Application to amend licence W-31

Water treatment

www. harveywater.com.au

South West Irrigation Management Cooperative t/a Harvey Water

PO Box 456 Harvey WA 6220

ABN: 54498176490

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APPLICATION SUMMARY

South West Irrigation Management Cooperative t/a Harvey Water intends to provide the following services in addition to the provision of non-potable water as specified in the current license WL-31:

Customer – Albemarle Lithium

- Treatment of non-potable water for process water at the lithium refinery in Kemerton. Filtration, chlorination and Reverse Osmosis;
- Treatment of non-potable water to potable water (135m3/day) for drinking, ablutions, irrigation, safety showers and wash down to a standard as defined by the Australian Drinking Water Guidelines (ADWG) – health guideline values. Monitoring and reporting of performance in line with ADWG requirements will comply with requirements.

Harvey Water will build (with MAK Water as the technology designer and supplier) install, maintain and operate the infrastructure as a service to Albemarle. This includes maintaining efficient daily operation, scheduled and emergency maintenance, and managing the monitoring and reporting of water quality criteria in accordance with:

- Australian Drinking Water Guidelines 2018 (ADWG), The National Health and Medical research Council (NHMRC);
- Mine Sites and Exploration Camps Drinking Water Quality Monitoring Requirements (WA Department of Health (DoH) 2008;
- System compliance and routine reporting requirements for small community water providers (DoH) 2008;
- The conditions of the ERA and Harvey Water's operating license;
- Guidelines for the non-potable uses of recycled water in Western Australia (DoH) 2011.

The supply and treatment of water to Albemarle is for use within the boundaries of the Lithium plant in Kemerton and is not for delivery or consumption outside of these boundaries.

Whilst the water quality is of high interest to employees and other site specific stakeholders the nature of this service will not be contrary to public interest.

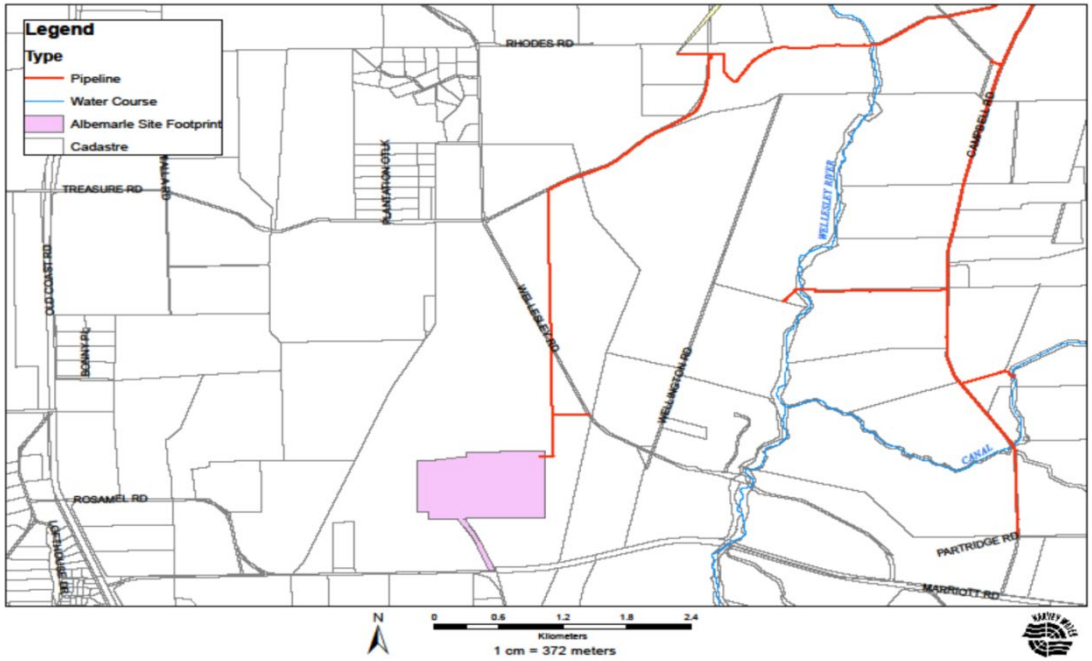
Harvey Water is currently sponsoring six employees to be trained in Water Treatment Operations to Certificate level III. This training will start on Monday 13th May 2019 and a second week takes place 15th -19th of July. The course will be completed in 2019. The training organisation is the regional and remote water specialist Simmonds and Bristow.

