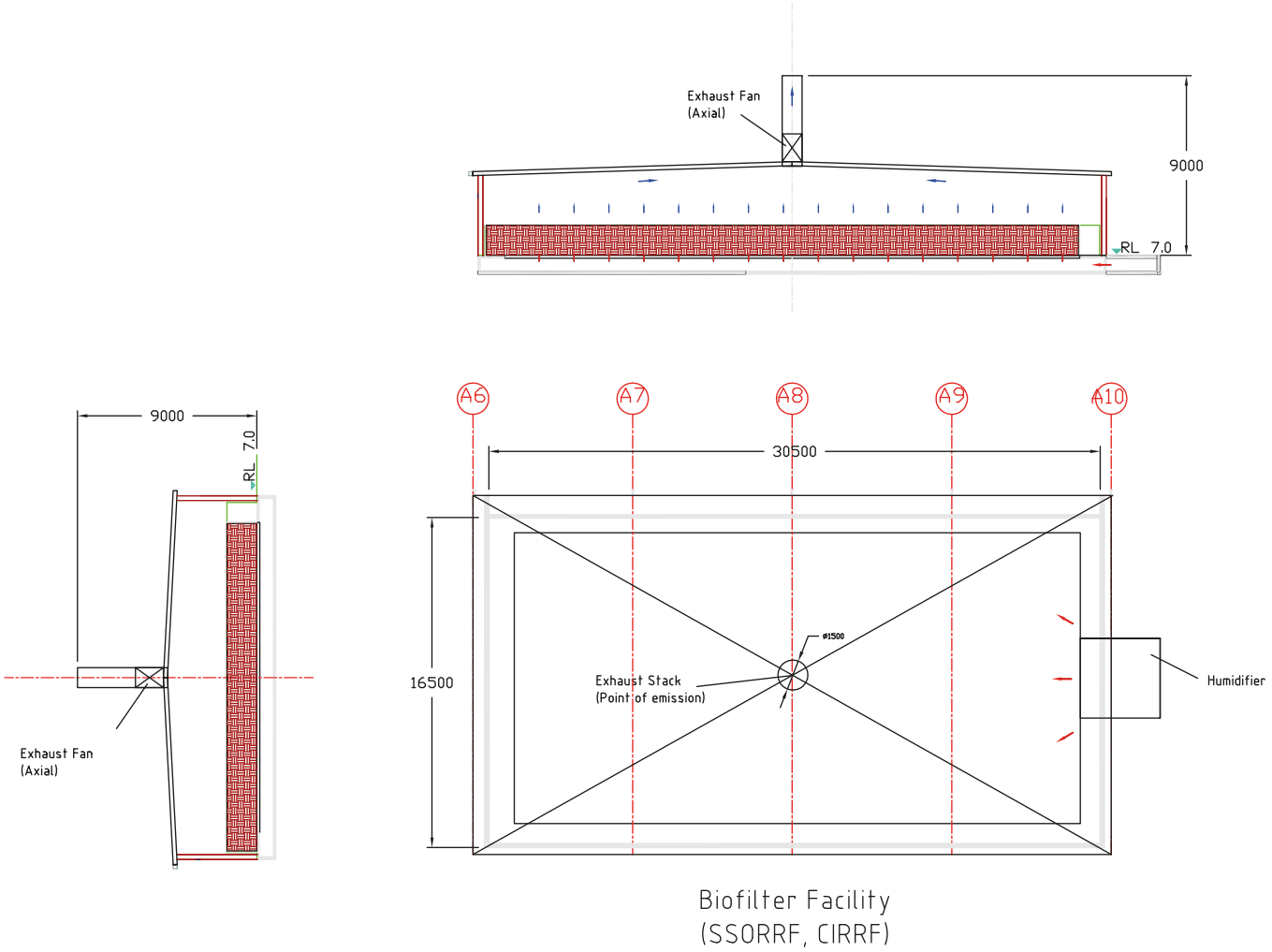
4.4 COMMERCIAL & INDUSTRIAL RESOURCE RECOVERY FACILITY (CIRRF)

4.4.1 Components

The CIRRF would be located on the eastern portion of the site. The facility will comprise:

- Waste delivery and receival area;
- Storage areas for wet and dry waste;
- Dry waste feeding and screening line;
- Recycling material recovery station;
- Baler Facility;
- Mixed waste feeding and screening line;
- Composting tunnels;
- Screening line for compost material;
- Storage and Handling Area; and
- Biofilter.

Figure 4.1 shows the key areas within the facility and Figure 4.6 shows the process.



Biofilter Facility
(SSORRF, CIRRF)

Enclosed Biofilter Data:
Filter Area:: 500 m2
Design Volume: 50,000 m3/hr
Stack: 1.5m dia
Exhaust Air Velocity: 9 m/s (max.)
Exhaust Air Temp: 35 C (+-5)
Emission Point: RL 16 (AD)

Figure 4.5 **Biofilter Design**

Source : AP Business & Technology Consultancy 2010

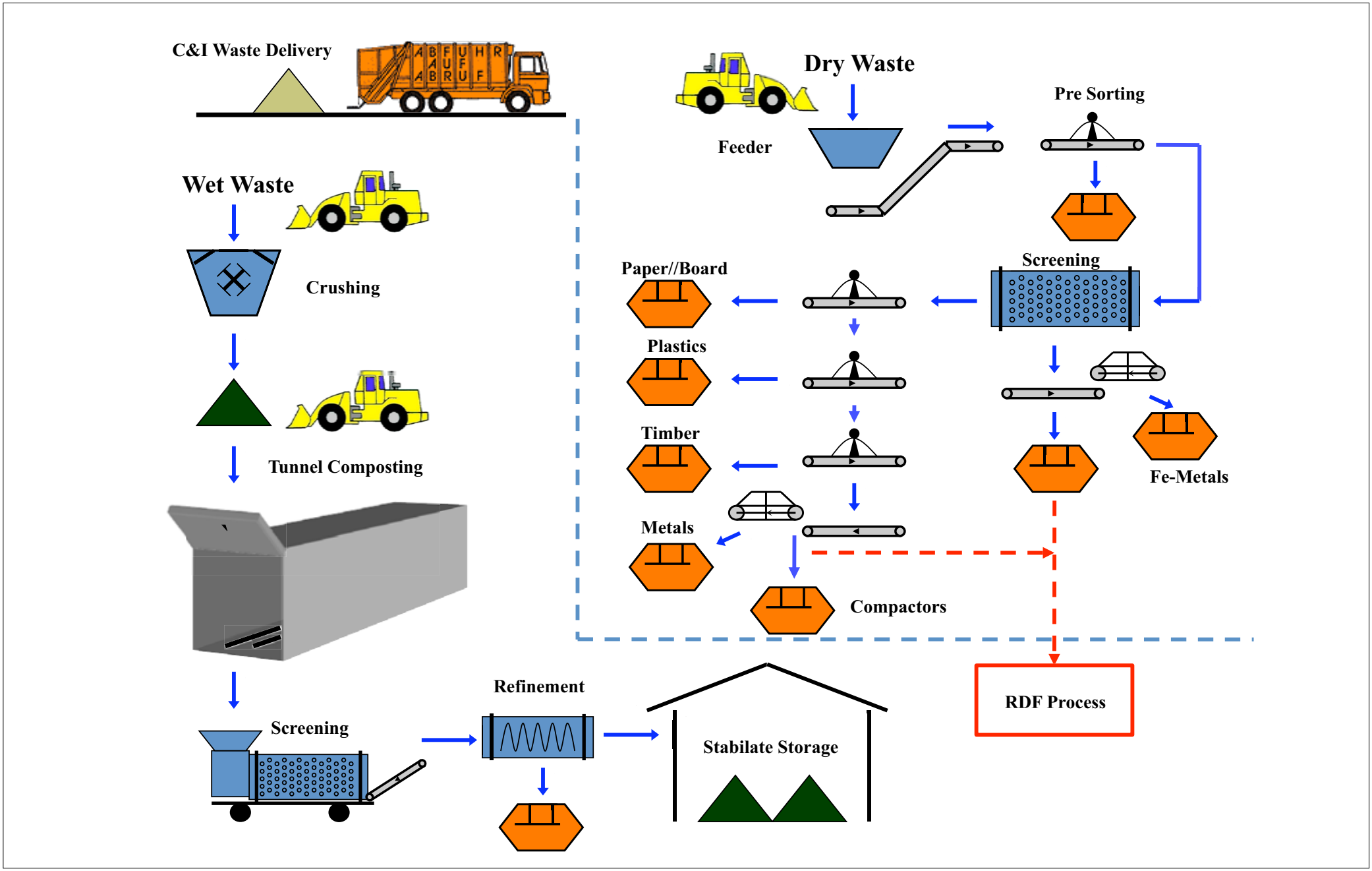


Figure 4.6 C&I Process

Source : APBTC

4.4.2 Design Capacity

The CIRRF facility would be open for waste receivals 24 hours per day, 7 days per week, year round. REMONDIS's waste collection operation operates based on 3 shifts, 7 days per week. The CIRRF operating hours would allow the waste trucks to dispose the loaded waste after each trip. A key requirement is that all waste received is processed immediately on the day of receival with no unprocessed stockpiles of waste over night under normal operation. This forms a key part of the management of the process in particular odour management.

The facility would operate on a 2-shift operation per day with each shift being 8 hours. Operating hours per shift and number of shifts per day would accommodate the quantities of waste delivered at the facility and may change accordingly over the life of the project.

The maximum processing capacity of C&I waste is 100,000 tpa. It is estimated that approximately 70,000 tpa will be mixed loads and the remaining 30,000 tpa being dry waste loads with a high content of recycling materials. Dry and mixed/wet waste streams will be kept separate.

On a daily basis, there would be collection trucks carrying about 82 tonnes/day of dry waste and 192 tonnes/day of mixed and wet waste collected from small businesses. This translates into a nominal hourly average of 5 and 12 tonnes per hour. To allow for peak delivery times, equipment availability and other down times of the plant, the equipment throughput capacity will be approximately 200% of the nominal hourly average. An average bulk density of 0.20 t/m^3 has been estimated for dry waste unloaded. An average bulk density of 0.4 t/m^3 has been estimated for wet waste unloaded.

4.4.3 Waste Sources and Composition

The composition of C&I waste varies significantly depending on the collection area, type of business or industry and service. The source material for the CIRRF would be collected from small business outlets throughout the CBD of Sydney and the Parramatta area.

DECCW (now OEH) carried out a field survey in 2008 to get a clearer and more accurate understanding of what is in the C&I waste stream. This survey (C&I Waste Stream Survey 2008) included visual assessment of C&I mixed and single material loads delivered to six landfills and six transfer stations and weight based sorting of garbage bags from eight selected industry sectors. Table 4.1 provides the input composition estimates derived from that survey.

Table 4.1
Mixed C&I Waste Composition Estimate

Composition	%
Food/Vegetation	20
Paper/Cardboard	17
Wood	17
Plastic	17
Textile	5
Metals	2
Construction/Demolition	10
Other	12
Total	100

Source: DECCW 2008

Further to above material, REMONDIS also expects co-mingled recyclables loads to be delivered to the plant, mainly comprising paper, cardboard and plastics.

4.4.4 Performance Objectives

The objectives for the CIRRF plant are to:

- Initially segregate loads with high recycling content (dry stream) from loads with high putrescible content (wet stream) by means of mobile machinery;
- Produce a raw material from the wet stream which is suitable for biological stabilisation in a static tunnel process;
- Removal of inert items from the wet stream at the first separation stage;
- Biologically stabilise the material;
- Recover in the most efficient way marketable recycling materials (namely paper, cardboard, plastics, metals and timber) to comply with secondary processors specifications; and
- Remove bulk nuisance for disposal and present the recyclables in a baled form for efficient transport to their designated secondary processor.

4.4.5 Process Description

Figures 4.6 and 4.7 show the layout and location of equipment within the C&I Plant.

