July 2019

(Plain English version, February 2021)

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Scope

This note applies to extractive industries[1] that remove basic raw materials (BRM) from the ground. BRM includes sand (including silica sand), clay, hard rock, limestone (including metallurgic limestone), gravel, gypsum and other construction and road building materials[2].

Extractive industries usually have an active point of extraction (e.g. a pit) that may be mobile, following the resource through the landscape (somhpmobile, following the resourc.3(b.re)7t

Recommendations

Location

Public drinking water source areas

Public drinking water source areas (PDWSAs) are surface water catchments and groundwater areas that provide drinking water to cities, towns and communities throughout the state. PDWSAs are proclaimed under the Metropolitan Water Supply, Sewerage, and Drainage Act 1909 or the Country Areas Water Supply Act 1947. Find their locations at www.data.wa.gov.au. For more information, see our Strategic policy: Protecting public drinking water sources in WA (Department of Water 2016a) and our WQPN no. 25: Land use compatibility tables for public drinking water source areas (Department of Water 2016b).

The following applies to BRM extraction within PDWSAs:

- BRM extraction is compatible with conditions

- You should use dry methods of extraction.
- You should manage fuel and chemical storage using WQPN no. 65 Toxic and hazardous substances and WQPN no. 56: Tanks for fuel and chemical storage near sensitive water resources. Additionally, schedules 2.1 and 2.2 of the administrative agreement (Department of Water & Department of Mines and Petroleum 2016) prohibit the handling, storage, transport and use of toxic and hazardous substances (including human wastes) within PDWSAs (unless we approve in writing).
- In the absence of a water management plan or fuel management plan we have approved, conduct any refuelling, mechanical servicing and washdown outside of P1 and P2 areas.
- You should train employees and use signs to remind them about the potential risks to drinking water quality in a PDWSA. See our brochure Living and working in PDWSAs (Department of Water 2011).

Clearing control catchments (Country Areas Water Supply Act 1947)

- We will need to assess BRM activities within clearing control catchments for potential salinity impacts. Please email

- Post-mining landscapes need to be identified and agreed upon through consultation before the approval of new projects (see Closure, rehabilitation and subsequent land uses).

Other land uses

- Separation distances between BRM extraction and sensitive land uses ±such as urban areas ±may apply, as stated in Guidance statement no. 3: Separation distances between industrial and sensitive land uses (Environmental Protection Authority 2005).
- Avoid infrastructure and maintain adequate separation distances to ensure its operation is not compromised. Please consult with the relevant operator/owner of the infrastructure.

Construction

- Use existing roads and tracks to access the site where possible. You should not create new access ways onto major roads.
- Restrict access routes to the excavation area to the minimum necessary (i.e. the least possible creek crossings) and select these for the least impact (i.e. areas with minimum vegetation).
- Construct creek crossings in accordance with Building creek crossings (Department of Water 2010). If the creek is within a proclaimed surface water area under the Rights in Water and Irrigation Act 1914, you may require a permit to interfere with the beds and banks (please contact us).
- Construct roads in accordance with WQPN no. 44: Roads near sensitive water resources.

Operation and mana gement

- You should stage extraction so that at any one time the active area of extraction is in accordance with the relevant approvals (L H O R F D O J R Y H U Q P H Q W ¶ V H [industry licence conditions, Part V Environmental Protection Act 1986 works approval or licence conditions or DMIRS approval conditions).

Solid waste

- It is an offence under the Environmental Protection (Unauthorised Discharges) Regulations 2004 to cause or allow scheduled items to be discharged to the environment. Scheduled items include (but are not limited to) acids, hydrocarbons and sediment.
- Any wastes you cannot reuse or recycle in the operation should be stored appropriately and disposed of at an approved facility offsite.

Water supply

- If your operation is within s

taken from them are licensed under the Act. Go to our website or contact us for more information.

- You should reuse uncontaminated stormwater in the operations where possible.
- If the operation is not connected to a scheme supply, and you need a potable water source, see our WQPN no. 9: Community drinking water sources ± protection and management for more information.
- Use low-volume, high-

- You should ensure overflow systems are engineered to manage stormwater runoff resulting from greater than two-hour, 1 in 10 (10%) annual exceedance probability events, and up to the critical 1 in 100 (1%) annual exceedance probability event. The overflow system and pathway should be designed to mitigate erosion and flood risks.
- See our Stormwater management manual for Western Australia (Department of Water 2004 ±08) for more advice.

