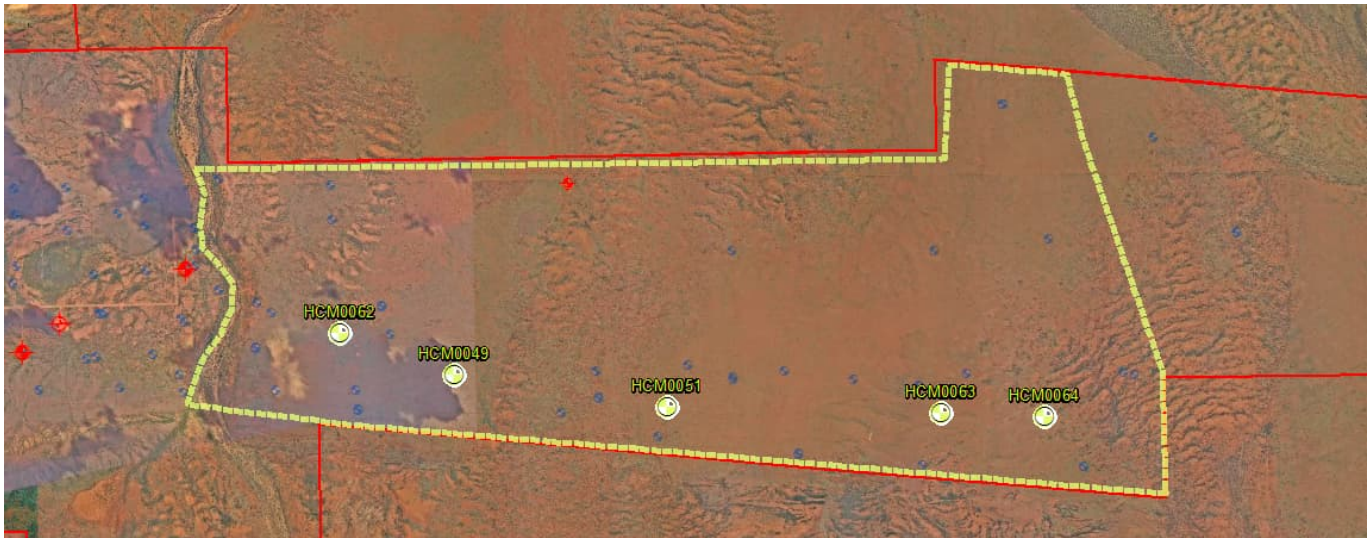
BHP

Caramulla East Phase 2 Test Pumping Discharge Management Plan

29 August 2024



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Purpose and Scope of Testing

The purpose of this document is to assess and address environmental concerns associated with groundwater discharged during the planned test pumping of bores in East Caramulla. The proposed test pumping is to be undertaken on bores completed during Phase 1 and Phase 2 of Caramulla drilling that was completed in 2021.

A total of 5 new bores were completed for the East Caramulla Phase 1 and Phase 2 program that are suitable for test pumping. The bores were completed as nominal monitoring bores; however their diameter enables them to be suitable for test pumping.

The bores are being tested to allow their supply potential to be assessed, as the bores may be used to supply water during injection testing of future bores (not yet drilled).

Test pumping is proposed to determine expected flow rates out of these bores, and to test conditions/responses in the surrounding aquifer.

All tested bores are located within the Lawson deposit of the Caramulla Project area. The aim is to contain the discharge within existing tenure. Discharge from the bores will be directed to existing sumps and to natural drainage where it will then run north-ward. The area is very flat, therefore there is potential for water may pool in places near the discharge location.

The wetting front is to be contained within the extents specified. If encroaching outside of this boundary the pump test may have to be terminated. This work is guided by the WAIO Discharge Management Standard; Controlled Document no. 0072882.