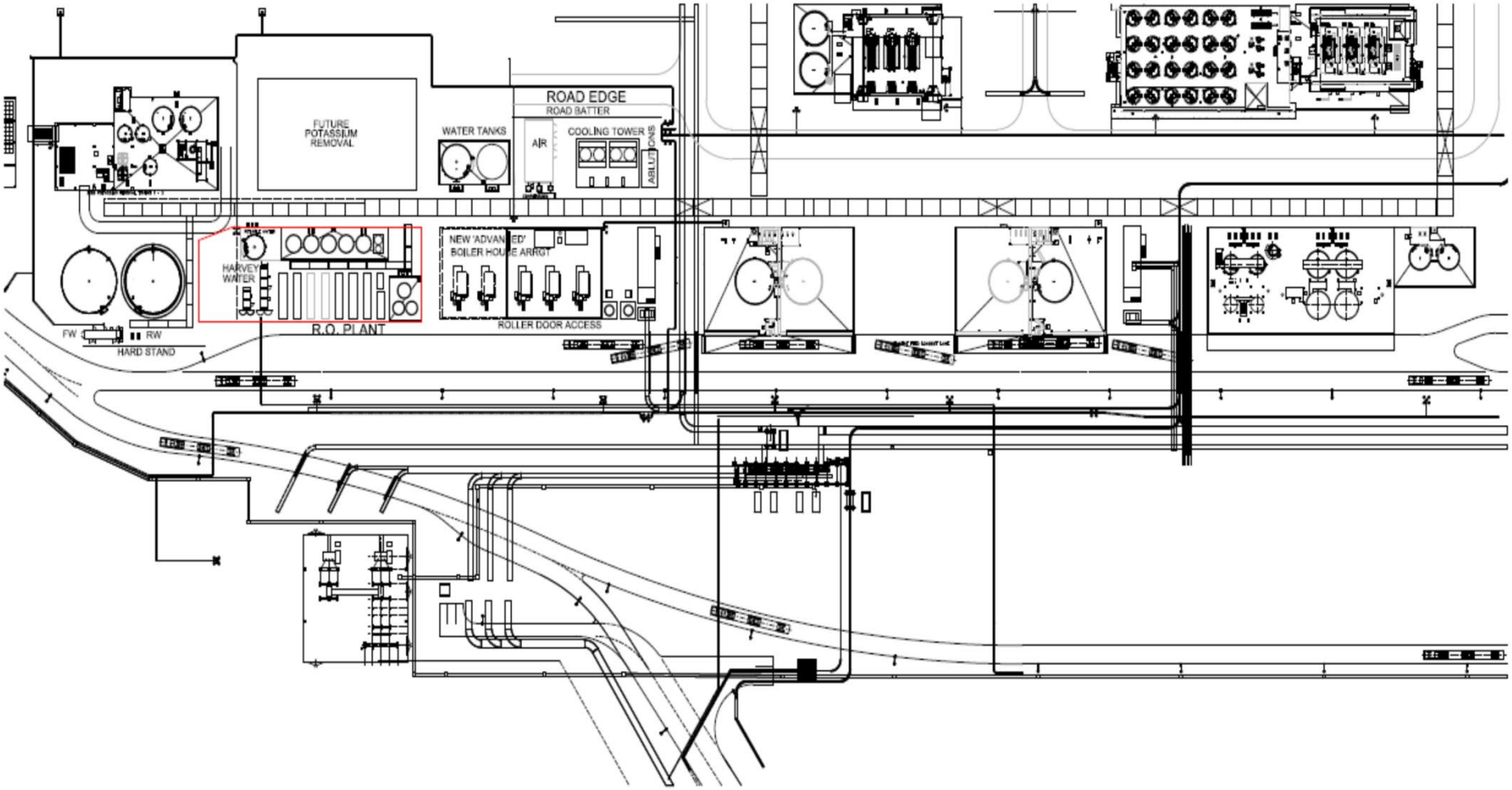
The Albemarle plant is located within the Kemerton the Industrial Area. As part of this application Harvey Water requests to extend our licensed area to encompass the whole of the Kemerton area for both potable and non-potable water provision; see the attached maps and accompanying GIS Shapefiles.

