WATER MANAGEMENT PLAN and WATER BALANCE

at

16 KERR ROAD INGLEBURN

for

BULK RECOVERY SOLUTIONS c/- KDC Pty Ltd

Project No. 180009

Revision: C

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1. Introduction

DRB Consulting Engineers (DRB) were engaged by KDC to undertake a Water Management Plan and Water Balance for the proposed submission to the Department of Planning to increase operating capacity of the existing Bulk Recovery Solutions facility, located at 16 Kerr Road, Ingleburn.

The purpose of this report is to investigate the civil engineering items outlined in the Secretary's Environmental Assessment Requirements (SEARs) and provide recommendations on inclusions within the proposed submission to ensure all relevant guidelines have been met.

Specifically, this report will provide comment on the impacts the proposed development will have on the following existing water elements:

- Stormwater Drainage Network and Overland Flow Paths.
- Onsite Stormwater Detention and Water Quality.
- Water Reuse and Demand on Mains Supply.
- Flood Levels and Conveyance.

2. Site Description & Proposed Development

The site is located on the eastern side of the Kerr Road cul-de-sac, Ingleburn. The site is bordered by Kerr Road to the west, Henderson Road to the northeast, an existing railway line to the south east and by existing industrial developments on the remaining sides.

At the time of this investigation, the site supported an existing industrial building with concrete hardstand area covering the remainder of the site.

The site currently supports the existing Bulk Recovery Solutions (BRS) operation.

It is proposed that the proposed development involves the following:

- Increase the volumes of waste that can be processed on site from up to 30,000 tonnes per annum (tpa) to up to 225,000 tpa of liquid and solid waste;
- Store up to 90,000 tonnes (t) of waste and / or waste for transfer at any one time;
- Vary the waste types that can be accepted on site
- Solid waste processing including screening, crushing and PASS/ASS treatment;
- Liquid waste processing including oily water, grease, sewer, silt and debris;
- Solid and liquid waste transfer;
- 24 hour operation of liquid and muddy waste processes;
- Extended operation of concrete batching from 3am; and
- Upgrade of approved concrete batching equipment with continued production of approved 50,000tpa.

It is our understanding that in order to meet the demands of the proposed expansion, the modification to existing plant and introduction of new plant will be required. However, there is no proposal to modify or amend the existing building or hardstand areas.

3. Stormwater Drainage Network and Overland Flow Paths

3.1 Information Provided

The following documents and information was provided to help determine the existing stormwater drainage flow regimes for the site.

- Detailed Site Survey – Prepared by Delfs Lascelles – Reference 18171.1.Rev1 – Dated 26.03.18
- Plan for Stormwater Collection – Prepared by BRE – Provided on 20.06.18
- Email correspondence between DRB and BRE dated 2.06.18 and 3.06.18.

Furthermore, a meeting was held between DRB, KDC and BRE on 11.07.18. During this meeting, information was provided verbally outlining the location of existing stormwater catchment areas.

3.2 Existing Development

A summary of the existing stormwater drainage and overland flow paths, as identified using the information above and visual inspection, can be seen below:

- The roofwater from 3,036 m^2 is directed to 2 x 10kL above ground rainwater tanks. Water contained within these tanks are used for external irrigation, with overflow directed to the existing stormwater drainage network.

- The roofwater from the remaining 2,607 m^2 is conveyed directly to the existing stormwater drainage network.

- Runoff from 3,932 m^2 of the concrete pavement area is directed to the onsite 'dirty' water aboveground storage area (426.5 kL). The water captured within this area is pumped to the Silo storages located within the site for use in site operations and dust suppression. In the event that the pavement storage area is filled to capacity during a major storm event, overflow is directed to the existing stormwater drainage network.

- Runoff from the remaining 3,369 m^2 of the concrete pavement area is conveyed directly to the existing stormwater drainage network.

- The northeastern portion of the site was burdened by a 30m wide easement. It is understood that this easement was created to allow overland flow from the railway line land to traverse the site, over the northernwestern boundary.

- A 2m wide easement to drain water was also located adjacent to the northwestern boundary. It is understood that this easement contained a subsurface 900mm diameter pipe, conveying flows from the Kerr Street cul-de-sac, whilst also providing an overland flow path from Kerr Street.

It should be noted that, Council was contacted to provide comment on the accuracy of the above summary, however, at the time of preparing this report, additional information was not provided.

3.3 Proposed Development

As discussed above, it is our understanding that the proposed development will consist of the modification to existing plant and introduction of new plant. However, there is no proposal to modify or amend the existing building or hardstand areas.