Table 1 below, provides approximate test types and test durations:

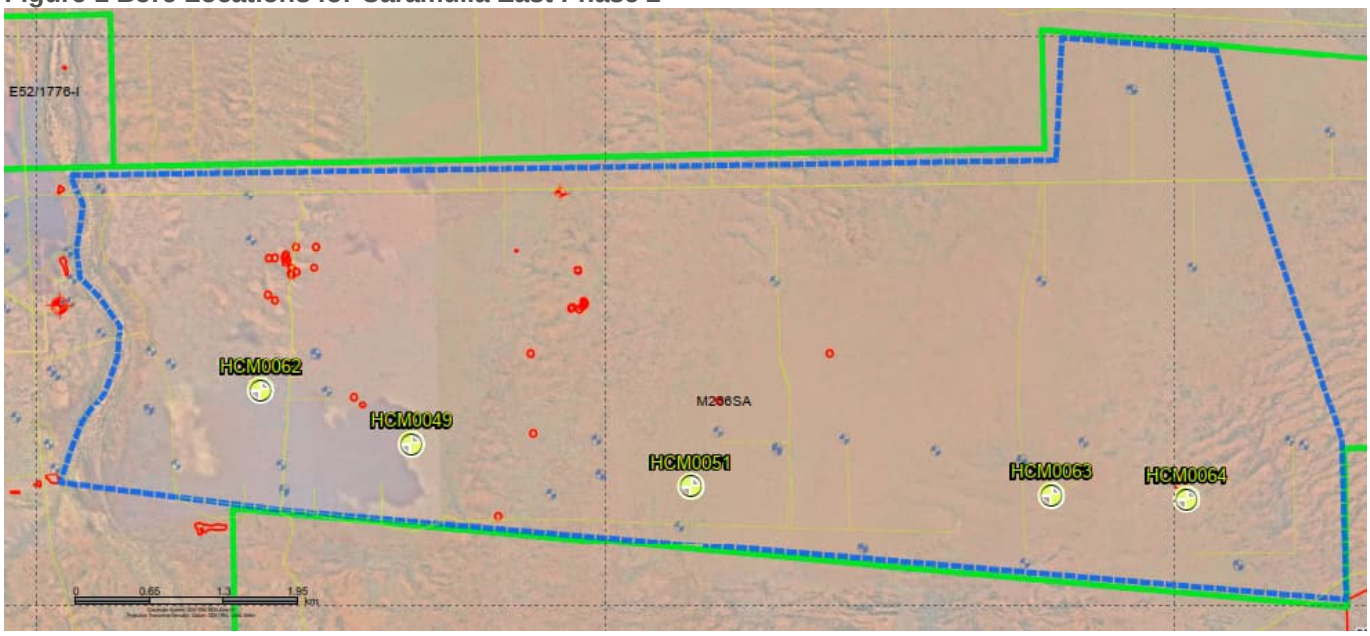
Table 1 - – Program scope

Program	No. of Bores	SRT	CRT	Total Days
FY24 Caramulla East SUR Phase 2 TP	5	1 day each	2-4 days each	30 (including calibration and set up/pack down)

Bore Locations

The Location of test bores for Caramulla East Phase 2 as shown below as Figure 1.

Figure 1 Bore Locations for Caramulla East Phase 2



Proposed Test Discharge Configuration – HCM0062

Primary discharge: Contain within sump and/or allow to drain to north. Layflat to be placed on existing or new tracks and orientated to avoid heritage areas. Test would be ceased if wetting front progresses close to heritage site (deemed unlikely given the expected duration and rates of tests). An alternative discharge option is to run layflat to the creek, but this would require new track to be cleared

Wetting front modelling – Representative wetting front modelling for Caramulla East area indicates that under worst case scenarios (high discharge rate of 90 Ls, for a period of up to 150 days), the wetting front would be limited to a distance of 1.3 km from the discharge location.