TECHNICAL INFORMATION

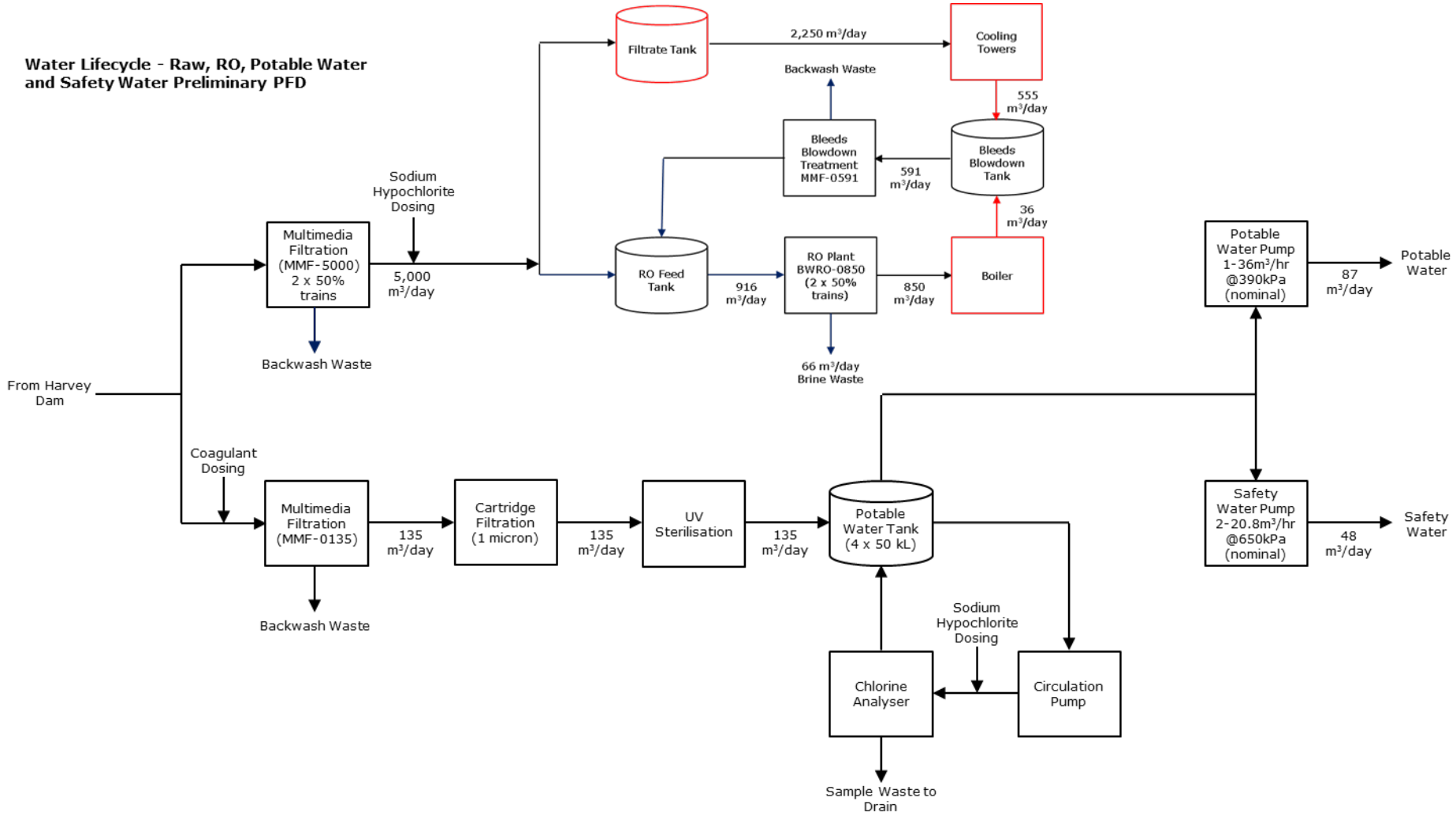
The water treatment plant and equipment will operate within the boundaries of the Albemarle Lithium plant at Kemerton Industrial Area off Marriot Rd in Benger near Harvey. The site is controlled access with no public access.

