Nickel West Leinster Operations

(Leinster Township)

Potable Water Quality Report

FY24 Annual Report: July 1st 2023, to June 30th 2024.

Contents

1 Water Provider Information

Water providers contact details	
Name of Company	BHP Nickel West Pty Ltd
Company Address	Level 43 125 St Georges Terrace, Perth WA 6000
DoH Liaison Officer	Giovanna De Sousa
DoH Liaison Officer Email	Giovanna.desousa@bhp.com
DoH Liaison Contact #	0466847141

1.1 System Description

BHP NiW Pty Ltd supplies drinking water to the township of Leinster, situated in the Northern Goldfields region of Western Australia. The Town and camp have an average population of approximately 2,100 people.

Raw water is abstracted from 16 dedicated drinking water production bores located at the 11 Mile Borefield. Raw water is pumped from the bores to the 11 Mile Site, where four raw water storage tanks are located: Two 160kL galvanized iron tanks and two 50kL polyethylene tanks (each with a 35kL usable volume due to tank height differences).

At the 11 Mile Site, there are two pumping stations, one for Site and one for Town. Each has two pumps that operate in a duty / standby and duty / duty arrangement respectively. A chlorine dosing facility is located at the 11 Mile Site, where chlorine is dosed at the pump suction pipework for each of the pumping stations.

One drinking water storage tank (3.000kL) is located within Leinster to supply the Town and camp. The Town accounts for approximately 80% of the total drinking water supply demand. Firefighting reserve (1,500kL) is included in the operating volume of the tank.

1.2 Number of Drinking Water Sampling Points

Table 1 below provides the number of drinking water sample points maintained. Source water sample points are included in the monitoring program to provide data relating to changes in chemistry and microbiology of pre-treatment water. As these points are not indicative of the quality of drinking water provided for consumption, only consumer or distribution sample point information is collated in this annual report.

Table 1: Drinking Water Sampling Points

Drinking Water Sampling Points		
Region	**Consumer / Distribution Points**	**Source Water Points (11 mile)**
Leinster Township	6	1

1.3 Water Users

Western Australian Nickel (hereafter, WAN) supplies drinking water to the town of Leinster, which comprises both mining camp and residential accommodation for WAN employees, families and personnel that support the town and its capacity to service the mining operations.

Drinking water is also provided to a number of public facilities including primary school and day care centre, small shopping complex, medical centre, airport, swimming pool and other recreational facilities, and police station. WAN also provides water services to commercial entities (e.g. vehicle rental, crane service, panel beater) and government agencies (school, and police).

Table 2: Leinster Water Users

Water User	Current Number of Users	Current Maximum Number of Users
Leinster Residential Houses	**600**	**840**
Leinster SPQ Accommodation	**1505**	**1591**
Total	**2105**	**2431**

2 Regulatory Overview

BHP Nickel West Pty Ltd (NiW) provides drinking water to the Leinster township in accordance with Water Services Licence (WL52) in compliance with the Water Services Act 2012. WL52 is regulated by the Western Australia (WA) Economic Regulation Authority (ERA).

The licence sets minimum service and performance standards for the supply of drinking water and requires an executed Memorandum of Understanding (MoU) with the WA Department of Health (DoH). BHP NiW executed a MoU with the DoH on 17th June 2024.

The MoU incorporates the 'Framework for Management of Drinking Water Quality' and Guiding Principles set out in the Australian Drinking Water Guidelines (ADWG)1. It also recognises the DoH as the regulator of drinking water quality in WA, enabling the DoH to audit NiW's water quality, management and reporting systems to provide assurance on ongoing satisfactory drinking water quality performance.

It is a requirement of the MoU that an annual water quality report for each financial year be submitted to the DoH and published, covering all drinking water quality testing results as well as information demonstrating NiW's performance in accordance with the MoU. The MoU also requires NiW to prepare quarterly reports detailing water quality testing results, including any exceptions reported in accordance with the Binding Protocols of the MoU.

3 Drinking Water System Information

3.1 Catchment

The raw water supply for the drinking water system is sourced from a dedicated production borefield at 11 Mile. The surface water catchment has a total area of 112km^2 and comprises a small valley with native vegetation, approximately 14km long with a maximum width in the north-south direction of 12km. It is prone to flooding after seasonal, tropical storms and cyclones.