Waste Delivery and Storage

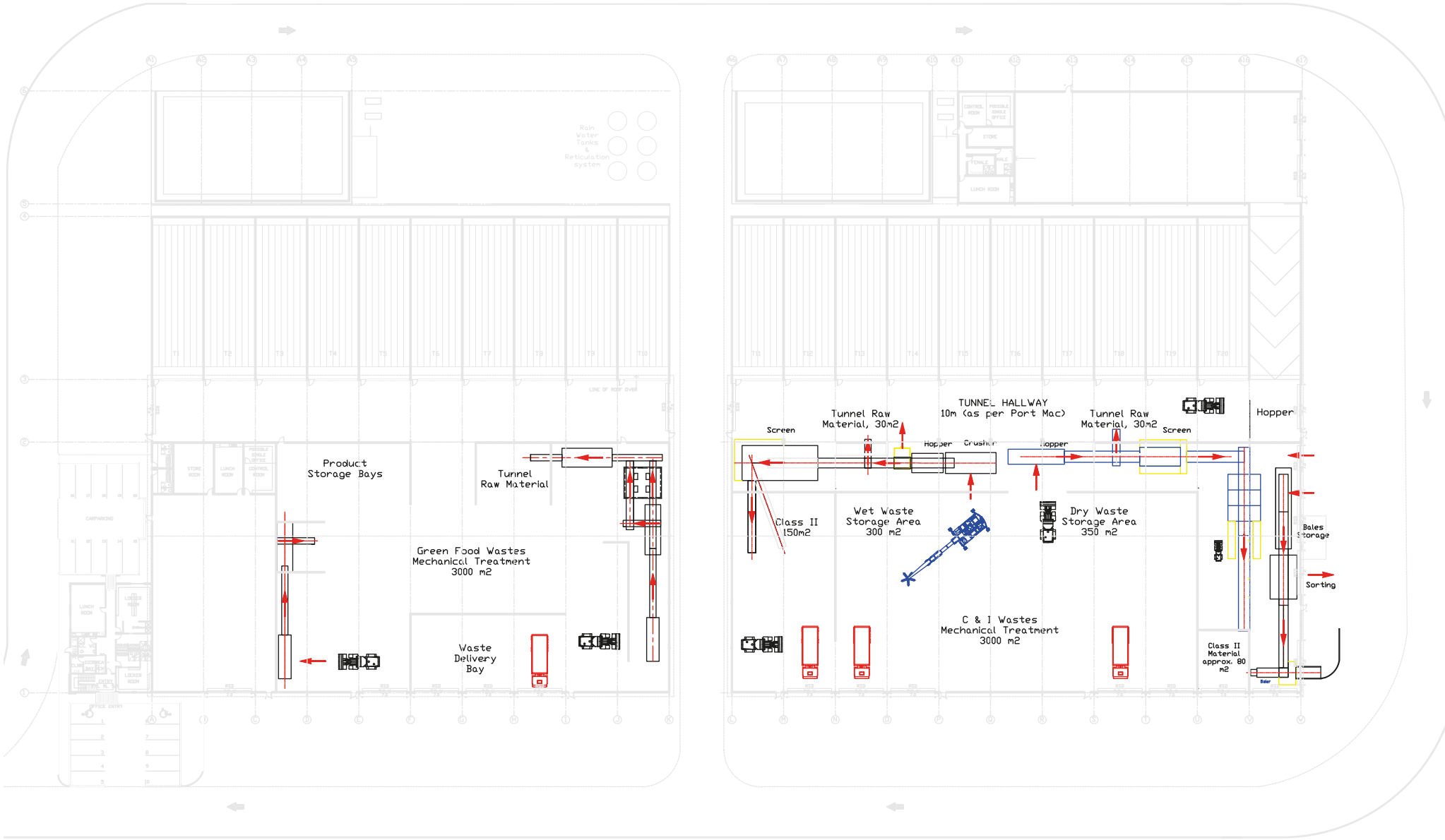
The delivery areas for the predominately 'dry' and 'wet' deliveries are within the same building however spatially separated. The trucks will enter the site via the weighbridge following road signs and signs in the front of the building, which will lead the trucks to the designated building and unloading areas for dry and mixed waste deliveries. The trucks will reverse back into the building through fast speed roller doors entries. When the trucks are within the building, the rollers will shut during the process of unloading. On completion the doors will open. The doors will remain closed at all remaining times outside deliveries to prevent any odour releases from inside the building. The layout for the two delivery areas (dry, wet) provides for rear/front-loader as well as HL-bin trucks delivery. Each area can accommodate 2 trucks at any one time during the operation.

Mixed Loads

Once a truck has unloaded in this area, a wheeled loading machine and staff will visually screen the material for gross contaminants and hazardous material. Clean and dry materials will be separated before the putrescible fraction is fed to the hopper of the crusher or stockpiling the material in the designated storage area. An important part of the process is to identify and remove non compliant materials that do not meet the standards for organic outputs derived from Mixed Waste Exemption 2010. REMONDIS will undertake this step and produce suitable compost like material for limited land applications such as mine site rehabilitation where it can meet specific requirements. Otherwise it proposes to biologically stabilise the material for General Solid Waste (GSW) disposal.

Dry Loads

Dry loads will be handled with a Front End Loader, which will segregate and screen the waste prior to either feeding the hopper of the sorting line or pushing the screened material into the dry waste storage area.



NOTES:

CONCRETE WALL SCHEDULE (REFER TYPICAL DETAIL)

WALL MARK	WALL TYPE	WALL HEIGHT (h)	MIN. THICKNESS (t)
W1	PUSH WALL	2500	200
W2	TUNNEL (PUSH) WALL	4500	200
W3	NON PUSH WALL	4000	200
W4	Push Wall	4000	200
W5	Mobile Wall Element	2000	TBA

Figure 4.7 **Equipment Layout**

Source : AP Business & Technology Consultancy 2010

Mono Loads

A separate delivery area will be used for receipt of mono loads in the form of a pit conveyor, which feeds a baling machine at the eastern side of the building. After the loads have been formally accepted, the truck will leave the building following the ring road before weighing out at the weighbridge.

Storage Requirement

A storage requirement for all output from the mechanical process of approximately 2 days for dry and mixed wastes has been predicted based on a 3m storage height. The corresponding storage area within the building is 600-700 m^2 for dry / mixed waste deliveries. Additional space has been allocated for waste segregation, grab maneuvering area and the placement of bins for the collection of segregated nuisance, unacceptable wastes and the raw materials for the biological process. Mobile push walls will be utilised to adjust storage requirements for each stream based on demand, which may vary from time to time. This concept provides a degree of flexibility to the operation over the life of the project.

Dry Waste Feeding and Screening Line

Important for the performance of the system is an even feed into the process. To uncouple batch loading and screen feeding, the material will be placed into a large hopper with a slow speed bottom conveyor to transport the material stream towards the screening device. The feeding hopper will discharge onto an inclined conveyor which then feeds the screen. The screen and mesh size will be selected based on the highest efficiency in removing any remaining putrescible waste from the dry screen.

A reverse directed conveyor will connect to an inclined conveyor which drops this material into a holding bay for tunnel loading. The screen overflow will be transported along a conveyor line into the resource recovery process.

Recycling Material Recovery Station

The level of automation to recover recycling material during the life of the plant will be driven by recycling material quantities and quality in the input material. The process module has been designed to provide the flexibility for future modification and the integration of automation systems.

The basic resource recovery configuration includes:

- Sorting mezzanine with a sorting belt conveyor and three sorting spots on either side of the conveyor, each with drop chutes into separate HL-bins/bays underneath;
- Optional: One over belt magnet for automated recovery of ferrous metals from the overs; and
- Optional: One eddy current separator for automated recovery of non ferrous items from the overs.

Various sorting strategies can be applied including:

- Positive sorting to recover materials with higher order resource recovery opportunity (e.g. for HDPE, PET containers, glass bottles, paper, cardboard); and
- Negative sorting in case the dry stream comprises one particular recycling material such as mixed paper, OCC or Cardboard to remove contamination.

The facility can be upgraded with the integration of automation systems such as:

- Glass recovery via colour spectrum separation;
- Paper / cardboard recovery via Near Infra Red (NIR) separation; and
- Individual / Mixed plastic separation via NIR or others.

Various systems are available either for individual sorting strategy or multifunctional units with up to three different product streams. The remaining material stream is discharged in a separate disposal storage bay within the building.

Baler Facility

A bob-cat or similar machine will push the various recovered recyclables into the pit conveyor of the baling facility. The facility is suitable for the baling of various materials. Direct access to the baler for mono loads delivered by REMONDIS or other contractors will be provided through an access door.

There will be a sorting line for all the different types of recyclables. The sorting platform will allow the sorters to conduct negative sorting. The purpose of the negative sorting will further reduce the contamination level of the recyclable product line before sending the material for final baling. Plastic will be sorted further in the sorting line.

The baling press will be able to compress the recyclable materials into sorted, easily transportable bales. All the fully sorted recyclable materials such as paper / cardboard, plastics, ferrous and non ferrous recyclables will be baled into a cubical bale before transported from the facility. The dimensions and weight of the baled products will provide optimal space for transportation. The bales produced will be tied up with iron wire with regular weight of 300 kg to 600 kg/m^3 per bale. Baled materials will be stored under cover in the baling storage area, which is attached to the main building.

Mixed Waste Feeding and Screening Line

Similar to the dry line, the mixed waste feeding line includes a large feed hopper, which provides an even material flow into the crusher. The crusher will be slow speed shredder type equipment, which opens the bags and spreads the material evenly onto the crusher bottom discharge conveyor. From there the material stream will be conveyed past a magnet to recover ferrous metals into a screen for separation similar to the dry line. The screen function is to remove non-compostable items such as plastic bags from the putrescible stream and reduce the capacity requirements for the biological treatment stage.

A sequence of conveyors will transport the tunnel raw material from the screen into the storage bay which is located in the tunnel hallway. The composting process is discussed further in Section 4.6. A storage and truck loading area for the screen overflow is separated from the input storage area with a separate entrance roller door.

Material Flow / Output Handling

The following principles for the material flow through the front-end process are applied for the design and configuration:

- Front End Loader to feed hopper with automatic dosing;
- Minimise fall heights at the take over points;

- Low conveyor inclinations to avoid roll-back effects;
- High degree of automation for material handling; and
- Allow up-grade and modifications integrations.

All output steams (recycling material, residuals wastes) will be automatically conveyed into either transport bins or containers for off site transport and recycling. The process allows for various storage and transport options (hook lift containers, skip bins, bales).

Storage and Handling of General Solid Waste (Non-Putrescible)

Tunnel composting which is used in both facilities is discussed in Section 4.6. All biologically stabilised waste from the tunnel composting process will be transported within the fully enclosed building complex to the storage and handling building area through the corridor by means of a Front End Loader for interim stockpile and off loading onto trucks for General Solid Waste (GSW) (non-putrescible) Landfill disposal and for source separated organic to licensed composting facilities.

The storage and handling area is a confined space connected using negative pressure. The two roller shutter doors will only open for the hauling trucks to enter and exit the building otherwise they will be closed. The doors will be closed during the loading operations. All non-putrescible waste will be sent to a licensed GSW (non- putrescible) landfill in the Western Sydney region.

4.5 SOURCE SEPARATED ORGANIC RESOURCE RECOVERY FACILITY (SSORRF)

4.5.1 Components

The SSORRF comprises the following:

- Waste delivery and Storage area;
- Composting Tunnels;
- Biofilter; and
- Product Storage Bays.

4.5.2 Design Capacity

Waste Delivery and Mechanical Treatment:

The SSORRF facility will accept waste delivery 24 hours per day and 7 days per week all year.

A key requirement is that all waste received is processed immediately with no unprocessed stockpiles of waste. Operating hours per shift and number of shifts per day will accommodate the quantities of waste delivered at the facility and may change accordingly over the life of the project.

The nominal processing capacity of SSORRF is 50,000 tonnes per annum.

The nominal annual average delivered quantities per day are 192 tonnes. This translates into nominal hourly average of 24 tonnes per hour in 1 shift. To allow for peak delivery times, equipment availability and other down times of the plant, the provided equipment throughput capacity will be approx 200% of the nominal hourly average. An average bulk density of close to 0.50 t/m^3 has been estimated for the annual average organic waste delivered to this plant.

The source of waste for the SSORRF will derive from source separated domestic kerbside collection schemes of groups of Councils within the metropolitan area.

4.5.3 Source Separated Organic Material Composition

The following input characteristic has been assumed:

- Green waste 30,000 tpa; and
- Food waste 20,000 tpa.

4.5.4 Performance Objectives

The objectives for the SSORRF plant are to:

- Remove contamination at the highest possible degree of efficiency for safe disposal to landfill;
- Produce a raw material which is suitable for static tunnel composting (homogeneity);
- To produce a product which is odour stable for outdoor processing elsewhere; and
- To produce product(s) with the highest possible beneficial uses.

4.5.5 Process Description

Figure 4.8 presents a schematic diagram of the process and Figure 4.7 shows the equipment layout.

Delivery and Storage

The material will be delivered via kerbside collection trucks only. Trucks will reverse into the designated delivery area of the main building through four 5m wide-open roller gate doors. The roller gates will close while the truck is in the building. Signs will direct the truck driver to the dedicated unloading area. Up to four trucks can deliver at the same time, which will keep turnaround times to a minimum.

Each load will be tipped onto a heavy duty concrete floor and visually screened for nuisance material before the Front End Loader pushes the screened waste either into the dedicated storage area or fed straight into the process. After the load has been formally accepted, the truck leaves the building forwards through the same gate. The gate will be opened after acceptance for the departing truck. Doors which are not in use will be kept closed to maintain negative pressure in the building. This procedure is important not only for odour management but ensuring compliance with the applicable Resource Recovery Exemptions including the Raw Mulch Exemption 2008 and Food Waste Compost Exemption 2008

The main building caters for a total of 3 days storage capacity of delivered waste and prepared feedstock for the composting process. This is sufficient capacity to cover for unexpected down times without impacting on the collection service.