Water is delivered from the Harvey Dam via a HDPE pipeline to the site. The water is then filtered and treated according to the quality required for each product, potable or process water. See the flow diagram below illustrating the water cycle.




FUTURE
POTASSIUM
REMOVAL
WATER TANKS
ROAD EDGE
ROAD BATTER
AIR
COOLING TOWER
ABLUTIONS
HARVEY
WATER
R.O. PLANT
NEW 'ADVANCED'
BOILER HOUSE ARRGT
ROLLER DOOR ACCESS
FW
RW
HARD STAND

Volume Supplied (kilolitres or cubic metres/day)	Up to 5000m3/day	Up to 87m3/day	Up to 48m3/day	Up to 916m3/day (lose 66m3 to Brine)- 850m3 produced	Secondary treatment Return Stream Up to 591m3/day*
"Raw Water" (MMF treated) total 2.25 ML/day to Cooling Towers	✓				
Potable 1 (Ablutions, drinking)		✓			
Potable 2 (Safety Water, EM shower etc)			✓		
Reverse Osmosis (Process water)				✓	
Return stream* (Albemarle Cooling tower bleeds and boiler blowdown water)					✓


Water Lifecycle - Raw, RO, Potable Water and Safety Water Preliminary PFD
From Harvey Dam
Multimedia Filtration (MMF-5000) 2 x 50% trains
Sodium Hypochlorite Dosing
5,000 m³/day
Backwash Waste
Filtrate Tank
2,250 m³/day
Cooling Towers
Backwash Waste
555 m³/day
Bleeds Blowdown Treatment MMF-0591
591 m³/day
Bleeds Blowdown Tank
36 m³/day
RO Feed Tank
916 m³/day
RO Plant BWRO-0850 (2 x 50% trains)
850 m³/day
Boiler
66 m³/day Brine Waste
Potable Water Pump 1-36m³/hr @390kPa (nominal)
87 m³/day
Potable Water
Coagulant Dosing
Multimedia Filtration (MMF-0135)
135 m³/day
Backwash Waste
Cartridge Filtration (1 micron)
135 m³/day
UV Sterilisation
135 m³/day
Potable Water Tank (4 x 50 kL)
Safety Water Pump 2-20.8m³/hr @650kPa (nominal)
48 m³/day
Safety Water
Sodium Hypochlorite Dosing
Chlorine Analyser
Circulation Pump
Sample Waste to Drain

Raw Water Supply (MMF treated delivered dam water)

Produced from a **filtration** plant at a rate of **2.5ML/day** initially and then ramping up to **5ML/day** at full demand capacity. This plant will undertake the initial reduction of total suspended solids (TSS), turbidity and the **removal of E.coli** in raw water and provide a chlorine residual for disinfection. The raw water produced will be used both to supply Albemarle cooling towers and for further treatment to produce other grades of water required, - notably RO water.

Potable Water Supply

The water undergoes separate coagulation, media filtration and disinfection (including ultra-violet (UV) treatment) of dam water to produce 87 m3/day of potable water compliant with Australian Drinking Water Guidelines (ADWG) health guideline requirements. This water will be used by Albemarle for human consumption and where there is extensive human contact including kitchens, ablutions, irrigation, laboratory etc.

Potable Safety Water

– shares a common coagulation, media filtration and disinfection (including ultra-violet (UV) treatment) as the aforementioned 87m3/day of potable above to produce and additional 48 m3/day of safety shower water compliant with ADWG health guideline requirements.

Potable distribution pumps.

Reverse Osmosis Water Supply

– Produced as the product of additional processing of a blend of raw water from the above and bleed water streams generated from within the Albemarle plant (cooling towers and boiler). This water is processed through a RO plant to produce 850m3/day of permeate to further reduce the total dissolved solids (TDS). This water will be used by Albemarle for process water, wash down hoses and steam production.