Figure 2 HCM0062 Testing

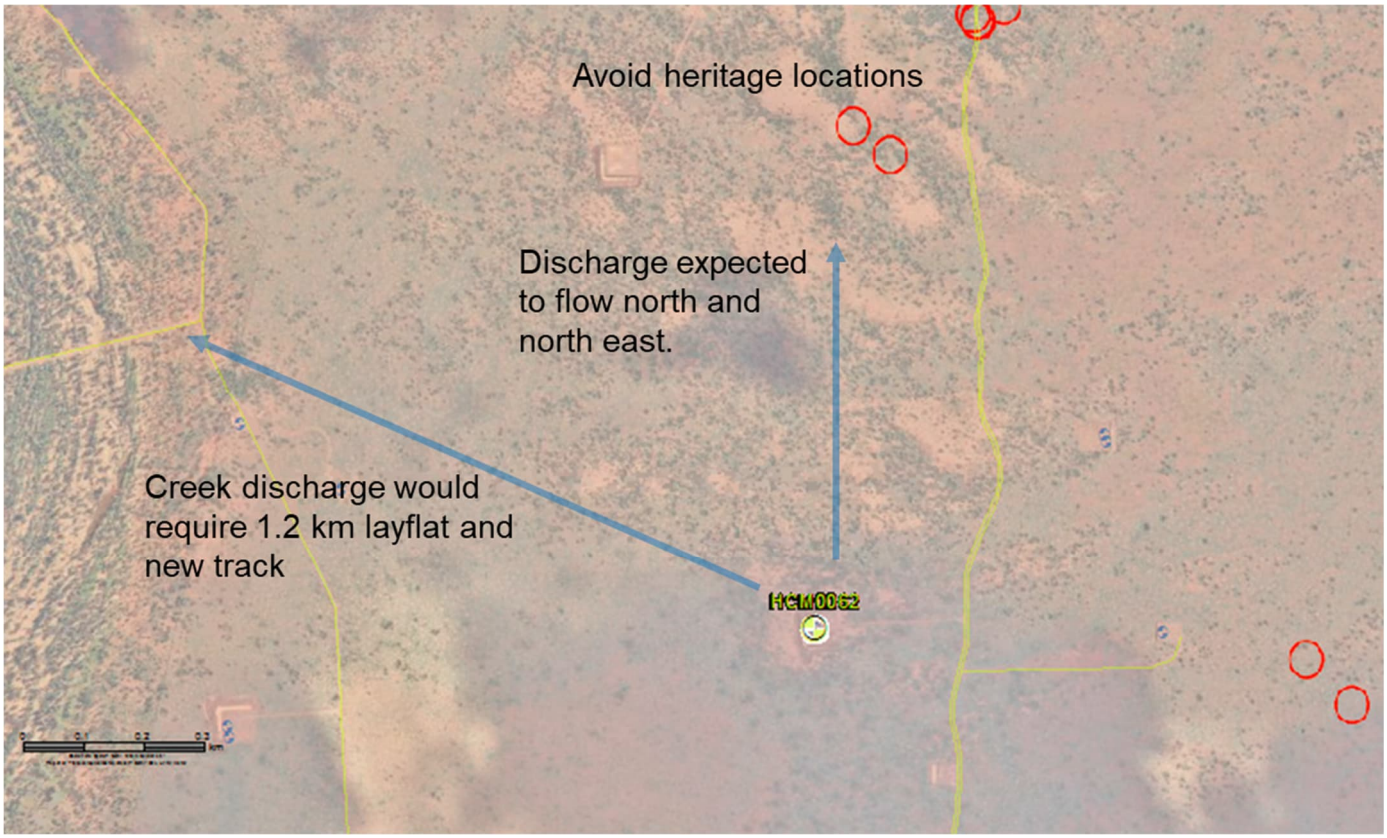


Table 2 - –HCM0062 Testing

Test Bore:	HCM0062
Bore depth:	240 m
Bore diameter:	200 mm (PVC)
Expected tests:	Calib, SRT 10-60 Ls, CRT, Recovery
Discharge considerations – sumps:	Existing sump is large L shape sump. Nominal volume of 1200 kL.
Discharge considerations – overflow:	Creek is 1.2 km to the west. Uncertain if the discharge will go in this direction or north.
Discharge restrictions:	Heritage sites 760 m to north, and 800 m to east. Avoid flooding north south track to east. Tenure boundary is far to north.