Pre-Treatment

The pre-treatment configuration offers a maximum of flexibility to the operation to cater for various levels of contamination and/or to produce various raw material blends for the composting process. The process would employ the following features:

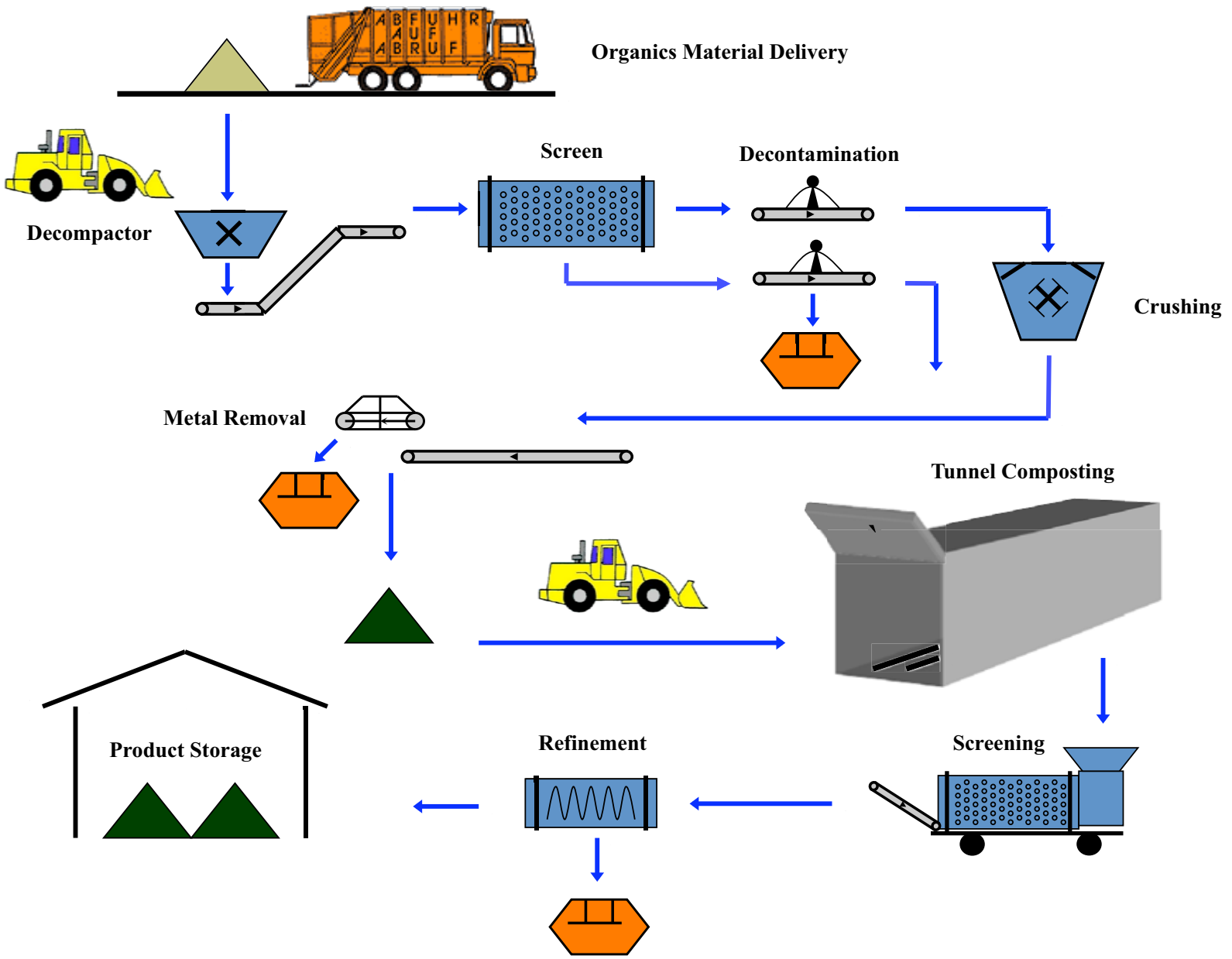


Figure 4.8 SSOM Process

Source : APBTC

Contaminated Kerbside Collected Biowaste

Biowaste (garden/kitchen waste mix) from the kerbside collection scheme has the greatest potential of being contaminated. Segregation and visual screening on the floor enable the removal of larger nuisance materials (eg steel bars, glass bottles, chemical containers) before the load is fed into the process. The Front End Loader will pick up the screened material and feed the material onto a hopper.

The heavy-duty hopper belt will move the material slowly towards a de-compactor unit, which will even the material stream and break-up lumps before the material drops onto an inclined belt conveyor underneath the de-compactor. A level indicator automatically will adjust the hopper belt speed in order to even the feed into the de-compactor. The inclined conveyor will then transport the material onto a screen. The purpose of the screening stage is the removal of fines.

Screening overflow and fines will be conveyed to the picking station, where both streams are screened for and cleaned from contamination. The picking station will provide for up to four picking spots along each sorting conveyor with outlet chutes to discard items into bins placed under the picking station. Staffing numbers can be adjusted to reflect level of contamination. The staff can also stop and start the belt if required.

The sorting belt conveyor (screen oversize only) will finally drop the cleaned material stream into the feed hopper of the particle size reduction unit. The fine fraction conveyor will drop the material onto the shredding outlet conveyor into the storage bay for the tunnel raw material mix.

Clean Green Waste

Clean green waste deliveries may be stored separately and can be fed with the Front End Loader straight into the shredder. This by-pass option will enable the operator to decide on a load-by-load basis which treatment strategy is to be pursued to increase the efficiency of the pre-treatment process. Parallel feed of the shredder via Front End Loader and via sorting conveyor will provide a further contingency to the pre-treatment plant operation.

Particle Size Reduction

The sorted feedstock will then automatically drop into the large feed hopper of the particle size reduction unit. The unit employed will be either a grinder mill or a slow speed shredder. The unit integrates a large feed hopper with optical feed control to uncouple manual sorting from processing.

A permanent magnet integrated into the head drum of the discharge conveyor will remove ferrous metals from the material via a chute into a recycling bin.

Finally a conveyor will transport the tunnel raw material into the interim storage area within the main building, where the Front End Loader loads the material into the designated tunnel.

Raw Compost Discharge and Handling

Following the tunnel composting process, the raw compost will be discharged from the tunnel and transported to the loading area within the SSORRF building by means of a Front End Loader and loaded onto a truck for compost refinement, marketing and sale at licensed composting facilities within the Southern and Western Sydney region.

The raw-compost output from the tunnels will be pasteurised, free of offensive odours and physical contaminations. The output will be suitable for transport to and processing in a licensed composting facility to produce AS 4454-2003 compliant products. REMONDIS is aware of the Food Waste Compost Exemption 2008 and Raw Mulch Exemption 2008 for excluded materials. The

tunnel output will be sent to licensed composting facilities that value add. REMONDIS will only supply to reputable and licensed operators that demonstrate that they comply with the exemptions. This will be part of the audit trail to ensure compliance through the value chain.

The Port Macquarie plant has front end sorting to detect and remove unsuitable material. This facility successfully complies with AS 4454 and has produced high quality source separated compost direct to the market for the past 8 years. The same de-contamination principles will be applied to the proposed RIRP.

4.6 BIOLOGICAL PROCESSING

The RIRP integrates two biological treatment plants for the organic stream derived from the CIRRF waste and the SSORRF waste streams. They are based on a technology termed tunnel composting, which is described in this section.

4.6.1 Advantages of the Tunnel Process

Both plants will utilise the same biological processing technology called tunnel composting albeit in a different operation mode. The tunnel composting system has been operating in the Port Macquarie REMONDIS ORRF successfully for almost 10 years. The main benefits are:

- During the composting process there is no need to access the tunnels, thus creating an air tight environment with all process air being collected and either recycled into the process or cleaned via the deodorisation system;
- The process does not employ machinery or equipment in the corrosive environment of a composting process thus significantly reducing maintenance and repair costs and extending the life of the plant;
- The on-line control, adjustment, recording and analysis of the process parameters for each individual tunnel on the computer terminal enables automated operation and guaranteed product sterilisation for each batch;
- The applied pressurised aeration results in a much more homogeneous and thorough material aeration profile for more critical feedstock. There are virtually no anaerobic zones in the composting matrix. As anaerobic zones are responsible for most of the odours originating from the waste, the process air coming directly out of a tunnel contains very low odour concentrations;
- The system is operationally flexible since composting takes place in discrete batches. Different grades of compost can be created simultaneously with different feedstock. With the tunnel system each tunnel load can be treated independently, making it possible to adopt process parameters for optimal composting when deviations in the waste occur;
- The system is highly modular, and can be extended in 3,000 – 6,000 t/yr stages to accommodate for quantity increase over the term of the contract. A residence time between 7 and 30 days can be selected depending on feedstock material requirements and desired degree of product maturity;
- The internal air and process water recycling systems reduce the total air discharge into the deodorisation unit and almost neutralise the water balance (depending on material moisture and climate condition slight water demand respectively surplus can be expected);

- The fully sealed nature of the system protects the surrounding building structure, without risk of corrosion, fogging or excessive condensation, thereby extending the life of the building;

- Feedstock Material Flexibility: The tunnel technology can handle a broad range of organic solid wastes streams, with different characteristics such as moisture/nutrient levels or biological activity (eg green waste, food waste, bio solids, putrescibles waste, animal waste, food processing waste, sludges, saw dust, grease trap). The aeration floor design, aeration capacity and performance, process control features etc. enable the operator to adjust for each batch (i.e. tunnel) the process parameters in order to achieve optimum performance for the given feedstock material;

- Modularity: The tunnels are of modular design. One or several tunnel modules can be added at a time without interrupting the existing operation. Each tunnel module provides between 300 m^3 and 320 m^3 processing capacity, which determines the annual throughput in conjunction with the selected residence time;

- Process Control and Product Quality Assurance: The unique design of the tunnel creates a closed atmosphere with uniform and stable conditions (temperature, moisture, oxygen levels) during the entire composting process (in contrast to systems, where the material pile surface can be exposed to a cooler, dryer etc environment than the core). The process control then measures and records these conditions continuously (data acquisition) respectively adjust whenever conditions deviate from the set points. The recorded data are then translated into graphical charts (trend lines etc.), which visualise the process conditions of a certain batch – a useful tool for the operator to demonstrate compliance with quality standards and protect against possible product liability claims from customers; and

- High Degree of Automation: The process itself is controlled via the plant office. At the start of the process, the operator determines via set-points the process parameters for the material batch (temperature progression, residence times in the various phases etc.). From then onwards, the process runs by itself and only notifies the operator about any set-point deviations to take action. Internal lighting and other OH&S features enable tunnel feeding and discharge by means of a Front End Loader within one hour. The tunnel facility requires only two (2) operators during 1 shift per day for loading and unloading.

4.6.2 Design Capacity

The continuous microbiological composting activity requires the tunnel composting plants to be designed for 24/7 and 365 days of the year operation. Filling and emptying of the tunnels will only occur during the mechanical process equipment operating hours.

Both plants will cater for organic feedstock material with slightly different characteristics (bulk density, moisture content).

The nominal spare capacity of 5 - 15% reflects the expected fluctuations over the weeks and months in both plants. An additional 10% contingency has been provided for operational requirements, which together with a maximum filling height of 2.8m provides for up to 4 weeks composting residence time potential in both composting plants.

Putrescible Waste Biological Stabilisation

The proposed tunnel composting for each facility comprises 10 tunnels of approximately 26 m length, 8m width and 4.5m height (internal). Each tunnel will be self-operating and comprises an air ducting system, blowers, process water collection and recycling system, and various process control features (temperature, pressure, fresh air ratio measuring devices etc.). Trenches in the slab will run parallel over the full length of the slab and are covered with purpose-designed panels.

Access to each tunnel will be via the front door, which can be lifted automatically. During the composting process, the door is locked hermetically to prevent any odour and leachate from discharge into the environment. Compost material will be placed into each tunnel individually and removed after a given composting time by means of a front-end loader. Each tunnel will be equipped with a fan, which blows a mixture of fresh air and recycled air through the trenches into the tunnel. At the same time surplus exhaust air will be being discharged to the deodorisation stage through the biofilter. The mixture of fresh and recycled air can be automatically controlled via the central process control for each tunnel. Surplus air from the tunnel facility will be discharged to the deodorisation stage.

Tunnel Residence Time

Tunnel residence time in both biological processes will range between 2 to 4 weeks, as required to meet the regulative performance requirements for the respective outputs. The main objectives of the process are to achieve a high level of biological stability, remove excess moisture and offensive odorous compounds and achieve pathogen destruction (pasteurisation) .The respiration index is a commonly used indicator for biological stability which shows that 2 weeks tunnel composting can lead to lower activity levels (<20mg O2/gTS) than 6 weeks of open windrow composting.

REMONDIS will demonstrate compliance with the respective regulative, measurable/quantifiable performance requirements (i.e. for biological stability and others) and adjust the tunnel residence time for each process accordingly.

Deodorisation Stage

All exhaust air from the tunnels will be finally discharged into the deodorisation stage for treatment and dispersion. The deodorisation stage comprises biofilter fan, humidifier and biofilter.

Each plant (CIRRF & SSORRF) will have a stand alone deodorisation stage to treat the exhaust air independently and avoid any cross contamination between the two plants.

The purpose of the deodorisation stage is to eliminate odours and deodorise the exhaust air from the tunnel-composting units before being discharged into the atmosphere. Air volume, moisture and temperature are also controlled via central process control. The biofilter structure will comprise a segmented sub-ground concrete basement with perimeter walls, a grate floor ('false floor') at ground level with a layer of filter medium on top. The filter medium will comprise a 1-1.5m thick layer of compost, bark or other mature organic matter. The structure has a pitched roof and a stack with a built-in exhaust fan.

4.6.3 Process Water Collection and Recirculation

Each biological process (CIRRF & SSORRF) will be equipped with its own closed process water collection and recirculation system, which functions as follows:

- Leachate from the tunnels drains through the duct and piping system via siphons into a sealed process water tank, which is also connected to the biofilter / humidifier unit as drainage facility. The process water is then collected and recycled back into the respective composting process to establish and/or maintain the desired material moisture content;

- A submerged pump mounted onto the process water tank has the purpose of topping up the humidifier and of supplying process water to the tunnel spraying system. Each tunnel is equipped with a solenoid valve controlled spray line, which connects to an array of nozzles, mounted onto the tunnel ceiling in a way to cover the entire tunnel surface area; and

- During the dry/hot period of the year, fresh water may be required to cover the water demand for the tunnel system; otherwise make-up water can be drawn from e.g. the rain water collection system on site.

4.6.4 Process Control and SCADA

Each biological process will be controlled by its own process control and Supervisory Control and Data Acquisition (SCADA) system.

The process in all tunnels will be integrated, operated and controlled via a central process control system. The operator can see the status of the installation, evaluate and adjust process parameters as required. The process control system also acquires and records the process data and enables the verification of processing time, temperature progression and other data for each material batches required for AS/NZL 4454 certification.

The fully automatic control system will be located in the administration office. A modem allows for remote supervision and control of the composting process. The computer records and stores all instantaneous measurements and cumulative data for each tunnel. During the process many different process parameters can be shown on the computer screen. The user can create any graphic needed with the mentioned parameters. This facilitates rapid review, evaluation and adjustments (if necessary) of the composting process.