TECHNOLOGICAL PARTNER

The water treatment plants will be supplied by **MAK Water**:
- Process water
- Potable water
- Reverse Osmosis (RO)

The construction of the industrial site commenced in January 2019. The water treatment modules are to be installed in the third quarter of 2019.

The water is metered through a magnetic flow meter Emflux i-500 by Aquamonix installed with a data-logger connecting back to our main office via the internet.

Our current Asset Management System (AMS) will be used to manage the plant maintenance and record all maintenance events.

Harvey Water is training six people to a level of Certificate III in Water Treatment Operations

https://www.makwater.com.au/

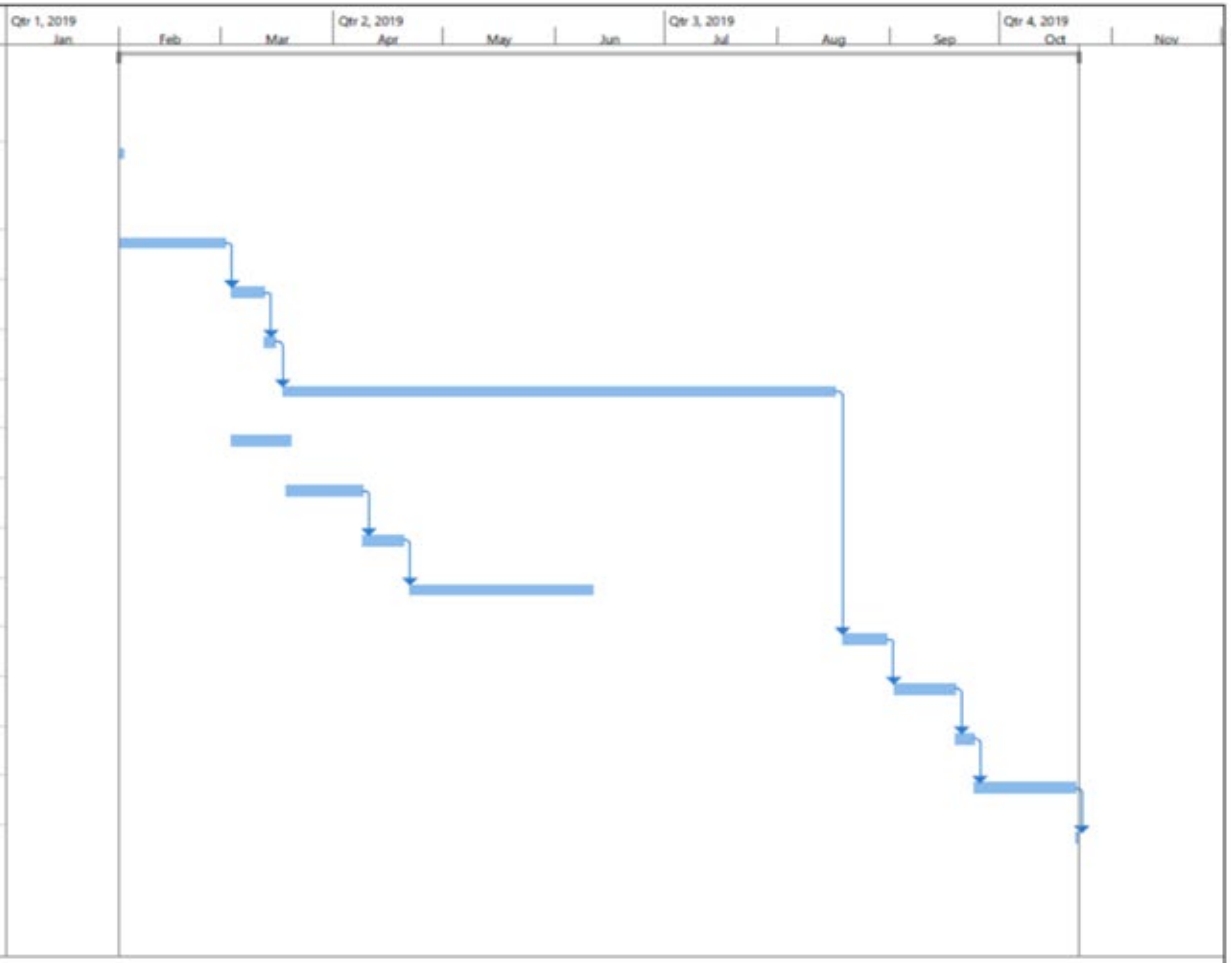
CUSTOMER CONTRACTS

Contract arrangements are fully negotiated between the parties A commercial contract to supply water from Harvey Water to Albemarle has been executed. A commercial agreement to carry out the water treatment process (WTP) as a service is in draft format.