Proposed Test Discharge Configuration – HCM0049

Primary discharge: Contain within sump and/or allow to drain to north. Layflat to be placed on existing or new tracks and orientated to avoid heritage areas

Wetting front modelling – Representative wetting front modelling for Caramulla East area indicates that under worst case scenarios (high discharge rate of 90 Ls, for a period of up to 150 days), the wetting front would be limited to a distance of 1.3 km from the discharge location.

Figure 3 HCM0049 Testing

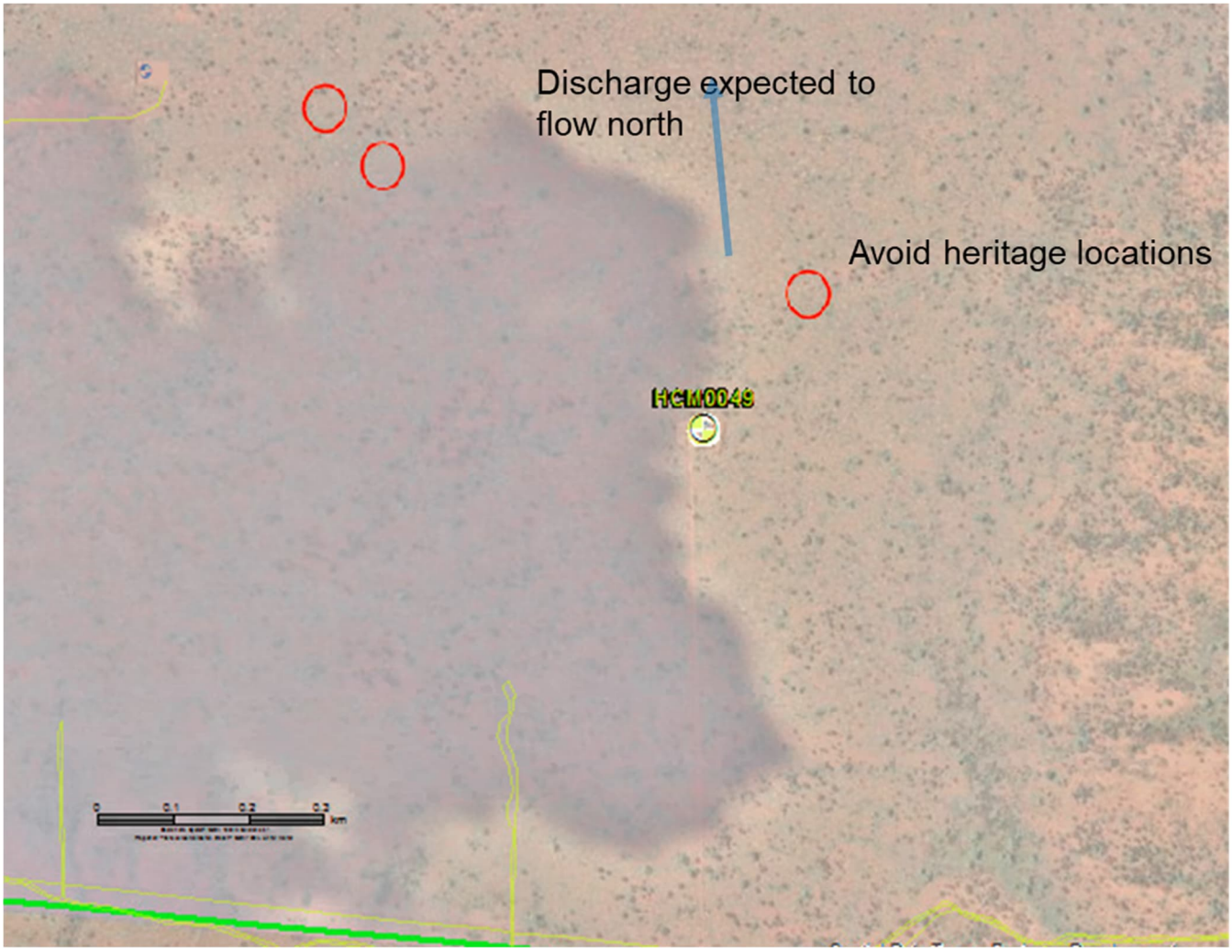


Table 3 - –HCM0049Testing

Test Bore:	HCM0049
Bore depth:	180 m
Bore diameter:	200 mm (PVC)
Expected tests:	Calib, SRT 10-50 Ls, CRT, Recovery
Discharge considerations – sumps:	Existing sump is small deep sump. Nominal volume of 600 kL.
Discharge considerations – overflow:	Likely that discharge will go to the north.
Discharge restrictions:	Heritage sites 200 m to north east, and 500 m to north west. Tenure boundary is far to north.

Proposed Test Discharge Configuration – HCM0063

Primary discharge: Contain within sump and/or allow to drain to north. Layflat to be placed on existing or new tracks and orientated to avoid heritage areas

Wetting front modelling: Representative wetting front modelling for Caramulla East area indicates that under worst case scenarios (high discharge rate of 90 Ls, for a period of up to 150 days), the wetting front would be limited to a distance of 1.3 km from the discharge location.