Dust

- For prescribed premises under the Environmental Protection Act 1986, we may consider that dust from processing and stockpiling activities is D µVSHFLILHG HPLVVLRQ¶ DQG impose controls via licence conditions. We do not consider that dust from BRM extraction, including blasting and free digging, is a component of the prescribed activity. This is subject to the general provisions of the Act.

management, water quality protection and mosquitoes/midges can be successfully managed in the long-term. See our Interim position statement: Constructed lakes for more information (Department of Water 2007).

- Prepare a mine closure plan that:
  - considers the timing of the project; you may need a staged closure plan, with rehabilitation occurring as areas are closed off rather than waiting for the entire operation to cease
  - considers zoning and future use of the land and appropriate finished ground levels as predetermined in a mining plan
  - specifies details of the final landform
  - specifies finished depth to groundwater levels, appropriate for the future land use
  - considers recontouring, stability and erosion risk
  - specifies appropriate material for backfilling if required
  - discusses proper removal of infrastructure (such as ramps)
  - addresses public and animal safety
  - outlines revegetation plans (if appropriate)
  - ensures any natural elements are replaced where required (i.e. large woody debris in streams)
  - refers to Guidelines for preparing mine closure plans (Department of Mines and Petroleum & Environmental Protection Authority 2015).
- If your site is within a PDWSA, please also see WQPN 84: Rehabilitation of disturbed land in public drinking water source areas.

time. The study assumed that the unsaturated zone consists of Bassendean Sands, which are typical of those being mined in underground water pollution control areas near Perth.

The study demonstrated that for slow leaks (5000 L, 400 L and 200 L of fuel leaking over 12 hours), the maximum depth of hydrocarbon infiltration would be contained in the range 0.64 m to 1.28 m. The time taken to reach these depths would range from 2.5 days to 50 days.

Hydrocarbon infiltration is sensitive to changes in soil characteristics, increasing in porous sandy soils.

For rapid spills (400 L of fuel spilled in 1 minute), the maximum depth of hydrocarbon infiltration would be contained in the 1.03 to 2.05 m zone. The time taken to reach these depths would range from 1.6 days to 12 days.

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2 m buffer zone of undisturbed sand profile is appropriate. This buffer minimises the risk of contamination of groundwater from hydrocarbons and allows time for remediation to take place.

Sufficient clearance to ensure evaporation losses during mining are acceptable

Direct evaporation of groundwater can take place when the watertable is close to the surface, usually within 0.5 to 2 m (Bouwer, 1996). Evaporation losses were found to be inversely proportional to the depth of the watertable. The relationship between the evaporation rate and watertable depth for sandy sediments, shows that with a watertable at a depth of 2 m the evaporation rate is approximately 1 mm/day (Bouwer, 1996).

Capillary rise also contributes to the process of evaporation. Empirical field data on sediments and other materials underlying the Swan Coastal Plain provides evidence that the watertable in these sediments can create a zone of capillary rise of 1.5 to 2 m (Davidson, 1995).

Existing data provide reasonable indication that a minimum thickness of 2 m of

for a depth of 3 m the predicted transpiration loss will be around 300 mm and for 4 m transpiration losses will be negligible.

Farrington et al. (1988) found that within the range 4 to 12 m of the watertable depth over Gnangara Mound, the evapotranspiration rate is not correlated to depth of watertable.

Perth area receives around 870 mm of rain per year, not all of which infiltrates into the soil. In Priority 1 areas the depth to watertable should be maintained such that transpiration losses are small relative to rainfall. The minimum clearance in these areas is recommended to be 3 m (roughly equating to the minimum clearance for phreatophytic vegetation). This recognises that these sites will be revegetated following mining.

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Lower-risk locations

- BRM resources can sometimes be sourced from the floodplain area or abandoned stream channels such as on terraces and outer areas of floodplains.

Resource estimation and replenishment

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- Deeper mining pits should be recontoured for stability (to prevent erosion) before the start of the wet season.

Monitoring

- Monitoring may be required to evaluate the upstream and downstream effects and any potential long-term channel changes as a result of in-stream mining.
- It may be necessary to monitor the sediment replenishment after major river flows to demonstrate the sustainability of the extraction rate.
- When extraction is undertaken near permanent pools, monitoring may be required to identify and minimise detrimental impacts.