The capital investment in the WTP is Albemarle's responsibility. The WTP contract provides for Harvey Water to carry out the operations and maintenance of the plant.

Program to installation

ID	Task Mode	Task Name	Duration	Start	Finish
0		**180530 Albemarle WTP Kemerton**	**188 days**	**Fri 1/02/19**	**Tue 22/10/19**
1		Submission to Albemarle	1 day	Fri 1/02/19	Fri 1/02/19
2		Clarification period	21 days	Fri 1/02/19	Fri 1/03/19
3		PO receipt for orde	7 days	Mon 4/03/19	Tue 12/03/19
4		Order placed with	3 days	Wed 13/03/19	Fri 15/03/19
5		Build of WTP	22 wks	Mon 18/03/19	Fri 16/08/19
6		Civil planning	12 days	Mon 4/03/19	Tue 19/03/19
7		Mobilise onsite	15 days	Tue 19/03/19	Mon 8/04/19
8		Pad installation	9 days	Tue 9/04/19	Fri 19/04/19
9		Concrete cure	36 days	Mon 22/04/19	Mon 10/06/19
10		WTP installation	10 days	Mon 19/08/19	Fri 30/08/19
11		WTP commisioning	13 days	Mon 2/09/19	Wed 18/09/19
12		Operater familiaris	3 days	Thu 19/09/19	Mon 23/09/19
13		Validation monitor	4 wks	Tue 24/09/19	Mon 21/10/19
14		Issue Certificate of practical completion	1 day	Tue 22/10/19	Tue 22/10/19



MAK Water Statement of Capability

Reliable Mining Expertise

EXPERIENCED. From the extreme heat of remote Australia and Africa, to the cold climates of Mongolia and Kazakhstan, MAK Water has delivered solutions for mining projects in the most challenging environments around the world.

EQUIPMENT RELIABILITY. In mining, equipment reliability is paramount. MAK Water has an established track record of manufacturing fully automated, high quality equipment for maximum reliability and minimum operator intervention.

FLEXIBLE SOLUTIONS. Our wide range of standard designs can be fully customised to meet project specifications. For short term requirements, rapidly deployable hire plants are available. Where project funds are better employed in other areas, MAK Water can offer a build-own-operate, or lease-to-own solutions.

INNOVATIVE DESIGNS. Our award-winning, pre-tested modular designs save time, reduce risk, and minimise installation costs and environmental footprint.

Where installed, ClearAccess™ Remote Monitoring enables MAK Water's Operations Specialists to assist your site team to diagnose problems, preventing unnecessary service call-outs and improving reliability and plant uptime.

END TO END SOLUTIONS. From the supply of process technology only, to turnkey installations, we can design, build, install, operate and maintain all your project's water treatment plants.

HEALTH, SAFETY AND THE ENVIRONMENT

MAK Water places the Health and Safety of our people, clients and contractors, and care of the Environment as our highest priority.

Mine Site Applications

From drinking and process water, to sewage and wastewater treatment, MAK Water's wide range of plant designs means we can meet all your mine project's water and wastewater treatment plant requirements.

EXPLORATION, CONSTRUCTION AND PERMANENT ACCOMMODATION CAMPS

- Potable/drinking water treatment plants, treating ground, surface or sea water
- Sewage treatment plants, for compliant discharge, or onsite reuse
- Pumping, storage and sterilisation solutions for sewage, potable or fire water
- Hire filtration, reverse osmosis and sewage treatment plants for short-term construction requirements

NON-PROCESS INFRASTRUCTURE

- Potable/drinking water treatment plants, treating ground, surface or sea water
- Sewage treatment plants, for compliant discharge, or onsite reuse
- Pumping, storage and sterilisation solutions for sewage, potable or fire water
- Oily water treatment and recycling systems for vehicle wash bays and workshops
- Demineralised water for boilers and cooling towers

PROCESS INFRASTRUCTURE

- Process water treatment
- Process wastewater treatment for compliant discharge or recycling
- Mine site remediation and treatment of wastewater

Planning

It make sense to engage with MAK Water early in the planning phase. Understanding your water and wastewater treatment options reduces risk by preventing unnecessary delays and maximising the use of your valuable resources.