Furthermore, there is no proposal to modify existing pavement levels within the site, specifically noting no changes to the existing surface levels within the existing easements.

As such, there will be no impact, negative or otherwise, to the existing stormwater drainage network and/or overland flow paths.

4. Onsite Stormwater Detention and Water Quality

4.1 Onsite Stormwater Detention

It is reasonable to assume that, in order to obtain approval for the current operation, the submitted documentation (at the time of the approval) had to adequately demonstrate the sites ability to manage post-development flows.

As the proposed development does not result in an increase in impervious area, there is no increase in post-developed runoff, and as such, no requirement for Onsite Stormwater Detention (OSD).

However, for the purposes of due diligence, the site's requirement for OSD was assessed in accordance with Council's guidelines. The calculations can be seen below.

Pre-Development Flow Rate

$^{Pre}Q_{100}$ = C x I x A
= 0.362 x 214 x 12,944
= 355.5 L/s

Post-Development Flow Rate

$^{Post}Q_{100}$ = C x I x A
= 0.992 x 214 x 12,944
= 763.1 L/s

Onsite Stormwater Detention (OSD)

Volume = ($^{Post}Q_{100}$ - $^{Pre}Q_{100}$) x 5min x 60
= (763.1 – 355.5) x 5 x 60
= 122.3 kL

The proposed development will have the pump out from the pavement storage area increased to 130 kL/day. As such, a minimum storage volume of 122.3 kL will be available in any 24 hour period and therefore, OSD requirements are met.

4.2 Water Quality

The site can be broken up in to 4 areas:

- **'Dirty' water** – This includes the area of pavement which is directed to the pavement storage and settling ponds for use and filtering within the sites operations.
- **Roofwater to Tank** – This includes the roofwater runoff that is directed to the existing above ground tanks for reuse in irrigation.
- **Roofwater to Stormwater** – This includes the roofwater runoff that bypasses the rainwater tank and is conveyed directly to the stormwater network.
- **'Clean' water** – This includes the remaining area of pavement which is collected and conveyed directly to the stormwater drainage network to the legal point of discharge.

As outlined within the OSD section (4.1) above, it is reasonable to assume that, in order to obtain approval for the current operation, the submitted documentation (at the time of the approval) had to adequately demonstrate the sites ability to treat post-development flows to improve runoff water quality.

As the proposed development does not result in an increase in impervious area, or an introduction of pollutants to the areas where runoff will occur, there is no decrease in post-developed runoff quality, and as such, no requirement for additional Water Quality (WQ) treatment measures.

However, for the purposes of due diligence, the site's requirement for WQ was assessed in accordance with best practice guidelines. The assessment and/or recommendations can be seen in the Table 1 below.

Table 1 – Runoff Catchments and WQ Recommendations

'Dirty' Water	A detailed water balance was undertaken on both the existing and the proposed operations (see Section 5). The water balance confirmed that runoff from the dirty water area will only overflow to the stormwater drainage network should there be more than **17.3mm** of rainfall fall in a 24 hour period. A rainfall event of this size, or larger, is considered outside the parameters of WQ assessment (3 month – 1 year storm events) as pollutants captured within the runoff would be significantly diluted.
Roofwater to Tank	Roofwater that is collected in the above ground rainwater tanks are reused within the site for irrigation. This is considered an acceptable means of treatment. As the tank fills it will act as a settling pond, removing sediment and improving the quality of water used in irrigation and/or overflowing to the stormwater drainage network.
Roofwater to Stormwater	Roofwater that it conveyed directly to the stormwater drainage network is susceptible to high concentrations of pollutants during smaller storm events (3 month – 1 year storm events). At the time of the inspection, a first flush device did not appear to be present. *In order to improve the runoff from the roofwater to an acceptable measure, it is recommended that a first flush tank be provided that collects a minimum of the first **1.0mm** of the storm event runoff.*
'Clean' Water	Runoff from the concrete pavement area outside the 'Dirty' Water area is conveyed directly to the stormwater drainage network. At the time of the inspection, it did not appear as though any WQ treatment devices were installed to treat runoff within this catchment. *In order to improve the runoff from the concrete pavement to an acceptable measure, it is recommended that **SPEL Stormsacks** (or approved equivalent) be installed in all surface inlet pits.*

5. Water Reuse and Demand on Mains Supply.

5.1 Existing Site Operations

Whilst only a very small amount of water is actually required for their operations, in order to reduce the facilities demand on water mains Bulk Recovery Solutions collects as much water as possible, treats it and reuses it within the site for irrigation, dust suppression via sprinklers and dust suppression via water cartage.