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Ball, J, Babister, M, Nathan, R, Weeks, W, Weinmann, E, Retallick, M & Testoni, I, (Editors) 2019, Australian rainfall and runoff: a guide to flood estimation, Commonwealth of Australia (Geoscience Australia), available arr.ga.gov.au/.

Bestow, T 7 µ:DWHU EDODQFH RI WKH 6ZDQ &RDVWDO 3OD Groundwater resources of the Swan Coastal Plain, BA Carbon (ed), CSIRO Division of Land Resources Management, Symposium Proceedings, Perth, 1975, pp. 77 ±88.

%RXZHU + -µ%RXQGDU\ HIIHFWV RQ UHFKDUJH ZDWHU Groundwater hydrology, ¶ LQ McGraw-Hill, Australia.

Davidson, WA 1995, Hydrology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142, Western Australian Geological Survey, Perth.

Farrington, P, Greenwood, EAN, Bartle, GA, Beresford, JD & Watson, GD 1988, µ(YDSRUDWLRQ IURP %DQNVLD ZRRGODQG RQ D JURX Journal of Hydrology, vol. 105, pp. 173 ±186, Elsevier Science Publishers, Amsterdam.

Johnson, CD 1997, Sharp-front modelling of the infiltration of diesel to a shallow water table, Consultancy report no. 97-29, Centre for Groundwater Studies, CSIRO Land and Water, Wembley.

Department of Environment and Conservation 2011, A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities, Government of Western Australia, Perth, available www.dwer.wa.gov.au.

Department of Health 2007, Public sector circular no. 88: Use of herbicides in water catchment areas, Government of Western Australia, Perth, available www.health.wa.gov.au.

Department of Health, Department of Planning & Department of Water 2016, Government sewerage policy, draft for public comment, Government of Western Australia, Perth, available www.dplh.wa.gov.au.

Department of Mines and Petroleum 2016, Guideline for mining proposals in Western Australia, Government of Western Australia, Perth, available www.dmirs.wa.gov.au.

Department of Mines and Petroleum & Environmental Protection Authority 2015, Guidelines for preparing mine closure plans, Government of Western Australia, Perth, available www.dmirs.wa.gov.au.

Department of Water 2000, Water quality protection guidelines no. 1 ±10: Mining and mineral processing, Government of Western Australia, Perth, available www.dwer.wa.gov.au.

2 2 2003, Water quality protection note no. 15: Extractive industries near sensitive water resources, Government of Western Australia, Perth. (Replaced by this WQPN).

2 2 2004, Stormwater management manual, Government of Western Australia, Perth, available www.dwer.wa.gov.au.

[22] no date, Risks from pathogenic micro-organisms in public drinking water source areas, Government of Western Australia, Perth, available www.dwer.wa.gov.au.

Department of Water & Department of Mines and Petroleum 2016, Administrative agreement between the Department of Mines and Petroleum and Department of Water: For mineral exploration and mining operations in water resource areas of Western Australia, Government of Western Australia, Perth, available www.dmirs.wa.gov.au.

Department of Water and Environmental Regulation 2018, Water quality protection note no. 56: Tanks for fuel and chemical storage near sensitive water resources, Government of Western Australia, Perth, available www.dwer.wa.gov.au.

Environmental Protection Authority 2005, Separation distances between industrial and sensitive land uses, Government of Western Australia, Perth, available www.epa.wa.gov.au.

Government of Western Australia 1909, Metropolitan Water Supply, Sewerage, and Drainage Act 1909, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 1911, Health Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 1914, Rights in Water and Irrigation Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 1947, Country Areas Water Supply Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 1978, Mining Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 1986, Environmental Protection Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 1976, Waterways Conservation Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 2004, Environmental Protection (Unauthorised Discharges) Regulations, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 2004, Environmental Protection (Clearing of Native Vegetation) Regulations, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 2005, Planning and Development Act, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 2007, Dangerous Goods Safety (Explosives) Regulations, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 2007, Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations, Government of Western Australia, Perth, available www.slp.wa.gov.au.

[22] 2015, Planning and Development (Local Planning Schemes) Regulations, Government of Western Australia, Perth, available www.slp.wa.gov.au.

Land development in groundwater constrained landscapes steering group 2016, Draft specification separation distances for groundwater controlled urban development, version 2, Government of Western Australia,