4.7 MASS BALANCE ESTIMATION

4.7.1 CIRRF

It is expected that about 70,000 tpa of predominately 'wet' waste will be sent to the wet pre-treatment line incorporating crushing, screening and metal separation. The organic material will be loaded into the tunnel for composting over a 4 week period in order to stabilize the waste material in accordance with the regulative requirements for non-putrescible waste classification and odour control

The 30,000 tpa of dry waste will go through the resource recovery process with positive/negative sorting of recycling products to have metals, plastics, timber and paper and board paper being picked at the segregation and cascade vibratory screen. The recyclable materials will be baled for the market.

The process water balance for the biological process have been estimated based on the expected input and output moisture content is presented in Table 4.2 and Figures 4.9 and 4.10.

Table 4.2
Water Balance - CIRRF

Component	Moisture %	tpa
Putrescible Waste Input	45	25,160
Evaporation Losses	100	21,190
Biological Formation	100	5,165
Stabilate Output	30	9,135

The air ventilation system will be capable of removing a minimum of 21,190 m^3/year of water from the process by means of evaporation through the biofilter facility.

Operational experience at Port Macquarie and other similar plants operated in this climate suggest that the tunnel composting process requires between 0 and 5% (refers to input water volume) additional water, which would be sourced from the rainwater storage facilities on site.

4.7.2 SSORRF

The mass balance is based on 55% average moisture content for the input and 40% moisture of the output after the biological process.

It is estimated that 30% of the feedstock will pass the screen for contamination screening and shredding with the remaining material bypassing the shredding process following the picking station.

All positive sorted contaminants and nuisance in both fractions will be sent for GSW Landfill disposal. It is expected that some ferrous metals will be recovered for recycling by means of a magnetic separator.

There will be a significant loss of overall weight due to moisture and carbon loss. Based on the assumed input composition, around 23,000 tpa of composted material will remain after the tunnel composting process. The process water balance for the biological process have been estimated based on the expected input and output moisture content is presented in Table 4.3 and Figures 4.11 and 4.12.

Table 4.3
Water Balance - SSORRF

Component	Moisture %	tpa
Organic Waste Input	53	25,500
Evaporation		22,300
Biological Formation		5,700
Raw Compost output	40	8,900

The air ventilation system will be capable of removing a minimum of 22,300 m^3/year of water from the process by means of evaporation through the biofilter. As discussed in the previous section operational experience at Port Macquarie and other similar plants operated in this climate suggest that the tunnel composting process requires between 0 and 5% (refers to input water volume) additional water, which would be sourced from the rainwater storage facilities on site.

4.8 OUTPUTS

4.8.1 Organic Output from the CIRRF Composting Process

After the CIRRF tunnel composting process the final organic material will comprise approximately 30% moisture content that will not be capable of environmentally significant biological transformation. REMONDIS has conducted trials in Europe which demonstrate that the level of biological activity (the AT4 respiratory activity) following only 2-3 weeks tunnel composting is lower than after 6 weeks open windrow composting with turning.

REMONDIS will demonstrate compliance with the respective regulative, measurable/quantifiable performance requirements (here: non-putrescibility) and adjust the tunnel residence time accordingly. The following graph summarises the trial results:

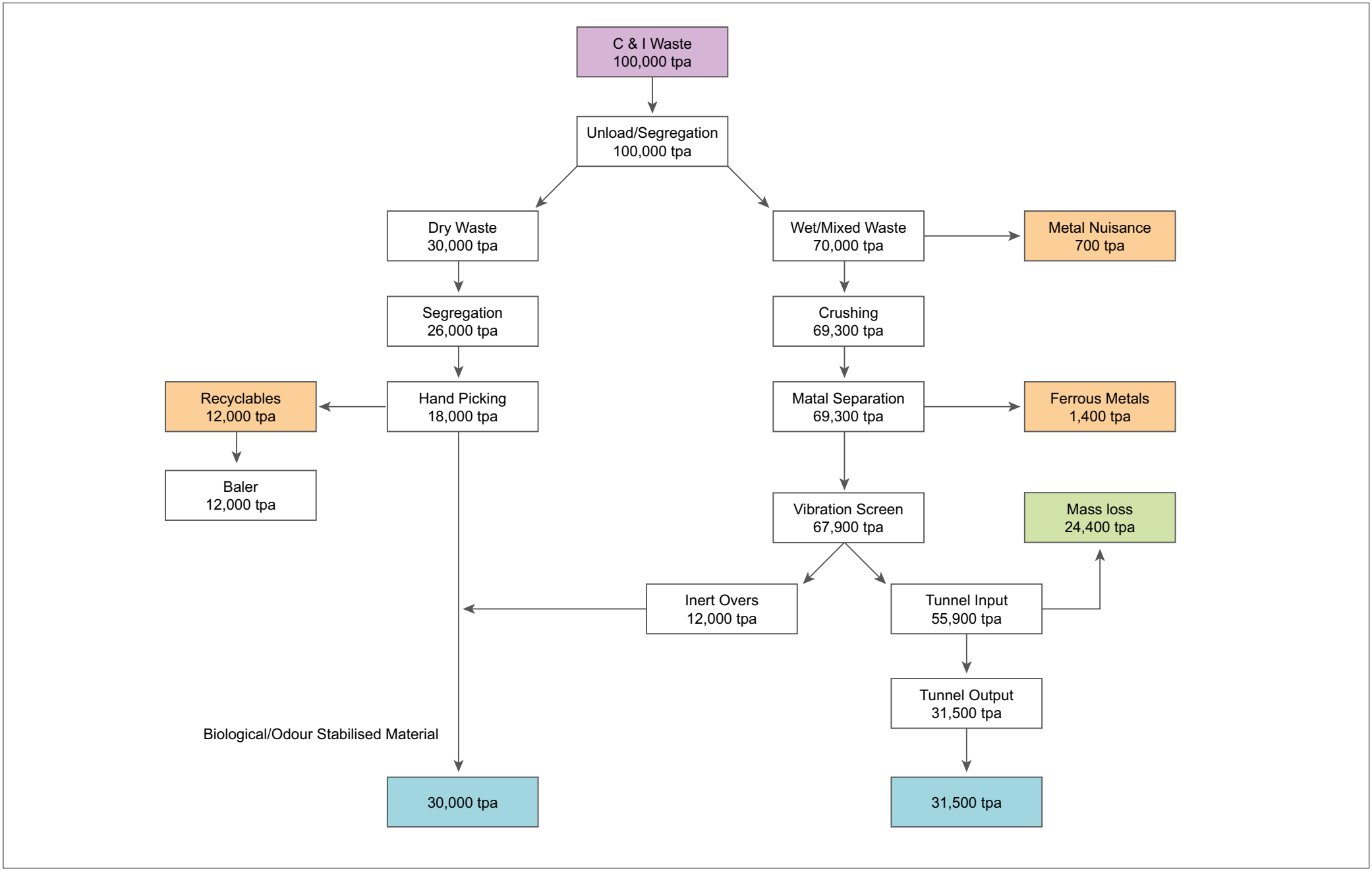


Figure 4.9 **Mass Balance CIRRF**

Source : AP Business & Technology Consultancy 2010

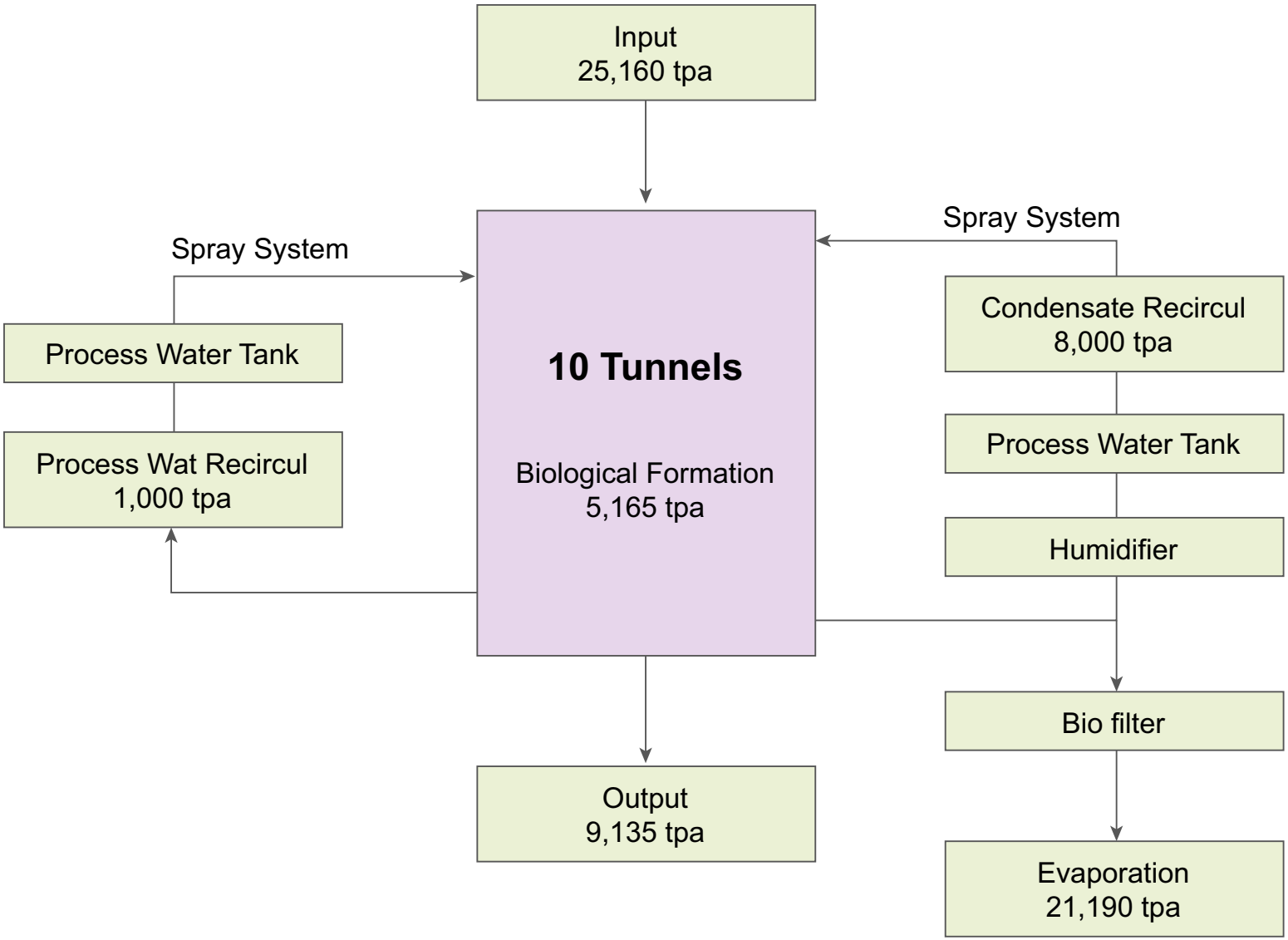


Figure 4.10 **CIRRF Water Balance**

Source : AP Business & Technology Consultancy 2010

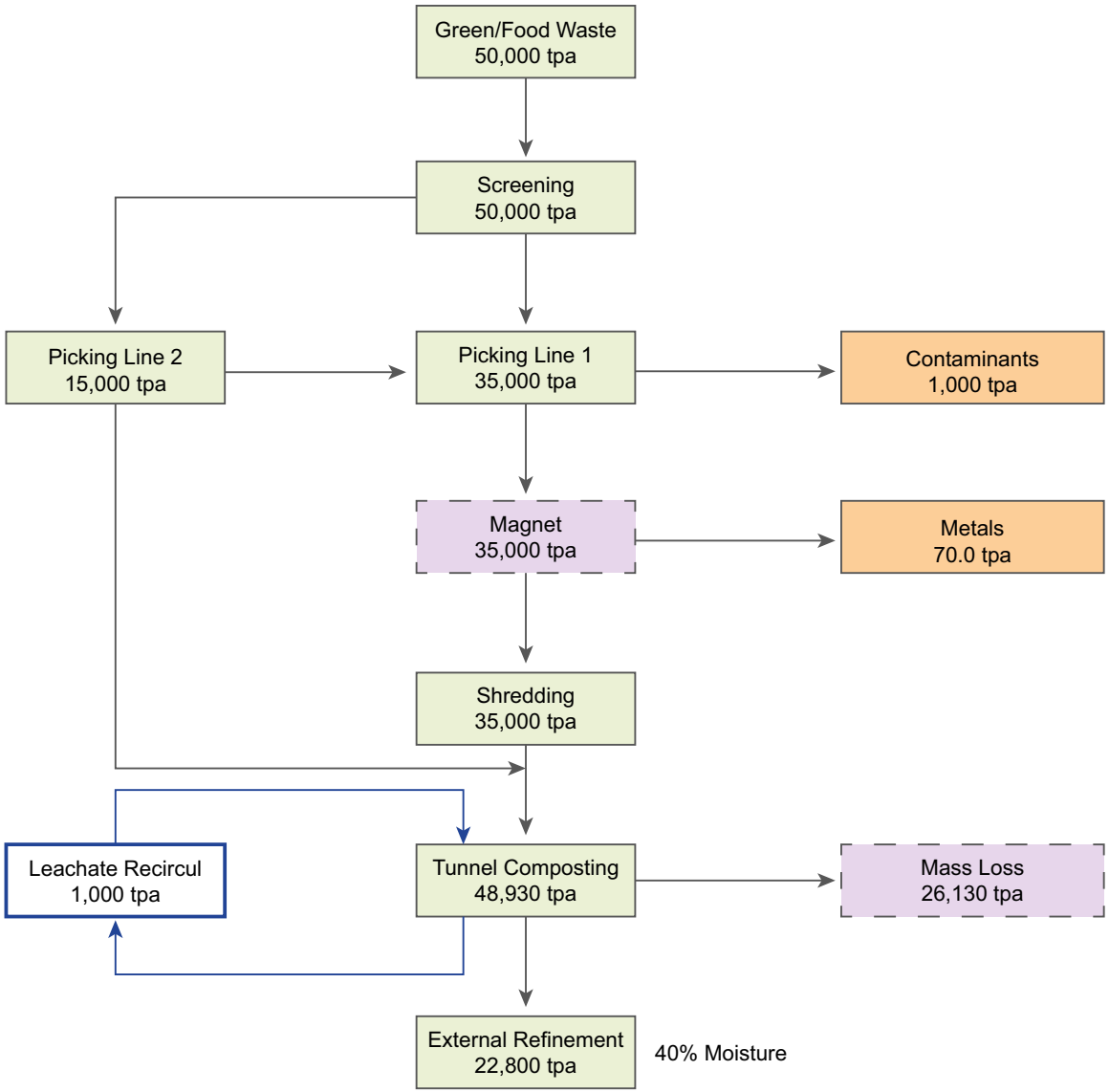


Figure 4.11 **Mass Balance SSOM**

Source : AP Business & Technology Consultancy 2010

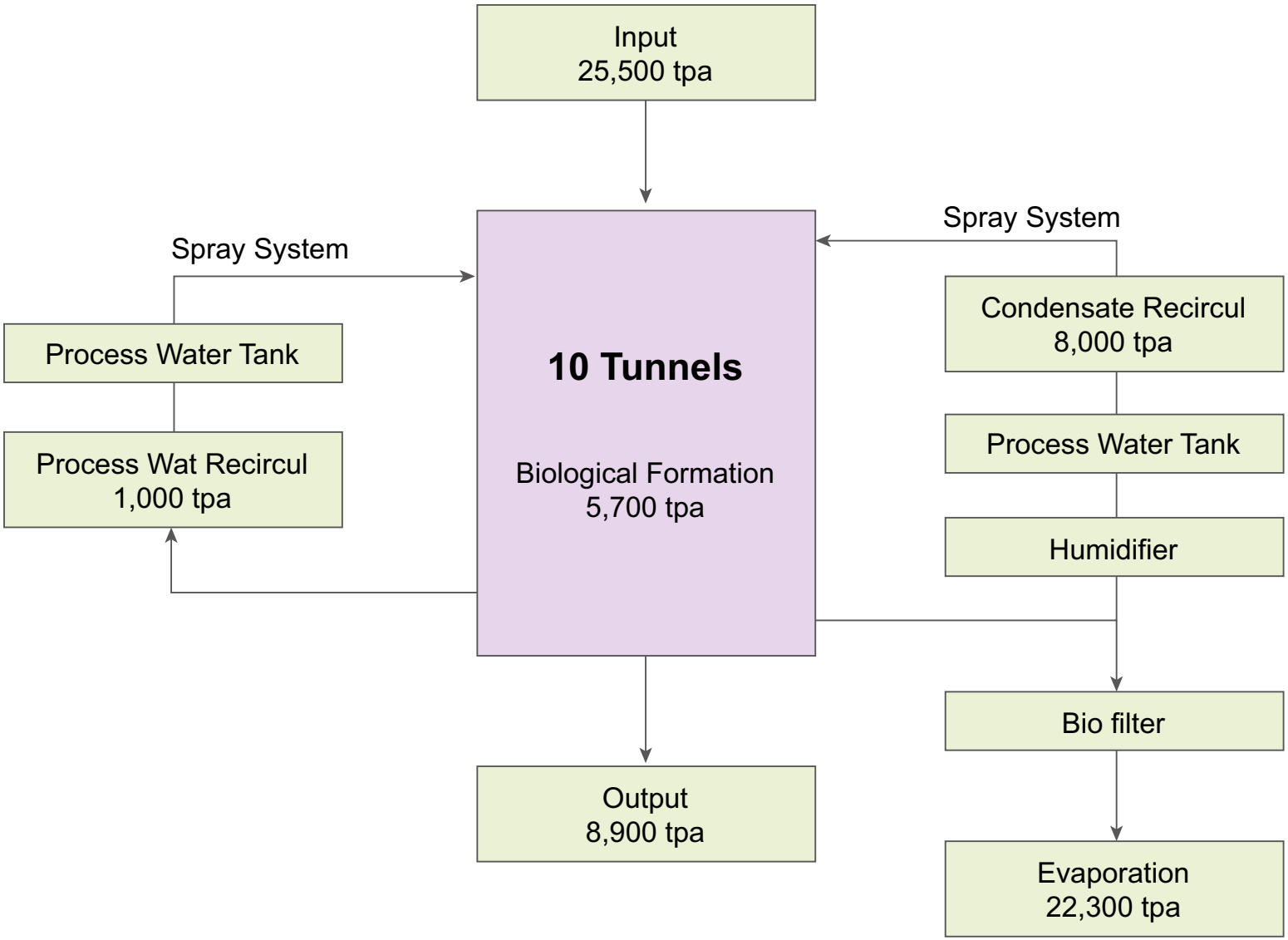
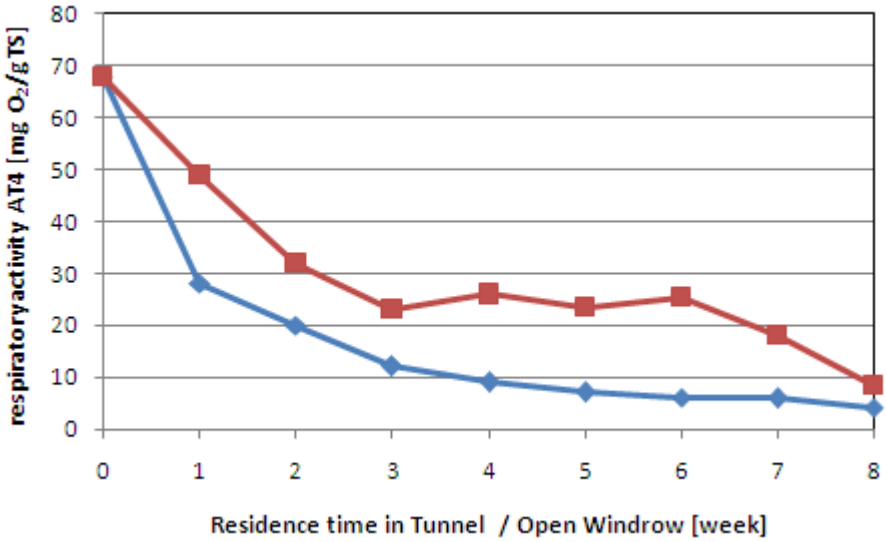


Figure 4.12 **SSORRF Water Balance**

Source : AP Business & Technology Consultancy 2010



Note: Trials conducted in Poland, blue line = tunnel system, red line = open windrow system, latter shows activity drop due to oxygen depletion in the first 3 weeks followed by an increase of activity after each turning cycle.

In accordance with the applicable DEC (now OEH) waste classification guideline Step 6 which states that '*output from Alternative Waste Technology facilities (AWTs) that requires disposal must be assessed in accordance with the above list to determine its putrescibility*'. The organic output from the process will as a minimum comply with the following criteria (as per OEH list):

- >14 days of composting at >40 C and average >45C;
- Does not readily decay under standard conditions;
- Does not emit offensive odours; and
- Does not attract vermin or other vectors (such as flies, birds and rodents).

However the output is still considered (non-putrescible) waste and the material will be disposed in General Solid Waste (non putrescible) landfill facilities. REMONDIS will comply with the *Protection of the Environment Operations (Waste) Regulation 2005- General Exemption under Part 6, Clause 51 and 51A 'The organic outputs derived from mixed waste exemption 2010"* as it applies to mine site rehabilitation. The balance will be biologically stabilised and landfilled in GSW landfills.

REMONDIS operations in Europe and Australia do not consider "compost" from mixed waste collections suitable for agricultural and other land applications because of the risk of chemical and physical contamination. The removal of the 2013 expiry date for AWT derived compost on agricultural land to December 2014 so as to allow for scientific tests is case in point .There have been no longitudinal studies done any where in the world that can confirm there are no health or other impacts of using this type of compost. The 3 year study by OEH will establish if the science supports that there are no issues from the use of this compost. There is no certainty that it can meet the required chemical and physical requirements for repeated use in agriculture. There is no guarantee that the Regulator will not amend or revoke if there are problems.

Application of this type of compost for agriculture is banned in Austria and Germany. Rather, this compost is stablised and landfilled after ensuring there is no biological activity that can create methane and all practicable energy is recovered. Article 22 of the EU directive encourages source separated collections that is treated to a high level of environmental protection to guarantee protection to human health and the environment

REMONDIS envisages that the landfilling of this material will change in the future as NSW develops a Waste to Energy policy anticipated later this year for public consultation. This will facilitate the production of engineered fuels. It should be noted that there is already a guidance note for the assessment of non-standard fuels for NSW. South Australia is processing and manufacturing processed engineered fuels for use in a cement kiln.

REMONDIS intends to recover fuel content from this "compost" which will further improve the diversion from this facility over time.

Countries with the highest recycling rates and diversion from landfills have Waste to Energy processes. This is the preferred pathway for REMONDIS into the future rather than the MSW compost route to achieve high diversion rates from landfills.

4.8.2 Dry Recyclables

It is expected that the process will recover high value plastic (HDPE containers etc.) and to some extent cardboard/paper by means of manual/automatic sorting. The materials will be placed in bins located underneath the sorting cabin and/or in baled form. Paper and cardboard will be baled and stored in a bale storage area under cover for pick-up and sale to meet the market requirements.

4.8.3 Metals

The CIRRF will recover ferrous and non-ferrous (mixed) metals, which are collected in various scrap bins inside the main building and located for pick-up and recycling.

4.8.4 Raw Compost Material (SSORRF)

The plant in Port Macquarie, which processes a similar input mixture of greenwaste and food waste (plus some Biosolids), produces compost of consistent high quality for various local applications. Table 4.4 gives an indication of the expected compost quality in comparison with the AS 4454-2003 standards.

Table 4.4

Compost Quality (Example)

Quality Parameter	Unit	ORRF Compost	AS 4454 / BSG
Organic matter	%	50-55	>25
PH		~ 7.0	5.0-7-5
Moisture	%	~30	>25
Conductivity	mS/cm	5-6	no limit
Nitrogen (total)	%	~2.0	>0.8
NDI		~1.5	>0
Ammonium	mg/L	~ 200	<300
Phosphorus (total)	%	~ 0.5	(<0.1)
Calcium	%	~1.5	No limit
Magnesium	%	~ 0.4	No limit
Arsenic	mg/kg	~12	<20
Cadmium	mg/kg	<0.5	<3
Chromium	mg/kg	~ 50	<100
Copper	mg/kg	~60	<100
Lead	mg/kg	~ 40	<150
Zinc	mg/kg	~150	<200
Mercury	mg/kg	<0.2	<1

Nickel	mg/kg	~15	<60
Selenium	mg/kg	<0.5	<5
Boron	mg/kg	~ 20	<200
Faecal Coliform	MPN/g	150	<1,000
Dieldrin/Chlordane	mg/kg	0.03	<0.01
Toxicity index		~100	>60 (compost)
PCB	mg/kg	<0.2	<0.3

Elevated background levels of dieldrin are sometimes present in the green waste and cannot be transformed biologically during the process. However the level is dependant on the historical application of this pesticide in the collection area.

Based on REMONDIS experience, the raw compost derived from the SSORRF will be a high quality raw material for organic fertiliser and landscaping products with high organic content and nutrient value.

The raw compost will be pasteurised, free of offensive odour and levels of physical contamination which will allow production of AS 4454-2003 compliance products through further processing at a licensed composting facility (maturation, value adding etc.).

4.9 WATER MANAGEMENT

4.9.1 Principles

The principles of the water management system are:

- No contaminated water will be discharged or allowed to flow from the site;
- Surface stormwater will be contained and directed to a first-flush system;
- Diversion drains will be installed around the perimeter to protect the site from external run-off water;
- Provision of a separate and enclosed system for leachate and process water collection and storage, to ensure no contaminated water can enter the stormwater or groundwater systems; and
- All roof water will be collected into rainwater tanks and used for various purposes.

Figure 4.13 shows the proposed stormwater management plan.

4.9.2 Stormwater System

Figure 4.13 shows the proposed stormwater management system which has been designed to collect all surface run-off excluding roof run-off and direct it to the collection and retention system which incorporates a first flush system and an oil interceptor, together with a gross pollutant trap.

Potable water will be supplied through rainwater collection tanks located to collect roof water from the main buildings. Supply to the outlets will be via a potable water reticulation system within the building area.

All stormwater drainage lines will connect to the existing onsite (600 pipe diameter) service which will be extended to a location adjacent to the north/west corner of SSORRF.

4.9.3 Process Water and Leachate

A complete closed process water collection system will be provided including two enclosed 50 000 L process water storage tanks, necessary connection pipes, siphons etc to collect leachate from the tunnels and biofilter together with condensate from the aeration ducts.

The tunnel irrigation system includes the irrigation pump at the process water tank, piping and sprinkler system into each of the tunnels and will be operated as required by the process control computer.

The humidifier system includes a submersible pump, spray bar and nozzles with a backup water connection line to the process water tank.

Leachate from the various process areas will be recycled. The mass balance for the plant indicates the production of excess leachate is not expected. There will be no connection which would allow leachate or process water to enter the stormwater system.

If any surplus leachate is produced, it will be pumped to a tanker for off-site disposal at a licenced waste water treatment plant.