Once used for dust suppression, the remaining portion of water that is collect on the surface will be collected again, before being treated again, and reused again for dust suppression.

A flow model was provided by Bulk Recovery Solutions which indicated the existing operations, whilst a meeting was held onsite between BRS, KDS and DRB to discuss these operations, specifically with reference to input parameters and values for the water balance equation. Table 2 below outlines the operations. This information formed the basis of the Water Balance (See Section 5.2) for the existing site operations. Please note, the water balance ignored catchments that were conveyed directly to stormwater.

Table 2 – Existing Operations

Rainwater Tank	The rainwater tanks are 20kL in size and collect runoff from 3,036 m^2 of roofwater. Overflow from this tank is conveyed directly to the stormwater drainage network. The water captured and stored within this tank is used in external irrigation of 180m^2 of garden beds. An irrigation rate of 3mm/day was adopted for the water balance calculations. This represented an average of anticipated irrigation rates of 0mm/day (wet periods) to 5mm/day (dry periods). If this tank is empty, irrigation does not occur.
Pavement Storage Area	The pavement storage area collects runoff from 3,932m^2 of pavement area and has a storage capacity (above ground) of 426.5kL. Further to rainfall, the pavement area also collects a percentage of the water used for dust suppression within its catchment. For the purposes of the water balance calculations, it was assumed that 25% of all water discharged from the sprinkler system and 75% of all the water discharge directly to pavement (truck cartage) was returned to the system. The pavement storage area is pumped to the silo storage tanks at a rate of 40kL/day. If the storage area is empty, water is not pumped to the silos. If the pavement storage area is full, 340kL of water cartage trucks will be made available to store the excess water and feed it back in to the system once permanent water storage is made available. It has been assumed that the pump rate will increase, as required, to ensure all stored water is fed back into the system asap. In the event of a major storm event where the cartage trucks cannot handle the excess volumes, the overflow will be discharged direct to the stormwater drainage network.

Silo Storage Tanks	The silos have a combined storage volume of 245kL. Water collects in the pavement surface storage area (and subsequent water cartage trucks if utilised) before being pumped to the silos at a rate of 40kL/day. Once the Silo storage is full, the secondary storage tanks (see mixing/sludge tanks below) accepts the water. If the secondary storage tanks, and Silo storage is full, water is then discharged to sewer. The maximum allowable discharge to sewer is 2L/s, or 172.8kL/day. Water storage volumes and pump rates must be managed carefully onsite to ensure this limit is not exceeded. The water stored in the silos is used for dust suppression via sprinklers and water cartage. There are 11 sprinklers located on site which run 24 hours a day and require 71.5kL/day of water supply (combined). Water cartage is run sporadically throughout the day, as required, with 120kL of water supply required. If reused water is not available, water cartage will stop, however, mains supply will be used to ensure the sprinklers continue to operate at full capacity.
Flocculation and Mixing/Sludge Tanks	The flocculation tank is filled once a day with 990L of mains water before being pumped to the mixing and sludge tanks. The mixing and sludge tanks have a combined storage of 115kL. As discussed above, if the Silos are full, the excess water is directed to these storage tanks. Within these tanks suspended solid particles are removed (20%) and the water (80%) is directed, via a filter press, to the pavement storage area.

5.2 Water Balance - Existing Site Operations

A water balance was prepared using Microsoft Excel. The water balance used 150 years of daily rainfall data obtained from the Bureau of Meteorology (BOM) from the weather stations:

- 67015 - Bringelly (Maryland) – 1967 – 1991
- 66190 - Ingleburn - 1992-2018

The assumptions and parameters provided by Bulk Recovery Solutions, and as summarised in Table 2 above, formed the basis of the Water Balance analysis.

The results of the water balance can be seen summarised in Table 3 below.

Table 3 – Water Balance - Existing Operations

Average daily top up from mains supply	44.9 kL/day
Reuse efficiency	37.6%
Number of days (over 150 years) runoff overtops pavement storage	20 days
Smallest rainfall event that results in runoff overtopping pave. storage	91.90 mm (in 24hrs)
Maximum daily discharge to sewer (allowable 172.8kL/day)	74.49 kL/day
How often all storage tanks are empty at end of 24hr period	69%

Due to the size of the file, a copy of the water balance spreadsheet has not been provided within this report. However, should the full water balance spreadsheet be required, please let DRB Consulting Engineers know.