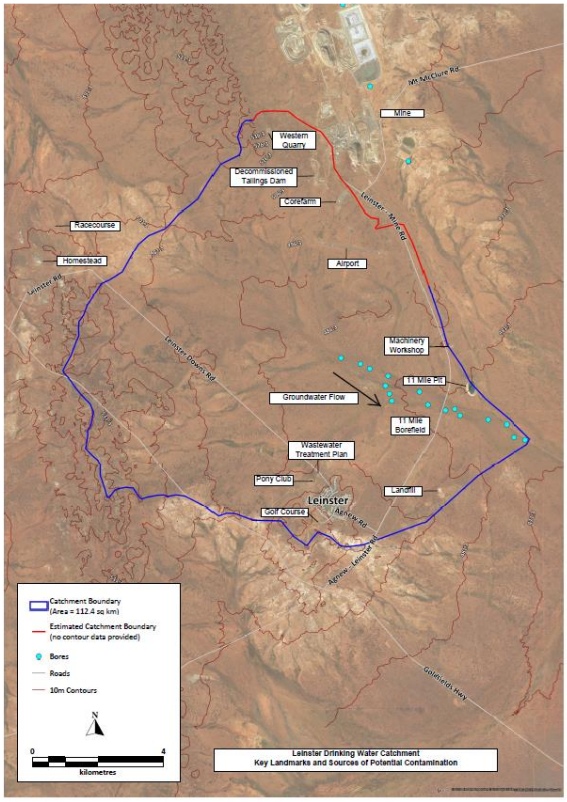
There are a number of land uses and activities in the catchment that can pose potential risks to

the groundwater quality. These include the Leinster township, pastoral activities, wastewater treatment plant, airport, decommissioned tailings dam, core farm and various storage areas and workshops. These risks are assessed in the WAN Leinster Drinking Water Quality Risk Assessment, including control strategies and improvement plans.

Appendix A contains a series of drawings showing the area where the water is harvested, extent of the recharge area, direction of hydrological flow, location of risks (potential sources of contamination), productions bores and well head protection zones.

The Leinster Drinking Water Source Protection Plan provides more detail on the water quality risks and recommendations for reducing these risks to acceptable levels, including the establishment of 500m radius wellhead protection zones.

Figure 1: Catchment Area



3.2 Distribution and Reticulation Network

The Town distribution and reticulation pipework is predominantly constructed of Asbestos Cement (AC) with copper connections or blue line PVC depending on age. The majority of the pipework is below ground to minimise the opportunity for breakage and to ensure cooler water temperatures.

Water is distributed to the town from the 11 Mile tanks via a DN300 AC main that traverses through town to the 3,000kL drinking water tank. This tank has a common inlet/outlet and approximately 50% of the tank volume (1,500kL) is reserved for firefighting purposes. Houses and businesses located upstream of the tank are supplied directly from the main during pumping operations. Drinking water is distributed in town to multiple users including all residential houses, the Camp Mess, industrial and commercial properties and the swimming

pool.

3.3 Treatment

3.3.1 Chlorination

A chlorination station is located at the 11 Mile Borefield together with two pumping stations – one for Site and one for Town. The station doses chlorine at the pump suction pipework for each of the pumping stations. Gaseous chlorine is used (2 X 920kg drums) and the system includes a full gas detection and shutdown system. Chlorine dose rates are typically 0.6mg/L.

3.3.2 RO Plants

There are two RO plants in Town, one located at the Camp Mess and one at the Medical Centre. The RO plants were installed to treat the naturally high level of nitrates and other naturally occurring chemical constituents in the raw water to prevent health risks to pregnant women and babies less than 3 months old. Residents can collect their own water from the RO plants.

The RO plants at the Camp Mess and the Medical Centre are small scale treatment plants and include pre-treatment with softening of the water and cartridge filters. The RO membranes are cleaned with clean-in-place chemicals. Treated water is then disinfected using ultraviolet (UV) radiation and chlorine.

4 Water Monitoring and Testing

BHP NiW maintain a drinking water quality monitoring program which has been developed in accordance with DoH requirements. The sampling program is the final step of our multi-barrier approach for verification of water quality and is categorised into four key groups as outlined in Table 3.

4.1 Types of Water Monitoring

Monitoring of water systems is an essential and integral part of managing risks associated with the respective systems. Different elements of an effective monitoring program are required to ensure the system can operate as designed and produce water that meets the system water quality objectives.

Potable water sampling consists of three main approaches:

- Operational monitoring - water sampling or monitoring of parameters such as temperature, total dissolved solids (TDS), pH, chlorine residuals, and turbidity conducted in-field. These measures are designed to be a leading indicator of water quality allowing for immediate action where required and can be initiated before a validation result comes back with a positive pathogen result.
- Verification monitoring - water samples are collected and submitted for laboratory analysis to verify potable water quality. Parameters such as microbiological, chemical, and physical contaminants form part of this monitoring.
- Event or Investigative monitoring – water samples initiated by a specific event such an exceedance of a routine water quality sample or from a consumer complaint.