The principles of the leachate and process water management are:

- To avoid or minimise the generation of leachate (eg wash down only where necessary);
- To keep areas with leachate generation strictly separated from cleaner operating areas and collect the leachate and process water as close as possible at the point of generation;
- To unload and store wastes only inside the dedicated areas within the buildings;
- When ever possible and appropriate, recycle leachate back into the process without jeopardizing product sanitation;
- To provide bunds around areas of wet waste storage (food waste etc) leachate or process water generation with appropriate drainage (slope, siphon) to the central process water collection system;
- To apply appropriately sized piping, inspection holes and water locks to ensure performance and accessibility for cleaning and maintenance purposes; and
- To provide fully enclosed and sealed systems for process water storage facilities to ensure that no contaminated water can enter the stormwater / groundwater systems.

The following leachate management system will be installed (refer Figures 4.13 and 4.14):

- The reception and pre-treatment areas will be bunded and any potential leachate generated from these areas would be contained;
- The tunnel composting plant has its individual process water and condensate collection system, which drains into the main process water tank;
- The process water tank also collects any condensate or leachate from the humidifier biofilter facility. The tank provides the water to the tunnel irrigation system, which is operated via a pump and can be topped up with make up water as required; and

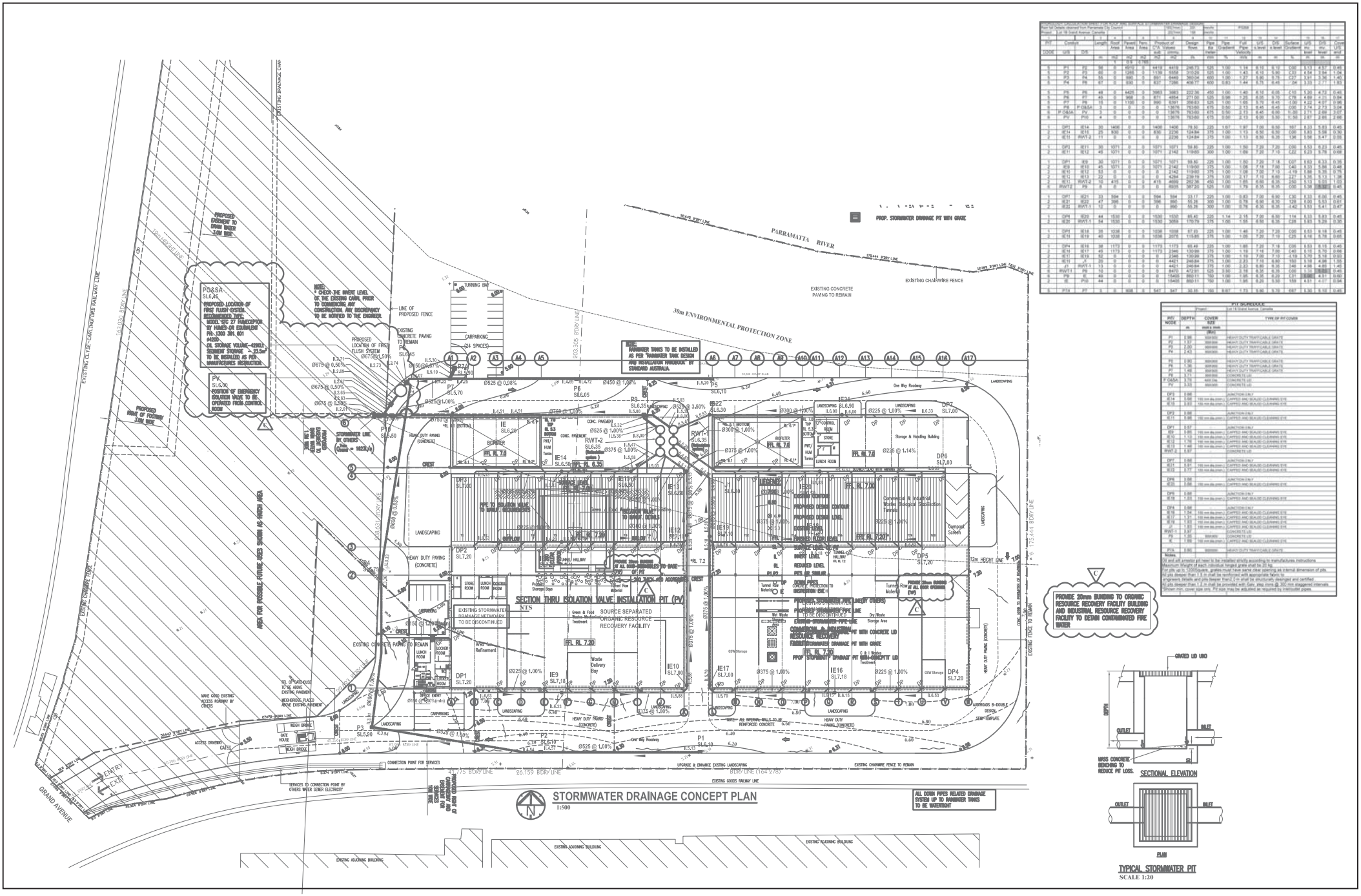
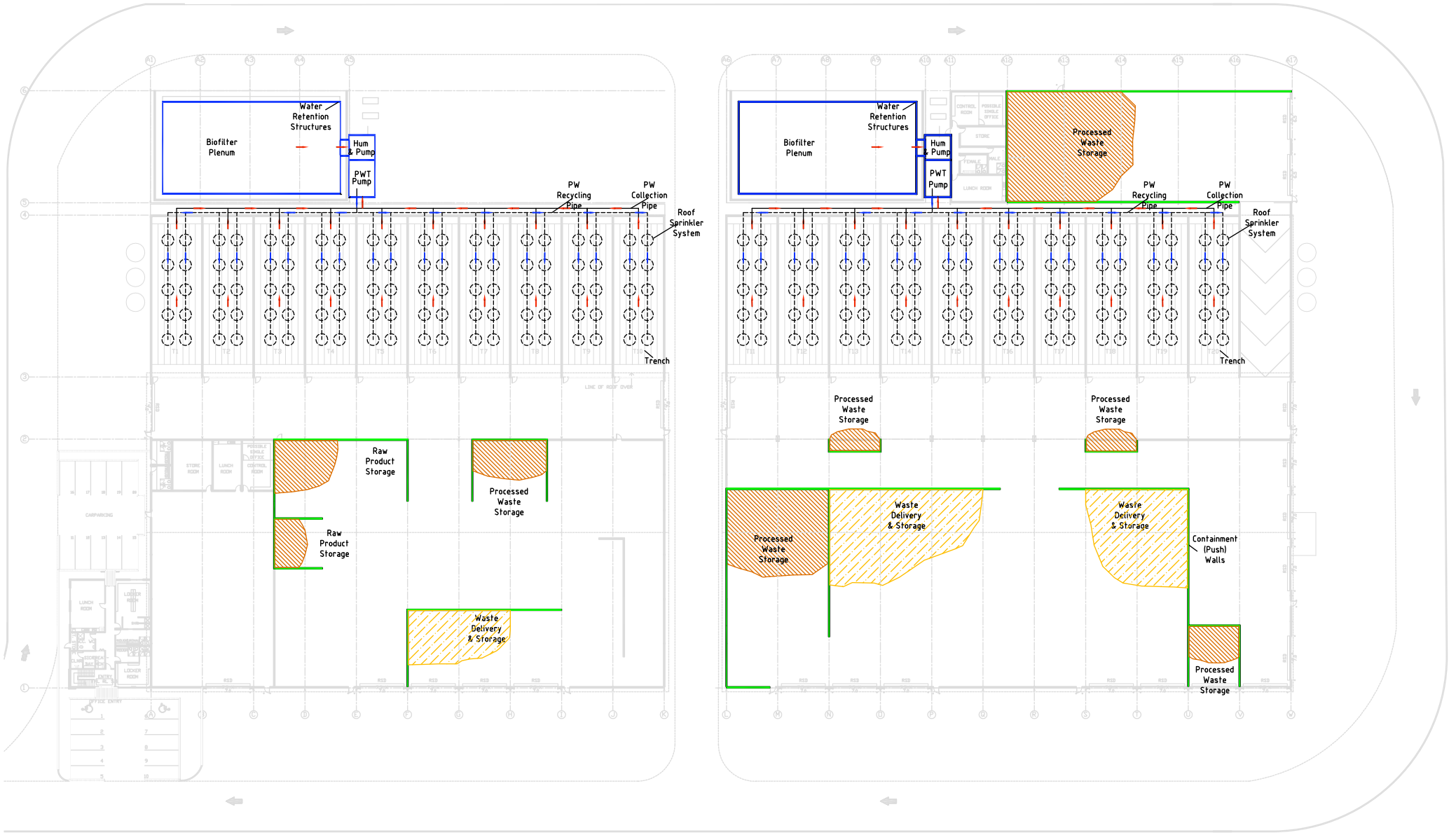


Figure 4.13 **Stormwater Plan**

Source : ALGORY ZAPPIA & ASSOCIATES 2010



NOTES:

- Process Water Collection Path
- Process Water Recycling Path

Figure 4.14 **Process Water and Leachate Management Conceptual Layout**

Source : AP Business & Technology Consultancy 2010

- Separate to the process water system, rainwater tanks will be provided to collect rainwater from the building roof areas for utilisation as either make-up water or other purposes. Stormwater on site will be collected and discharged via the stormwater collection and retention system.

Each biological process (CIRRF & SSORRF) is also equipped with its own process water collection and recirculation system, which functions as follows:

- Leachate from the tunnels drains through the duct and piping system via siphons into a sealed process water tank, which is also connected to the biofilter / humidifier unit as drainage facility. The process water is then collected and recycled back into the respective composting process to establish and/or maintain the desired material moisture content;

- A submerged pump mounted onto the process water tank has the purpose of supplying process water to the tunnel spraying system. Each tunnel is equipped with a solenoid valve controlled spray line, which connects to an array of nozzles, mounted onto the tunnel ceiling in a way to cover the entire tunnel surface area; and

- During the dry/hot period of the year, fresh water may be required to cover the water demand for the tunnel system; otherwise make-up water can be drawn from the rain water collection system on site.

4.9.4 Water Quality

The process water collected from the composting processes is corrosive being slightly acidic (pH 5-7) with the temperature ranging between ambient and 50ºC. The loading rates can be up to:

- COD 5 g/L;

- BOD 3 g/L; and

- Suspended Solids 1%.

Other contaminants can be found in traces (ie ppm levels) as it is typical for leachate derived from commingled waste. As a general guide, leachate from source separated organic wastes (SSORRF) will tend to show a lesser range of contamination than leachate derived from the commingled waste (CIRRF).

The collected process water is ‘consumed’ in the composted or stabilised material during the composting process in the tunnels. Therefore there is no accumulation of process water and also no accumulation of contaminants in the process water over time.

The process water collection and recirculation system for both plants has been designed to meet those requirements.

4.10 AIR MANAGEMENT

The main objectives of the air management system within the main building complex are to:

- Retain odorous air inside the buildings;

- Remove odorous air from the various building areas to the tunnel composting system;

- Provide heated/cooled fresh air and extraction to the sorting cabins;

- Provide heated fresh air and extraction to the amenities areas; and

- Provide heat pump air conditioning and fresh air to the office areas and the control rooms.

Collection hoods (extraction grills) will be mounted over the high emission areas within the building such as material unloading, storage and handling areas. The air extraction rate in the various parts of the building will be controlled (ramped up/down) by means of various dampers / extraction grills. For example, higher extraction rates will be applied in the reception area during waste delivery and pick-up, tunnel loading and unloading.

One fan in each building complex will extract odorous air and deliver the air along the duct pathways to a manifold at the rear of the tunnel composting system. The manifold connects to all fresh air dampers of the tunnel air ventilation system, which controls the air supply into the composting process.

The system will maintain a slight negative pressure inside the respective building areas. Any balance of the odorous air from the buildings is automatically drawn from the biofilter fan and ducted into the biofilter facility.

All frequently trafficked doors (truck delivery and pickup) will be equipped with fast speed roller doors, programmed to only open during delivery times, maintaining negative pressure and containing emissions within the building for the majority of the time.

If required, an option to retrofit the system with additional air curtains mounted above each fast speed roller door entrance which can be installed and operated in case of temporary roller door failure or during truck delivery to retain odorous air inside the building.

The fresh air demand for each tunnel will be automatically restricted to a minimum through the recycling of odorous air back into the tunnel. Exchange of exhaust air between the tunnels is controlled through a one-way valve in the discharge duct.

The total building ventilation system air volumes will not exceed 60,000 m³/hour at any time.

Principles for the air management are:

- Real time processing of odorous feedstock materials will minimise odour emissions in the reception, pre-treatment and tunnel loading/unloading areas (raw material will not be stockpiled for more than a day under normal operating conditions);

- Areas which are a source for significant odour release will be either encapsulated (composting tunnels) or controlled close to the emission source (eg ventilation hood) with connection to the overall air management system;

- Odorous air (tunnel) will be recycled as far as possible to minimise the total air volume into the deodorisation biofilter / humidifier units and subsequently to the atmosphere;

- Stockpile heights of delivered green organics and other odorous feedstock materials will be managed in a way to facilitate natural ventilation in order to prevent anaerobic zones. The stockpile is under cover inside the building with slight negative pressure;

- Redundant and reliable equipment (i.e. fans, scrubber, ducts) will be installed to minimise down-times;

- Two stage deodorisation units will be employed for both plants. The process control systems will monitor, log and control in real time some performance parameters of both units in order to enable management to identify and rectify defects or deficiencies; and

- No outdoor handling /maturation of stabilised / composted materials at any time. All output from tunnels will be loaded onto trucks inside the building area and transported to external treatment.