Figure 4 HCM0063 Testing

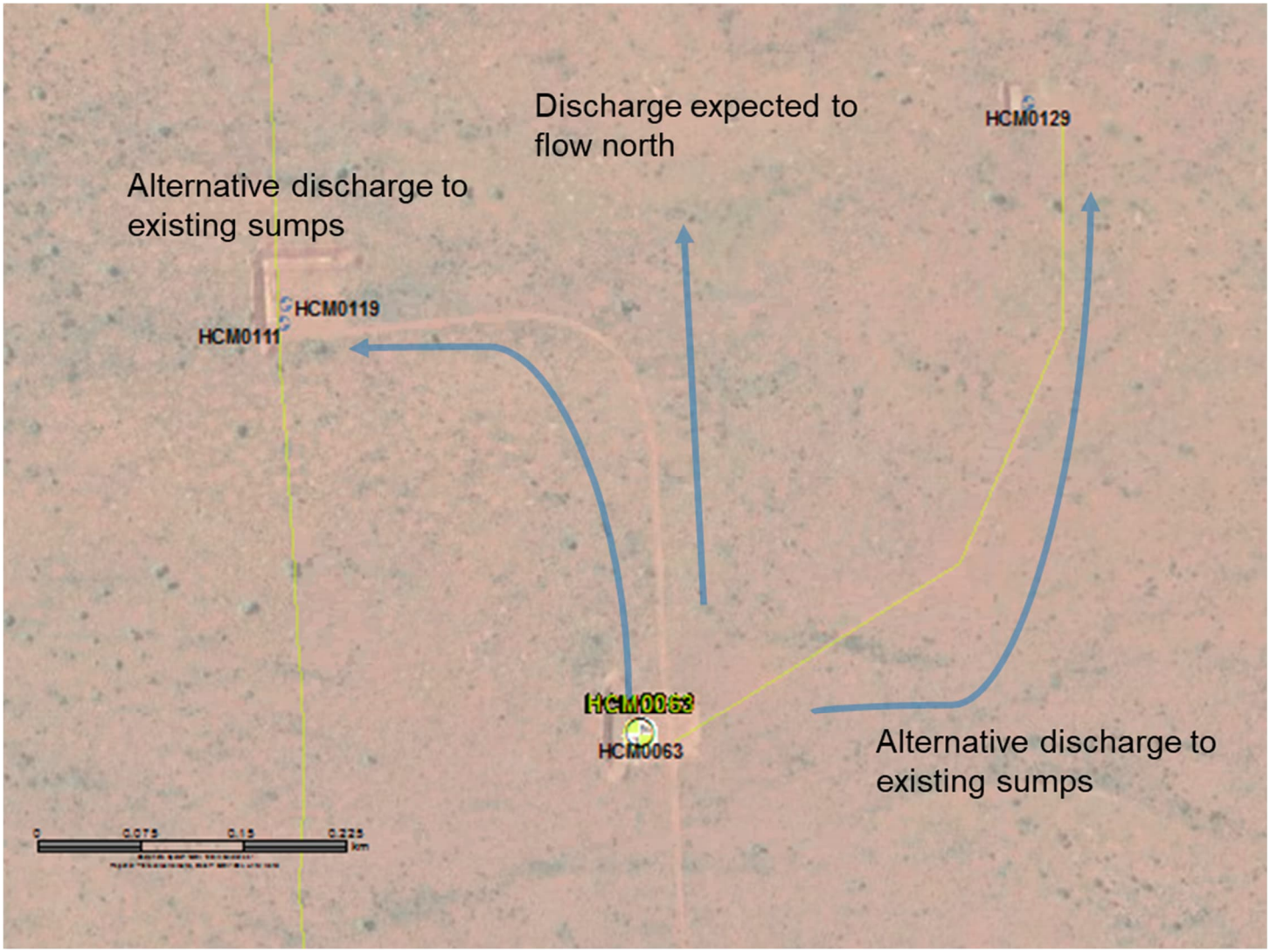


Table 4 - –HCM0063 Testing

Test Bore:	HCM0063
Bore depth:	292 m
Bore diameter:	220 mm (Steel)
Expected tests:	Calib, SRT 5-30 Ls, CRT, Recovery
Discharge considerations – sumps:	Existing sump is small deep sump. Nominal volume of 350 kL. Option to use HCM0111 (large L sump to north west) and/or HCM0129 large sump to north east.
Discharge considerations – overflow:	Likely that discharge will go to the north.
Discharge restrictions:	Heritage site to far east, unlikely in path of discharge. Track north from bore to be used to layflat, avoid flooding track. Tenure boundary is far to north.

Proposed Test Discharge Configuration – HCM0064

Primary discharge: Contain within sump and/or allow to drain to north. Layflat to be placed on existing or new tracks and orientated to ensure that discharge avoids heritage areas

Wetting front modelling: Representative wetting front modelling for Caramulla East area indicates that under worst case scenarios (high discharge rate of 90 Ls, for a period of up to 150 days), the wetting front would be limited to a distance of 1.3 km from the discharge location.