Table 3: Key Sampling Parameters

Parameter Group	Description and Management
Microbiological	Parameters used to indicate microbiological risk to the drinking water supply in accordance with ADWG requirements. The most common and widespread health risk associated with drinking water is contamination by pathogenic microorganisms. Organisms associated with the gut and faecal matter from humans and other warm-blooded animals cause several waterborne diseases. As it is impractical to test for the presence of all pathogenic microorganisms in drinking water supplies, the ADWG recommends testing for the microbial indicator bacterium Escherichia coli (E. coli) to indicate the presence of faecal contamination. The ADWG states that E. coli should not be present in a minimum 100mL sample of drinking water. Thermophilic Naegleria refers to a group of amoebae which includes Naegleria fowleri, the organism that causes the waterborne disease primary amoebic meningoencephalitis. Naegleria fowleri is an environmental pathogen which naturally lives in fresh warm water. Any detection of E. coli or Thermophilic Naegleria is responded to immediately by BHP NiW to ensure the potential risk to health is managed and to ensure the drinking water supplied is safe. BHP NiW will also notify DoH as per notification protocols.
Chemical Health	Parameters that have health guideline values as outlined in the ADWG to ensure the safety of the drinking water to consumers. Key chemical health parameters that BHP NiW monitor include: • Pesticides and Industrial Chemicals Pesticides are chemical compounds used for the control of 'pests' (including insects, weeds, rodents). These compounds, when at a high enough concentration, may be toxic to humans, cam enter the drinking water system through over-spray, wind-borne dust, transmission through groundwater and other mechanisms. Industrial chemicals of significance to water quality include synthetic compounds, many of which if at high enough concentrations, toxic to humans. The ADWG provides health-related guideline values for an extensive range of pesticides and industrial chemicals. • Metals Metals occur naturally in waters as a result of being in contact with rocks and soils in the aquifer. They can also accumulate in pipe sediments and be re-suspended during period of rapid changes in water flow patterns. Whilst not health-related, elevated concentrations of iron and manganese can discolour water. • Trihalomethanes Trihalomethanes may be present in drinking water as a by-product of disinfection using chlorination. The ADWG specifies a health guideline value of 0.25 milligrams per litre (mg/L) based on long-term exposure. • Per- and poly-fluoroalkyl substances (PFAS) PFAS refers to a large group of manufactured chemicals that do not occur naturally in the environment. They have been widely used since the 1950s in a range of common household and consumer products as well as in industrial products including firefighting foams. The ADWG incorporates two PFAS health-based guideline values for three PFAS chemicals. These are 0.07 micrograms per litre (µg/L) for combined perfluorooctane sulfonate and perfluorohexane sulfonate (PFOS and PFHxS) and 0.56 µg/L for perfluorooctanoic acid (PFOA).

Chemical Aesthetic	Parameters that have aesthetic guideline values outlined in the ADWG which ensure the drinking water is aesthetically pleasing to drink. Key chemical aesthetic parameters that BHP NiW monitor include: • Turbidity Turbidity is the cloudy appearance of water caused by the presence of suspended particulate matter. The ADWG specify an aesthetic guideline value of 5 Nephelometric Turbidity Units (NTU) which is just noticeable in a glass of water. If disinfection is required, a turbidity of less than 1 NTU is desirable at the point of disinfection. • pH pH is a measure of water acidity. pH 7 is neutral, low pH is acidic and high pH is alkaline. The ADWG specify a lower and upper aesthetic value of 6.5 and 8.5, respectively. • TDS Total Dissolved Solids (TDS) consist of inorganic (natural) salts and small amounts of organic matter dissolved in water. TDS typically comprises of sodium, potassium, calcium, magnesium, chloride, sulphate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate, and phosphate. Water with low TDS can taste flat, while water with high TDS tastes salty and causes scaling in pipes and fittings. The ADWG provides guidance in the palatability of drinking water according to TDS concentration, with TDS < 600 mg/L being of good quality. • Hardness Hardness is caused by the presence of dissolved calcium and magnesium in water. Hard water requires more soap to obtain lather and can also cause scale to form on hot water pipes and fittings. The ADWG specify an aesthetic hardness guideline value of 200 mg/L. • Colour Colour in water originates from natural mainly from natural materials, such as organic matter and minerals, following water drainage through soil and vegetation in a catchment. The ADWG specify an aesthetic guideline value based on the colour which is noticeable in a glass of water. This is generally accepted as 15 Hazen Units (HU).
Radiological	There are naturally occurring levels of radiation within the environment emanating from rocks and soil. Testing is undertaken for gross alpha and gross beta radioactivity, where screening levels can be determined. The ADWG recommend a screening level of 0.5 Becquerel per Litre (Bq/L).