The following integrated air management system will be installed (refer Figure 4.15):

- The main buildings for the CIRRF and SSORRF plants, the attached tunnel hallways and the loading building will be fully enclosed and air controlled areas by maintaining a slightly negative pressure in the building. This will be achieved through collection hoods mounted over the critical odour emitting areas such as the material unloading, storage, handling areas. Various dampers will control the air exchange rate in the various parts of the building, which can be locally and temporarily increased (eg higher rates in reception area during waste receival);

- A common fan for each plant delivers the air to a manifold along the rear of the tunnel complex, which connects to the tunnel ventilation systems. The balance of the air demand into the tunnels is automatically drawn from outside through process controlled damper regulation. This concept minimises total air volumes from the plant and guarantees high performance of the deodorisation unit;

- Roller doors for waste delivery will be only open during delivery times maintaining negative pressure and containing emissions within the building at most times. In case of temporary roller door failure the building ventilation system ramps up to maintain negative pressure inside the building;

- The fresh air demand for each tunnel will be automatically restricted to a minimum through the recycling of odorous air back into the tunnel. Exchange of exhaust air between the tunnels is controlled through a one-way valve in the discharge duct;

- The tunnel aeration systems for the CIRRF and SSORRF tunnels are not connected thus avoiding cross contamination and improving the contingency of the operation;

- Fresh air, recycling air and discharge air volumes will be automatically controlled for each tunnel via the central process control located in the control room and individually for CIRRF and SSORRF tunnel system to individually determined process parameters;

- High specific aeration rates (m^3 of air applied per m^3 of material and hour) which can be applied to each tunnel module will ensure that aerobic conditions are maintained at all times during the process and across the material surface batch in each tunnel;

- The total exhaust air volume which may be discharged into the deodorisation units will not exceed 50,000 m^3/hour for each plant (total of 100,000 m^3/hr). The biofilter surface emission will not exceed the equivalent of 125 OU/m^3 (technology supplier performance guarantee);

- The biofilter design is based on proven technology and provides the most efficient solution for biological processes. Low operating costs and operational consistency are further design features of the system. Emissions from the deodorisation units are basically free of offensive odour, bio aerosols and dust; and

- Biofilter performance indicators are monitored via the central process control computer. The discharge limits will be established during the design stage and based on the site conditions (meteorology), and sensitive receptors in the neighbourhood.

4.11 NOISE MANAGEMENT

On-site mobile and fixed equipment and machinery with significant noise emission levels are crushers, shredders, the baler and the Front End Loaders (all operated indoor). Outdoor machinery comprises mainly trucks, Front End Loaders and the fans for the composting and biofilter facilities. Apart from the blowers (24 hours over 7 days), all other equipment will be operating only during the specified operating hours. The blower sound pressures levels are at full load about 82 dB(A). However they are running at an average of 50% during 24/7 they are also not an intermittent noise source.

To minimise the noise emissions from the proposed RIRP, the on-site management measures shall comprise a combination of:

- Fitting and maintenance of appropriate mufflers on mobile equipment;
- Installation of noise hoods on engines and enclosure of noisy equipment;
- No operation of shredders after 10 PM on weekdays or on the weekend; and
- If necessary, noise generating activities will be restricted when wind and weather conditions are unfavourable.

4.12 TRAFFIC

Internal traffic on site during the 3 shifts derives from staff vehicles and trucks.

Staff

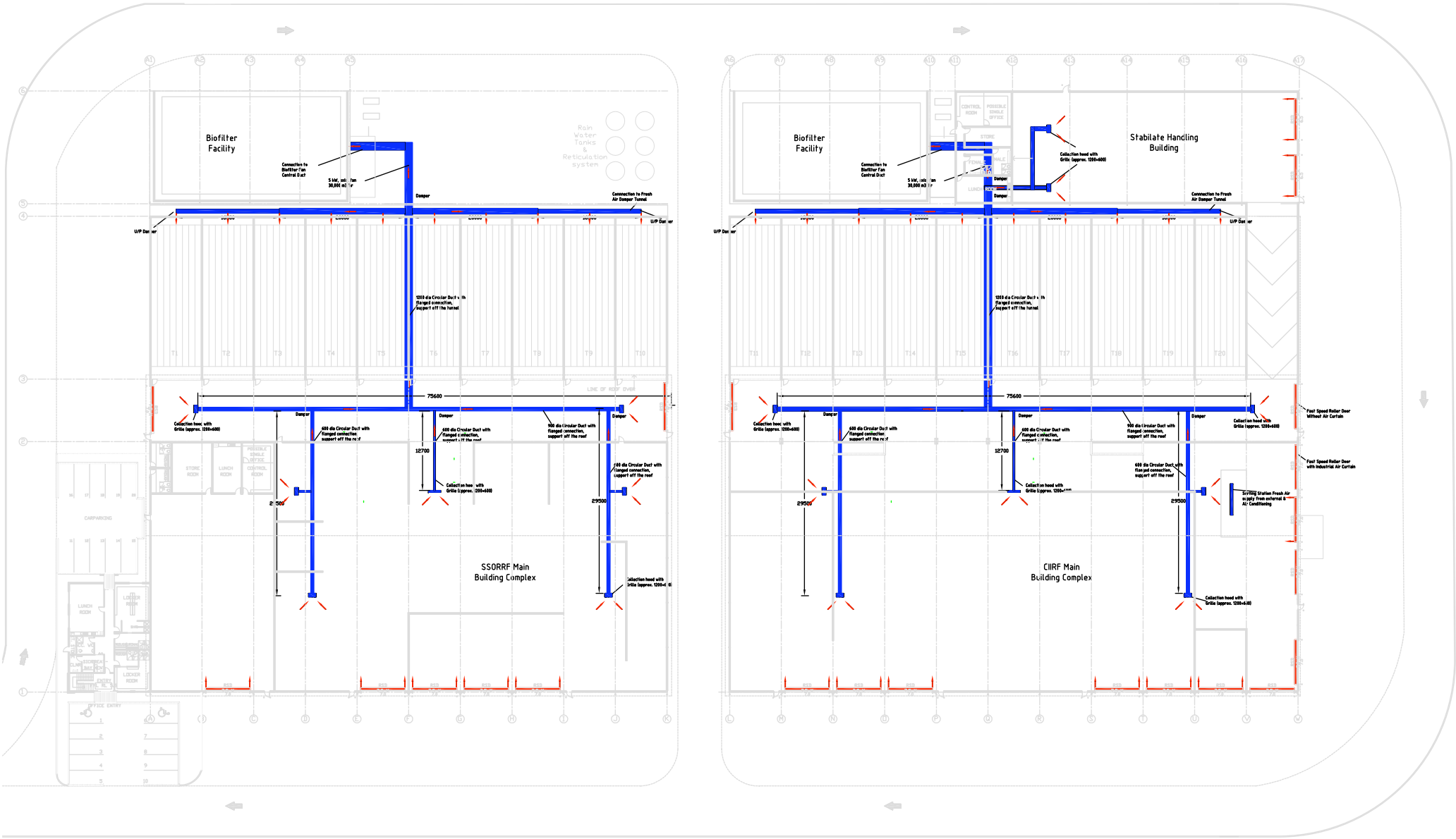
There will be 40 staff working on the morning shift and 20 staff working on the 2nd shift and 5 staff working on the night shift.

CIRRF Trucks

- Delivery Trucks are loaded trucks which deliver all the C&I Waste to the CIRRF. Expected average 46 delivery trucks per 24 hours.
- GSW/Pickup trucks that pick up the inert residuals from the CIRRF. Expected 9 trucks per 24 hours to cart inert waste to regional landfill facilities.
- GSW / Pickup trucks that will pick up stabilised material from the CIRRF tunnel composting process for landfill disposal. The 24 hour average estimate is 7 trucks.
- Recyclable/ Pickup for recycling material will be daily at the CIRRF for trading purposes. There are currently 4 trucks that are doing the haulage now.

SSORRF Trucks

- Delivery Trucks will deliver all the SSORRF Waste to the SSORRF with an estimated total of 18 trucks throughout the day.
- Compost/ Pickup trucks will pick up raw compost from the SSORRF tunnel composting plant for further refinement at external offsite facilities. Estimated total of 6 trucks throughout the day.



NOTES:

CONCRETE WALL SCHEDULE (REFER TYPICAL DETAIL)

WALL MARK	WALL TYPE	WALL HEIGHT (h)	MIN. THICKNESS (t)
W1	PUSH WALL	2500	200
W2	TUNNEL (PUSH) WALL	4500	200
W3	NON PUSH WALL	4000	200
W4	Push Wall	4000	200
W5	Mobile Wall Element	2000	TBA

Figure 4.15 **Air Ventilation and Emission Control** Source : AP Business & Technology Consultancy 2010

- Contamination/ Pickup trucks that pick up the contaminated material from the SSORRF for disposal. Altogether 2 trucks daily will send the disposable contaminants to landfill.

Hourly External Traffic Estimates

Traffic volumes distribution estimates during a normal day for the proposed RIRP are summarised in Table 4.5

Table 4.5
Incoming and Outgoing Traffic for RIRP

	CIRRF			SSORF		
Total	**Incoming**	**Outgoing**	**Hours**	**Incoming**	**Outgoing**	**Total**
1	1		1			
1	1		2			
3	3		3			
3	3		4			
3	3		5			
3	1	2	6		1	1
3	1	2	7	2	1	3
4	2	2	8	4	1	5
5	3	2	9	4		4
5	3	2	10	1	1	2
3	2	1	11			0
7	4	3	12		1	1
4	4	0	13			0
6	4	2	14	4	1	5
6	3	3	15	3		3
3	3	0	16		3	3
2	2	0	17			
1	1		18			
1	1		19			
1	1		20			
			21			
			22			
			23			
			24			
65	46	19		18	9	27

There are incoming and outgoing traffic for proposed RIRP throughout the 24 hours.

The traffic to the CIRRF facility is almost 24 hours/day starting at 1am and ending around 8pm in the evening with the peak hours expected between 8am – 4pm which is when the garbage collection trucks finish the morning and afternoon collections.

The trucks for the SSORRF are expected to come in between 6am until 4pm with 2 peak hours estimated around 7am - 9am and 2pm - 4pm.

Trucks departing the site will be required to turn left from Grand Avenue North on to Grand Avenue to minimise disruption to traffic flows.

4.13 HAZARDOUS AND DANGEROUS MATERIALS

Drums of grease for maintenance purposes and fuel (petrol / diesel) for the refuelling of mobile equipment such as Front End Loaders will be kept on site. Table 4.6 details the quantities stored. Those containers will be stored inside the main building complex.

Table 4.6
Materials Stored on Site

Material	Quantity
Diesel	Ten 250 L Drums
Grease	One 250 L Drum
Machinery Battery	3-4 pieces

4.14 ELECTRICITY CONSUMPTION

Table 4.7 identifies the following preliminary power requirements have been estimated (all within 10% contingency and pre equipment selection).

Table 4.7
Power Requirements

Plant Operations	kW	kVA
C&I		
Dry Line	130	140
Wet Line	282.5	310
Refinement	130	140
SSOM		
Pre-Treatment	325	360
Post Treatment	60	70
TOTAL MECHANICAL	**927.50**	**1020**
Biological Processing	225	240
SSOM	225	240
C&I	450	480
Total Mechanical Equipment		
Other Building Services	100	110
TOTAL	**1477.5**	**1610**

The mechanical equipment for both plants is estimated at 1020 kVA connected load. The composting processes will consume a total of approximately 480 kVA. Other building services connected load is estimated to be in the order of 110 kVA. The total process related power consumption is in the order of 1.5 million kWh per year.

The Diesel consumption estimate is provided in Table 4.8.

Table 4.8
Diesel Consumption for Mobile Machinery

C&I - Mechanical		Units	L per hour	Hpa	Lpa
Dry Line	Front End Loader	1	20	2,200	44,000
Wet Line	Wheeled Grab	1	18	2,200	39,600
Refinement	Front End Loader	1	20	2,200	44,000
SSOM - Mechanical					
Pre-Treatment	Front End Loader	1	20	2,200	44,000
Post Treatment	Front End Loader	1	20	2,200	44,000
Total Mechanical Equipment				11,000	215,600

Biological Processing					
SSOM – 225 kW	Front End Loader	1	20	2,200	44,000
C&I – 225 kW	Front End Loader	1	20	2,200	44,000
Total Mechanical Equipment				4,400	88,000
Other			5	2,200	11,000
Total				17,600	314,600

4.15 INFRASTRUCTURE

Telecommunications

Telecommunications and power will be provided to the plant from the lease boundary.

Electrical Utilities

The Power Supply from the main gate entry will be extended underground to the office building.

Water

The water main will be extended from the main Site entry by way of a 150 diameter pipe, laid in-ground. Appendix F shows location of services associated with fire fighting.

Hydraulic Services

Potable water will be supplied through rainwater collection tanks located to collect roof water from the main building complex. Supply to the outlets will be via a potable water reticulation system within the building area, including the office.

All stormwater drainage lines will connect to the existing onsite (600 pipe diameter) service which will be extended to a location adjacent to the North/west corner of Tunnel 1. A Gross Pollution Trap will be installed in accordance with Sydney Water requirements.

A complete process water collection system will be provided including two enclosed 50 000 L process water storage tanks, necessary connection pipes, siphons etc to collect leachate from the tunnels and biofilter together with condensate from the aeration ducts.

The tunnel irrigation system includes the irrigation pump at the PWT, piping and sprinkler system into each of the tunnels and will be operated as required by the process control computer.

The humidifier system includes submersible pump, spray bar and nozzles with a backup water connection line to the PWT.

4.16 PROCESS CONTROL PRINCIPLES

The CIRRF facility will be controlled by a Programmable Logic Controller (PLC) and SCADA system from a centralised location. The normal operation sequence, start-up, shutdown, modulating control and alarming functions will be performed by the PLC in automatic mode. The SCADA system will monitor equipment status (run/stop alarm conditions) and acquire data for administrative reports and historical trending which is useful for diagnostics and maximising plant efficiency.

Latching emergency stop push buttons will be installed at strategic locations around the plant to provide safety to personnel. These emergency stop push buttons will be hard wired to the PLC remote stations and interlocked in accordance with the relevant Australian Wiring Rules.