MAK Water works collaboratively with your environmental and engineering teams to develop solutions for every stage of the mining life cycle, to meet your project objectives.

Services provided to support the investigation and planning stage of the project include:

- Technology selection and expert process advice
- Budgeting and value engineering
- Assistance with obtaining environmental approvals
- Supply of trial plants and piloting equipment

Design and Construction

Products and services provided to support greenfield sites and expansion of mine infrastructure:

- Supply of hire plants for construction water and temporary camps
- Supply of permanent water and wastewater treatment plants
- Installation, commissioning, performance testing and training
- Development of water and wastewater quality management plans
- Remediation and treatment of wastewater
- Operation, service and maintenance of water and wastewater assets
- Supply of chemicals, consumables and spare parts

Operations

Products and services provided to support mine infrastructure include:

- Supply of water and wastewater treatment plants
- Operation, service and maintenance of water and wastewater assets
- Plant reviews, upgrades, modifications and refurbishments
- Implementation of water and wastewater quality management plans
- Regulatory compliance monitoring and reporting
- Supply of chemicals, consumables and spare parts
- Supply of hire plants for temporary plant outages, upgrades etc.

Closure

Post operational and rehabilitation services include:

- Contaminated wastewater treatment for compliant discharge
- Irrigation water for plant nurseries
- Decommissioning and demobilisation of plant and equipment
- Remediation and treatment of wastewater

Solutions

BRACKISH WATER REVERSE OSMOSIS

Treat brackish ground, surface or industrial water to achieve potable water quality. Standard process includes pre-treatment, RO desalination and a clean-in-place (CIP) system for membrane cleaning. Add additional treatment steps as required.

SEA WATER REVERSE OSMOSIS

Treat sea water or high salinity ground water to achieve potable water quality. Standard process includes pre-treatment, RO desalination, auto flushing and a clean-in-place (CIP) system for membrane cleaning. Add additional treatment steps as required.

DEMINERALISED WATER REVERSE OSMOSIS

Treat fresh water to achieve high purity demineralised water. Standard process includes pre-treatment, two-pass RO desalination, permeate polishing with ion exchange or continuous electro-deionisation (CEDI), and a clean-in-place (CIP) system for membrane cleaning. Add additional treatment steps as required.

WASTEWATER / SEWAGE MOVING BED BIOREACTOR

Treat sewage to achieve Class C effluent for reuse in "low risk" applications, or spray field disposal. Standard process includes screening, biological degradation, clarification and sterilisation. With the optional Class A module, reuse in "medium risk" applications is possible.

WASTEWATER / SEWAGE MEMBRANE BIOREACTOR

Treat sewage to achieve Class A+ effluent for reuse in "high risk" applications. Standard process includes screening, biological degradation, ultrafiltration and sterilisation. Add additional treatment steps, such as enhanced nutrient removal, as required.

WORKSHOPS / WASH BAYS OIL WATER SEPARATOR

Remove free floating hydrocarbons (diesel, hydraulic fluid, oil) and heavier solids from wastewater (prior to discharge) for any wash bay where hydrocarbons are present. Add additional treatment steps for reuse as required.

MULTIMEDIA FILTRATION

Treat ground, surface, storm and waste water with suspended solids to achieve potable or process water. Standard process includes auto-backwashing multimedia filtration. Add additional filtration media and other treatment steps, such as sterilisation or pH correction, as required.