5.3 Proposed Site Operations and Water Balance

The proposed development involves the following:

- Increase the volumes of waste that can be processed on site from up to 30,000 tonnes per annum (tpa) to up to 225,000 tpa of liquid and solid waste;
- Store up to 90,000 tonnes (t) of waste and / or waste for transfer at any one time;
- Vary the waste types that can be accepted on site
- Solid waste processing including screening, crushing and PASS/ASS treatment;
- Liquid waste processing including oily water, grease, sewer, silt and debris;
- Solid and liquid waste transfer;
- 24 hour operation of liquid and muddy waste processes;
- Extended operation of concrete batching from 3am; and
- Upgrade of approved concrete batching equipment with continued production of approved 50,000tpa.

With regard to water reuse and the demand on mains supply, the proposed development will include a new liquid waste resource recovery operation. The liquid waste operation will increase water supply by approximately 208 kL/day.

In order to capture as much of this increased supply, and to address OSD issues on the site (See Section 4.1), it is proposed to increase the pump rate from the pavement storage area to 130 kL/day.

The results of the water balance for the proposed operations can be seen summarised in Table 4 below.

Table 4 – Water Balance - Proposed Operations

Average daily top up from mains supply	0 kL/day
Reuse efficiency	100%
Number of days (over 150 years) runoff overtops pavement storage	1866 days
Smallest rainfall event that results in runoff overtopping pave. storage	17.30 mm (in 24hrs)
Maximum daily discharge to sewer (allowable 172.8kL/day)	164.49 kL/day
How often all storage tanks are empty at end of 24hr period	0%

5.4 Proposed Site Operations Outcomes

With reference to the Water Balance analysis, and the results outlined in Table 3 and Table 4 above, the following conclusions can be made with regard to the introduction of the liquid waste operation:

- The water reuse efficiency will increase to 100% with no top up from the mains supply required.
- The maximum daily discharge to sewer will increase to 164.49 kL/day, however, this is still below the allowable 172.8 kL/day.
- The storage tanks will never be empty.
- The number of times the pavement storage area will overflow to stormwater will increase to 1866 individual days, with the minimum rainfall event required to overtop reducing to 17.30 mm (in 24 hours). However, it is our understanding that Sydney Water requirements state that the first 10mm of a rainfall event should be captured onsite with the rest allowed to runoff. As such, 17.30 mm (in 24 hours) is considered adequate.

5.5 Water Balance Limitations

The Water Balance spreadsheets have been prepared based on the assumptions, parameters, information and guidance provided by Bulk Recovery Solutions. Whilst due care has been undertaken by DRB to cross-reference the values provided with available information, DRB can not confirm the accuracy of the values provided.

Furthermore, the rainfall values are based on recorded daily rainfall obtained from the BOM, with all recorded rainfall falling consistently across the 24 hour period. The water balance has been prepared with this in mind, using 24 hours as the time increment for the assessment. However, it should be noted that this is theoretical only. The “real-life” behaviour of rainfall, as well as site operations and water usage, is not likely to be as consistent as the water balance projections.

6. Flood Levels and Conveyance.

At the time of preparing this report, the Flood Study for the Bow Bowing Bunbury Curran Creek Catchment was still being finalised, and as such, the results were not available.

Council was contacted to discuss the site and whether or not flooding was an issue, however, the Council engineer confirmed that he could not provide any information.

Regardless, as discussed above, it is our understanding that the proposed development will consist of the modification to existing plant and introduction of new plant. However, there is no proposal to modify or amend the existing building or hardstand areas, including the existing finished floor levels.

As a result, it can be concluded that, the proposed development:

- Will not increase flood levels on the site or its neighbouring sites.
- Will not have a negative effect on existing flood levels.
- Will not increase the risks to occupants of the site.

7. Conclusion

DRB Consulting Engineers prepared this Water Management Plan and Water Balance for the proposed submission to the Department of Planning to increase operating capacity of the existing Bulk Recovery Solutions facility, located at 16 Kerr Road, Ingleburn.

It can be concluded from the investigation that:

- The existing Stormwater Drainage Network and Overland Flow Paths will not be affected as a result of the proposed development.
- With some minor alterations to the proposed operation Onsite Stormwater Detention can meet Council's guidelines. Furthermore, with the introduction of a few minor treatment measures, the Water Quality of site runoff can be improved to industry standards.
- The proposed operations will improve Water Reuse and therefore reduce the Demand on Mains Supply. Whilst the frequency that stormwater will overflow the pavement storage area will increase, the size of the storm event that this occurs in is still within Sydney Water guidelines (as provided by the BRS).
- Flood Levels and Conveyance is not affected by the proposed development.

Should you require any further advice or clarification of any of the above, please do not hesitate to contact us.

Yours faithfully
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