The level in both leachate tanks will be centrally controlled using level switches and pumps communicating back to the control room SCADA and fitted with audio/visual alarms.

Other relevant data (monitoring, weather station etc.) will be integrated into the data acquisition and recording system in accordance with license requirements and operational convenience.

4.17 ALTERNATIVES

The selection of the proposed technology has been based on the following requirements:

Air Emission Control

The highest control of air emissions from the process requires a fully enclosed technology with a high degree of automation and control, in order to minimise the final exhaust air discharge volumes and air concentration levels from the plant. Alternative technologies such as windrow composting, or other forms of enclosed composting systems, enclosed bay composting with agitation which are in operation in Australia so far do not offer the same level of emission control.

Wastewater Emission Control

The selected technology includes the recycling of any leachate back into the composting process thus avoiding disposal and/or treatment of wastewater from the operation.

Waste Management and Handling

The proposed design minimises storage volumes of waste material and travel distances for the material to/from the composting tunnels.

Camellia Site Historical Constraints

Given the history of the site, any technology which would require sub-ground facilities (tanks etc) or high structural requirements (loading, foundations etc) is considered not suitable for the project. This applies for example to anaerobic digester technologies.

Camellia Site Available Area

The site has limited space given the required capacity of the two proposed plants. The emphasis of the design was therefore to maximise biological decomposition rates in order to minimise processing volume (area) requirements. Tunnel composting technology delivers highest conversion rates and requires least space compared to many other biological treatment systems.

On Site Arrangement

The following considerations lead to the proposed layout for the RIRP facilities as shown on the drawings:

- One-way (clockwise) circular traffic flow around the facilities provides the necessary access points for delivery and pick-up around the development; smooth traffic flows to minimise truck manoeuvring shall reduce noise and dust emissions; minimise space requirements for roads and associated facilities;

- Access to the site is predetermined through the existing road access. Speedy processing of delivering trucks at the weighbridge / counter facility shall minimise waiting time to ensure that waiting trucks don't queue back outside the site. An existing underpass of the Clyde - Carlingford railway line on the western side of the Billbergia site does not provide an alternative access route due to technical and site ownership constraints;

- The on-site arrangement allows a staged development of CIRRF (stage I) and SSORRF (stage II) if required;

- The efficient utilisation of the site provides more available area for landscaping and building set-back from the boundary thus improving the amenity of the development to the neighbourhood;

- The proposed layout minimises impacts by locating the main odour emission source (biofilter) furthest away from the closest sensitive receptor; and

- The co-arrangement of the two facilities provides a cost effective solution to REMONDIS to develop a sustainable infrastructure project on that site.

4.18 LANDSCAPE MASTER PLAN

A Landscape Master Plan has been prepared for the proposed RIRP site. The plan addresses recommended visual mitigation measures including preserving significant existing trees, increasing the density of planting along the site boundaries and provision of extensive screen and feature planting and shade trees around proposed structures where appropriate. As part of the commitment to minimise disturbance to the site cap landscaping within the Environment Protection Zone has been designed utilising movable concrete containers. This also provides flexibility for meeting any future requirements in relation to provision of access for pedestrians/cyclists through the Environment Protection Zone.

Key principles of the landscape design include:

- Retain and protect significant existing trees where possible along the site boundaries to ensure sightlines and screening acknowledged in the visual assessment outcomes are maintained;

- Reduce the volume of site runoff by minimising hard surface areas and maximising planted surface area. Raised mounded areas with groves of Cumberland Plain Woodland/Sydney Coastal River Flat Forest tree and shrub species over the existing capping slab;

- Tree and shrub screen planting of Cumberland Plain Woodland/Sydney Coastal River Flat Forest species where appropriate along the site boundaries to reinforce existing boundary planting as required;

- Extensive planting of native trees, shrubs and groundcovers along the southern boundary extending from the site access point to the south eastern corner of the site;

- Native trees in movable concrete containers in the 30m wide Environmental Protection Zone to provide filtered screen from Parramatta River and also to enhance the aesthetic value of the site;

- Native low water-use groundcover and shrub feature planting to the site entrance and around proposed carpark margins to enhance aesthetic value and a more human scale arrival area for visitors;

- Reduce the hard surface area and heat island effect, balance the visible mass of proposed buildings with surrounding groupings of native tree and shrub planting; and

- Provide outdoor amenity for staff and visitors by providing raised informal outdoor decking areas with seating, screening vegetation to provide shade and privacy from site activities and operations.

Figures 4.16 and 4.17 illustrate the Landscape Master Plan and associated site cross sections. Technical Report No 8 provides further details of proposed plantings.

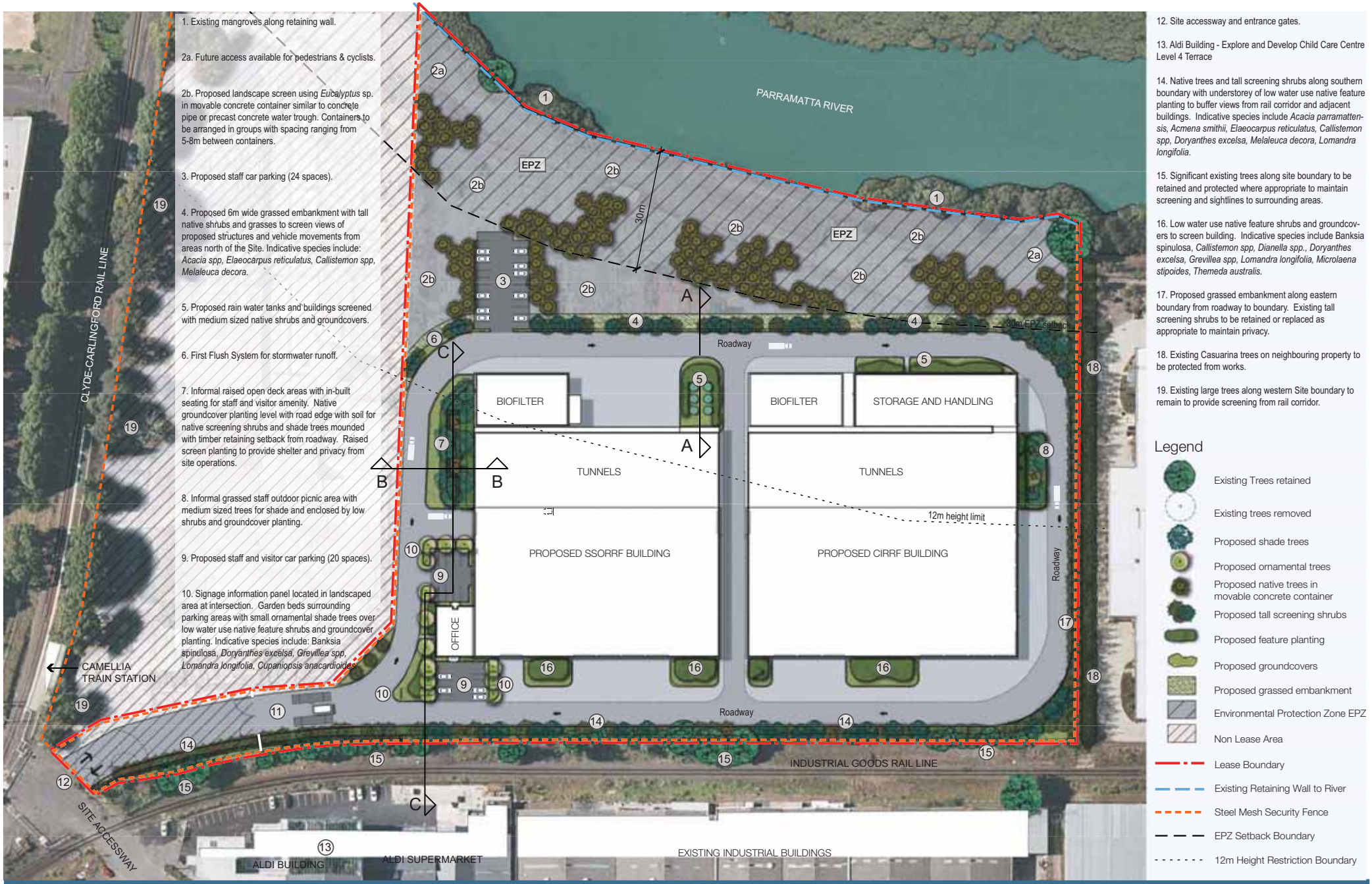
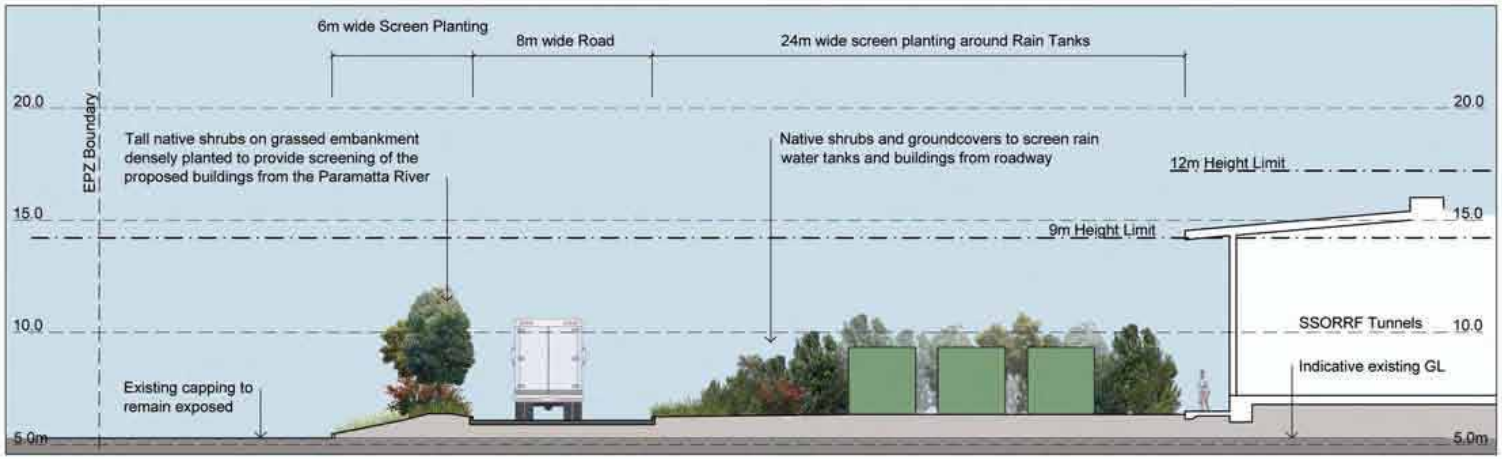
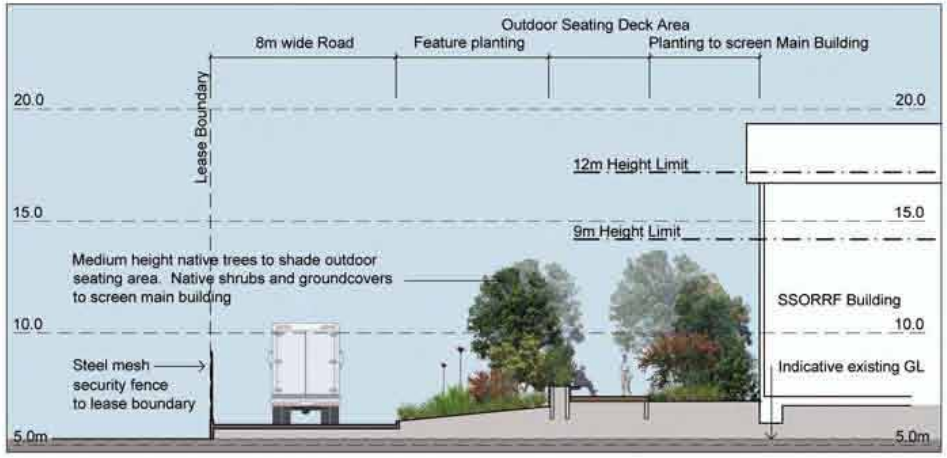


Figure 4.16 **Landscape Master Plan**



Section A-A - Approx scale 1:250 at A3



Section B-B - Approx scale 1:250 at A3

Section C-C
Approx scale 1:500 at A3

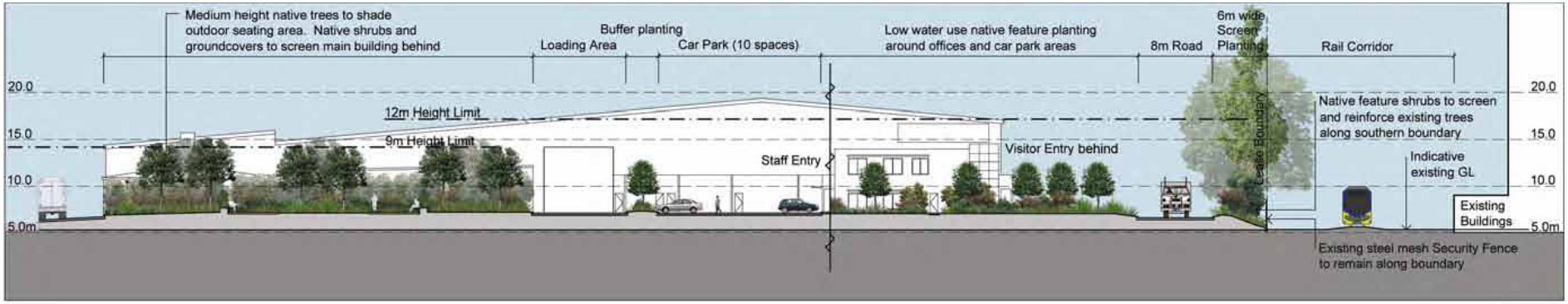


Figure 4.17 **Landscape Sections**