Figure 5 HCM0064 Testing

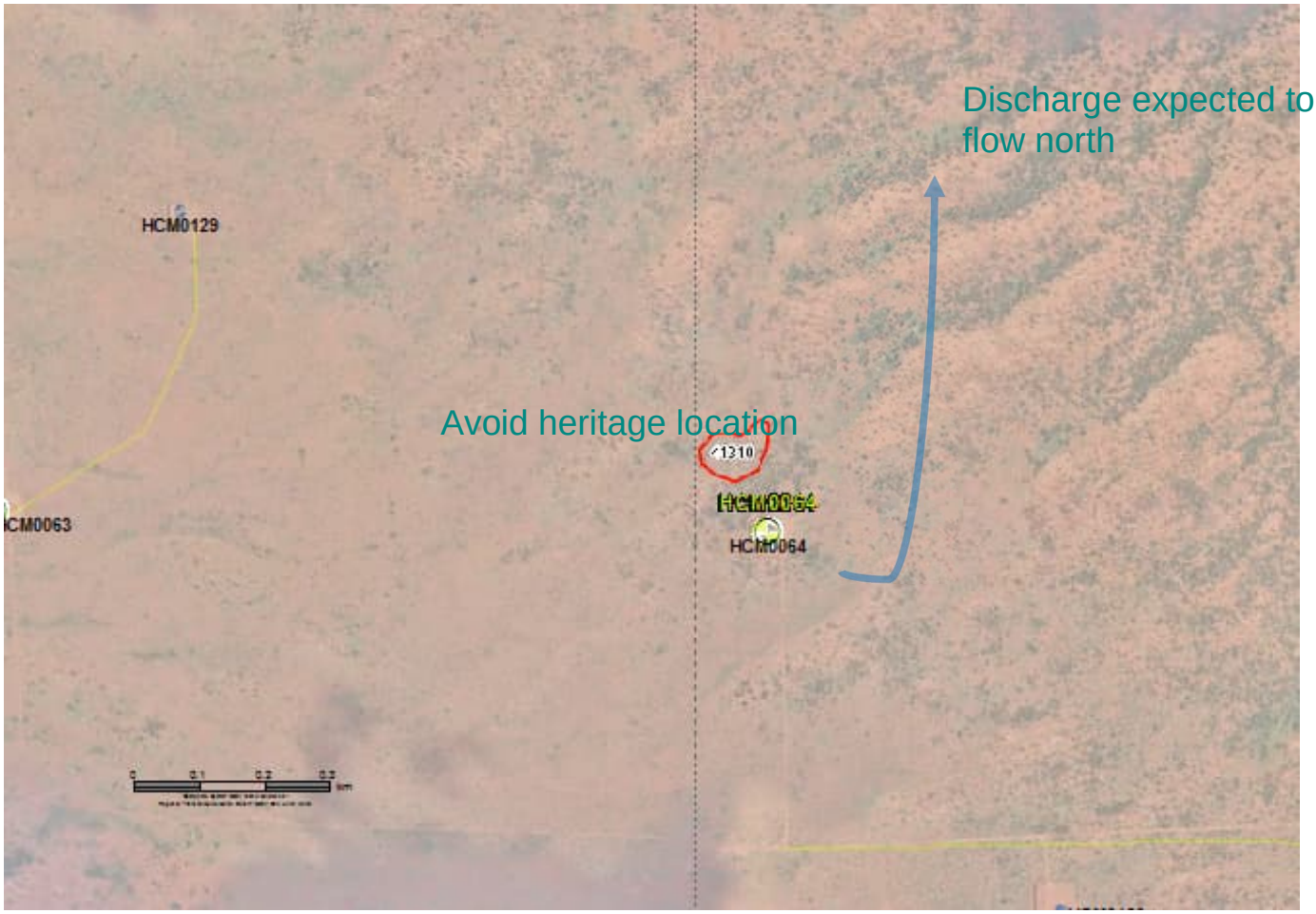


Table 5 - –HCM0064 Testing

Test Bore:	HCM0064
Bore depth:	298 m
Bore diameter:	220 mm (Steel)
Expected tests:	Calib, SRT 10-60 Ls, CRT, Recovery
Discharge considerations – sumps:	Existing sump is large. Nominal volume of 900 kL.
Discharge considerations – overflow:	Likely that discharge will be directed to the north east away from heritage site.
Discharge restrictions:	Heritage site immediately to north that will be avoided. Tenure boundary is far to north.

Water Quality

The expected Total Dissolved Solids (TDS) and pH values included in Table 6 are based on laboratory analysis of water samples collected at the end of each bore's development. The TDS values are considered fresh.

The TDS and pH values are within acceptable water quality as defined in the Discharge Management Standard, i.e. TDS < 5000 mg/L and pH ranging between 4 and 10.

As the water is being pumped from developed bores it is expected to be “free from fines”. However, some of the bores were drilled with mud-rotary techniques, therefore there may be some minor volumes of muds that are mobilised with the initial pumping. As this intention is to contain the initial discharge within the sumps, the muds would not be mobilised beyond these sumps.

The electrical conductivity (EC, convertible to TDS) and pH of water discharged to the environment will be monitored throughout the test pumping program. Comprehensive water quality samples will be taken at the completion of each test.

Table 6 - water quality, rates and volumes

Bore	Estimated TDS	Estimated pH	Estimated Pumping Rate	Expected Discharge Volume
	mg/L		***L/s***	***ML***
HCM0049	1100	8.4	10-50	15
HCM0051	1500	8.4	10-50	15
HCM0062	870	8.3	10-60	30
HCM0063	1500	8.4	5-30	12
HCM0064	1600	8.4	10-60	20

Water Volumes

Discharge rates are expected to be between 5-60 L/s during test pumping. All bores will undergo a step test, followed by a longer CRT and recovery.