ULTRAFILTRATION

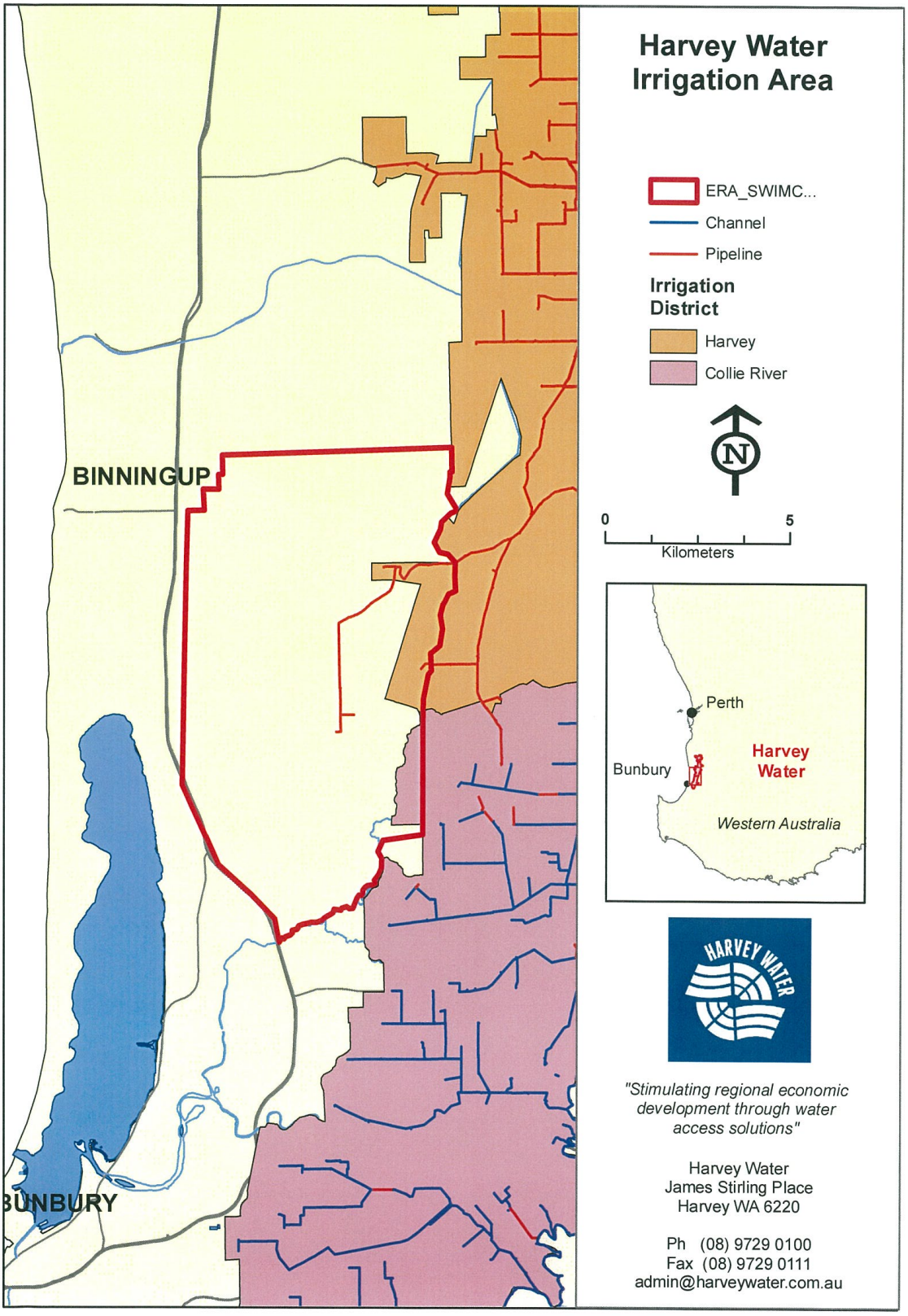
Treat ground, surface, storm and waste water to achieve ultra-clear filtrate that is free of viruses and bacteria. Standard process includes pre-filtration, ultrafiltration and automated membrane cleaning systems. Add additional treatment steps as required.

WATER STERILISATION

Automatically maintain the correct amount of free chlorine in a potable water storage tank, or use ultraviolet sterilisation to disinfect water, in accordance with Australian Drinking Water Guidelines.

AREA MAPS

Harvey Water application to amend license to incorporate potable water provision at industrial locations – proposed area map



Harvey Water application to amend license to incorporate the complete Kemerton Industrial Area into the licensed area for the provision of non-potable water