5 Performance Summary

Table 4: Drinking Water Sampling Performance Summary

Drinking Water Sampling Performance Summary			
Microbiological Quality	**No. assessed**	**No. compliant**	**Variance**
Thermotolerant coliforms / E.coli	112	111	**1**
Amoeba (Thermophilic Naegleria)	112	112	**0**
Chemical - Health	205	78	**127**
Chemical - Aesthetic	558	424	**134**
Radiological	6	6	**0**

5.1 Microbiological

Table 5: Drinking Water Microbiological Sampling Performance Summary

Drinking Water Microbiological Sampling Performance Summary			
Microbiological Quality	**No. assessed**	**No. compliant**	**Variance**
Thermotolerant coliforms / E.coli	112	111	**1**
Amoeba (Thermophilic Naegleria)	112	112	0

5.2 Microbiological Reporting Events

Table 6: Microbiological Reporting Events

Microbiological Reporting Events						
Sampling Point	**Date**	**Microbiological Characteristics**	**Alert Level**	**Remedial Actions**	**Date DOH notified**	**Close out date**
Medical Centre RO	08/04/2024	E.coli	1	Water to taps was isolated and inspections of RO completed. No Cracks or visible damage to the tanks or taps were identified. Internal cleaning was conducted.	13/04/2024	29/04/2024

5.3 Chemical (Health)

Table 7: Drinking Water Chemical Health Performance Summary

Drinking Water Chemical Health Performance				
	Analyses Completed	**ADWG Compliant**	**Variance**	**Maximum recorded value**
Antimony (0.003 mg/L)	1	1	0	<0.001
Arsenic (0.01 mg/L)	0	0	0	0
Cadmium (0.002 mg/L)	1	1	0	<0.001
Copper (2 mg/L)	1	1	0	0.075
Cyanide (0.08 mg/L)	0	0	0	0
Fluoride (1.5 mg/L)	2	2	0	<0.1

Iodide (0.5 mg/L)	2	2	0	<0.1
Lead (0.01 mg/L)	1	1	0	<0.001
Nickel (0.02 mg/L)	1	1	0	<0.001
Nitrate (50 mg/L)	196	69	**127**	**82**
Nitrite (3 mg/L)	0	0	0	0
Selenium 0.01 mg/L)	0	0	0	0

5.4 Chemical Health Exemption Notifications

Table 8: Leinster RO Monthly Nitrate Analysis

Due to scheduled maintenance the Medical Centre RO was unable to be sampled in August 2023

Leinster Medical Centre RO Monthly Nitrate Analysis	
Sample Date	**Nitrate Value (mg/L)**
07/07/2023	5.2
07/09/2023	6.6
29/09/2023	4.2
17/11/2023	10
28/11/2023	9.7
28/12/2023	10
04/01/2024	2.4
01/02/2024	2.6
29/02/2024	4.4
27/03/2024	17
21/04/2024	16
16/05/2024	16
20/06/2024	16

5.5 Chemical (Aesthetic)

Table 9: Drinking Water Aesthetic Health Performance Summary

Drinking Water Chemical Aesthetic Performance				
	Analyses Completed	**ADWG Compliant**	**Variance**	**Maximum recorded value**
Aluminium (0.2 mg/L)	1	1	0	<0.01
Ammonia (0.5 mg/L)	0	0	0	0
Chloride (250/L)	2	2	0	32
Colour (15 HU)	6	6	0	<5.0
Hardness (200 mg/L)	4	2	**2**	**280**
Iron (0.3 mg/L)	3	3	0	0.017
Manganese (0.1 mg/L)	3	3	0	<0.001
pH (6.5 - 8.5)	182	170	**12**	8.2

Sodium (180 mg/L)	2	2	0	130
Sulfate (250 mg/L)	0	0	0	0
TDS (600 mg/L)	179	61	**118**	**740**
Turbidity (5 NTU)	176	174	**2**	**19**

Australian Drinking Water Guidelines state based on taste total dissolved solids should ideally be less than 600 mg/L to be regarded good quality for drinking. The Australian Drinking Water Guideline also state between 600 – 900mg/L is regarded as fair quality drinking water and acceptable. Highest record value for TDS in this quarter was recorded at 740mg/L, within "fair quality water" as defined in ADWG.

5.6 Radiological

Table 10: Drinking Water Radiological Performance

Drinking Water Radiological Performance				
	Analyses	**ADWG Compliant**	**Variance**	**Maximum**
Gross Alpha (0.5 Bq/L)	3	3	0	0.15
Gross Beta (0.5 Bq/L)	3	3	0	0.094

6 Planned Sample Summary

Table 11: Drinking Water Planned Sample Summary

Drinking Water Planned Sample Summary			
	Planned Analyses	**Taken**	**% Compliance to Plan**
Microbial	146	112	77
Chemical	759	763	101
Radiological	8	6	75

6.1 Planned Sample Exceptions

Across the April and March period, the Leinster medical centre reverse osmosis plant was fitted with a new chlorinator and UV filter. During this maintenance period the tank was unable to be sampled. Samples were instead taken from the recreational room RO plant during this time.