Note that the pumping rates are estimated. Final pumping rates and volume will depend on bore performance.

See below table (Table 7) for the breakdown of test pumping activities.

In general, water produced during testing shall be directed towards selected sumps and natural drainage to the north using layflat (Section 2.2) and to avoid heritage sites.

Discharge is anticipated to be clear and sediment free. As the water is being pumped from developed bores it is expected to be “free from fines”.

It is proposed that CRT’s will generally be 48 hrs. However, allowance for a 96 hr CRT is included. This will be determined during the testing.

Table 7 - Nominal test rates

Bore	Estimated Pumping Rate	SRT	CRT	Total TP Days	Expected Discharge Volume (Total)
	L/s	**Days**	**Days**	**Days**	**ML**
HCM0049	10-50	1	2-4	5	15
HCM0051	10-50	1	2-4	5	15
HCM0062	10-60	1	2-4	5	30
HCM0063	5-30	1	2-4	5	12
HCM0064	10-60	1	2-4	5	20

Receiving Environment and Propagation of Flow

The discharge receiving environment will be natural, largely undisturbed land and will likely flow primarily to existing sumps and then to natural drainage to the north.

Discharge to north is likely to 'pool' due to the significantly flat area; however water will be subject to infiltration and evaporation.

Representative wetting front modelling for Caramulla East area indicates that under worst case scenarios (high discharge rate of 90 Ls, for a period of up to 150 days), the wetting front would be limited to a distance of 1.3 km from the discharge location.

See Slides 5 to 9 for predicted discharge routes and any conditions surrounding discharge.

Discharge will be constrained to BHP's M266SA tenements. The discharge is expected to flow north, and the northern tenure boundary is between 2 to 3 km north of the test bores.

The spatial extent of the wetting footprint is based on best available interpretation. As such wetting fronts should be monitored daily.

Heritage, Flora and Fauna Management

DWER have previously advised that pump testing activities do not require licensing as they do not trigger Category 6 of the *Environmental Protection Regulations 1987*. They have advised that for any pump test BHP should also ensure that the discharge is monitored and if any detrimental environmental impacts become apparent, ensure that discharge ceases. This relates to Section 51 of the *Environmental Protection Act 1986*, which requires an occupier of a premises to take reasonable/practicable measures to prevent or minimize emissions.

Discharge routes will be planned to avoid heritage areas that have been mapped within this area.

Proximity to Infrastructure (Public/ Mining)

All test bores are within a regional area where no active mining is occurring. The only existing land use is for access tracks to exploration areas and existing monitoring bores. A main track running east-west broadly along the tenure boundary is accessed by third parties and the public. The intent is to direct free flowing discharge to the north of each site, but also avoiding existing track areas.

Mitigation of Impacts – Erosion and Scouring

For any pumping test BHP is to ensure that the discharge is monitored and if any detrimental environmental impacts become apparent, ensure discharge ceases.

If flow out of the layflat discharge line is causing exacerbated rates of erosion (more than would naturally occur during precipitation events), a rubber mat tarp or other energy dissipating material will be deployed under the immediate area to minimize soil erosion.

If flow continues to cause exacerbated rates of erosion, an environmental officer will be consulted, and actions will be identified to prevent the issue from occurring again. This may include stopping the test.

Ongoing Monitoring

Water Quality

The EC and pH of water discharged to the environment will be monitored throughout the test pumping program using hand held tools. If levels approach the limits outlined in the WAIO Discharge Management Standard, and environmental officer will be consulted and the test potentially terminated when the limit is reached.

Erosion and Scouring at Discharge Point

Visual observation at the discharge point will be undertaken daily, and if excessive rates of erosion are seen then actions will be identified to prevent the issue. This may include stopping the test.

Observations of Wetting Front (towards pre-determined limits)

Visual observation of the wetting front position will be undertaken daily. This will be particularly important when discharging in areas with proximate receptors,