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Phase 2 Hydrogeological Risk Assessment

150 Onslow Road, Talandji, Onslow



Prepared for Shire of Ashburton

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Executive Summary

Talis Consultants Pty Ltd was engaged by the Shire of Ashburton to undertake a Phase 2 Hydrogeological Risk Assessment at 150 Onslow Road, Talandji, Western Australia, approximately 36 kilometres (km) to the south of the town of Onslow, on Unallocated Crown Land (the Site). This assessment was necessary to assess the potential for adverse impacts to the underlying groundwater regime from the construction of the Pilbara Regional Waste Management Facility (PRWMF) and to ensure that the PRWMF complies with the specifications presented within the Environmental Protection Authority Victoria's *Best Practice Environmental Management: Siting, design, operation and rehabilitation of landfills* (BPEM, 2015).

The Phase 2 HRA was carried out in accordance with the United Kingdom's Environment Agency: Hydrogeological Risk Assessments for Landfills, 2003 utilising the LandSim modelling software (version 2.5) which is a software package developed specifically for landfills and employs a 'Monte Carlo Simulation' technique. This software package is the preferred modelling software of the United Kingdom's Environment Agency however it is an internationally recognised program. The model code has been verified in studies open to peer review and is generally accepted by regulatory bodies (Guidance on the Assessment and Interrogation of Subsurface Analytical Contaminant Fate and Transport Models National Groundwater and Contaminated Land Centre report NC/99/38/1). LandSim models chemistry, leachate production and the migration or seepage that may occur in both non engineered and engineered landfills.

Soil Conditions

The hydrogeological conceptual site model was based on intrusive sub-surface investigations, groundwater monitoring and the proposed design of the PRWMF. The intrusive investigation suggested the following ground conditions:

- Sandy clayey SILT and silty clayey SAND, with trace gravels. This is colloquially known as 'Pindan';
- Gravelly SAND;
- Cemented GRAVEL/SILCRETE (possibly a Cretaceous weathering profile); and
- Sandstone (Unidentified Cretaceous sediments).

The permeability assessment of the superficial soils highlighted a value of between 9.0×10^{-6} m/s and 1.0×10^{-6} m/s for the silty sand horizon and between 4.8589×10^{-8} m/s and 6.107×10^{-9} m/s for the sandy silt horizon. The cemented gravel/silcrete recorded a permeability of between 1.6339×10^{-7} m/s and 3.382×10^{-9} m/s.

Unsaturated thickness beneath the PRWMF basal secondary liner will be between ~2.9 m and ~5.3 m.

Aquifer

No superficial or perched groundwater was identified during the investigation. Groundwater was intersected within the sandstone; the phreatic surface was shown to be sitting at 6.586 m AHD (BH05) and 12.026 m AHD (BH01) across the Site and flowing in a westerly/north-westerly direction. The hydraulic conductivity was shown to be up to 0.36 m/day based on data obtained through the use of slug tests, with a seepage velocity of 2.08 m/year.

Phase 2 Assessment

The Phase 2 HRA was carried out using conservative assumptions regarding the 'source-pathway-receptor' linkage. Risk assessments should take into account future failure and degradation of the active controls (e.g.

liners and management controls), as well as the likely contaminant concentrations in the landfill when failure/degradation occurs. The potential failures and degradation were modelled under three scenarios including the operational phase, post closure phase and long term post closure phase.

LandSim 2.5 considers the degradation of management and engineering systems, however, it does not consider the potential impacts associated with accidents. Accidents are considered to be the unintentional incidents that could reasonably occur, which are unforeseeable in terms of their occurrence. This was undertaken via a qualitative risk assessment of the potential impacts of certain accident scenarios and the damage to the engineering and management systems. The assessment has suggested that the likelihood of an accident or failure occurring is 'unlikely' to 'very unlikely'. However, fire was determined to be 'possible' which will be managed through a bushfire management plan.

The assessment of LandSim seepage rates through the engineered barrier system (EBS), based on the leachate heads modelled, highlighted that no leachate (both 50th and 95th percentile) would seep through the EBS during the period that management controls were in place (~60 years). This shows compliance with BPEM, 2015 which requires a modern, well designed facility to have a leakage rate during operation of <10 l/ha/day. Following cessation of active management controls, the rates of leakage through the EBS gradually increased to a maximum volume of ~219 l/ha/day (95th percentile) and ~51 l/ha/day (50th percentile) at ~70 years, assuming an average annual infiltration rate through the capping system of 104.8 mm.

The combined leachate and aquifer flow during the period of management control was shown to be ~57 m³/year (50th percentile), or ~775 m³/year (95th percentile). The facility then reaches a peak of ~303 m³/year (50th percentile), or ~1,110 m³/year (95th percentile) at ~65 years.

The modelling has demonstrated that based on the proposed development, anticipated waste stream, and geological and hydrogeological conditions; there should be no significant release of hazardous contaminants above relevant guidelines, at both the 50th and 95th percentiles, at the down-gradient monitoring point (~1 km from the landfill cell) through the lifecycle of the PRWMF.

The result of the LandSim modelling (default values) has shown that the predicted concentration of the non-hazardous contaminants at the 50th and 95th percentiles do not exceed the relevant guidelines or background concentrations during the operational and post closure managed phases of the facility.

The results of the LandSim model (default values) have, however, shown that following degradation of the lining system and landfill cap, chloride concentrations, at the 95th percentile, exceeded the current sampled background concentration. The modelling has suggested that it will take ~300 years until an increase in concentration is observed, ~1km down gradient of the PRWMF, with a peak concentration at ~3,000 years. This exceedance of background water quality was not present at the 50th percentile, which is deemed the 'most likely' scenario. Nitrite (95th percentile) was also shown to exceed background concentrations following cessation of active management control and degradation of the lining system and landfill cap. Values were shown to gradually increase above the non-potable guideline, taking ~3,000 years to exceed this guideline. Again, the 50th percentile for nitrite was in line with background concentration during management, post-closure and the duration of the modelling (20,000 years). Potassium (95th percentile) showed a similar trend to chloride, with concentrations at the off-Site compliance bore noted to gradually increase from ~250 years, followed by a sharp increase at ~550 years. This increase again was not noted at the 50th percentile.

A further assessment was undertaken utilising Talis in-house leachate concentration data relating to a Class IV facility. This generally displayed a similar outcome to the LandSim default values, with chloride and nitrite, as well as sodium and sulphate, possibly showing impacts at the off-Site compliance well at timelines of ~300 years. This was at the 95th percentile, with the 50th percentile generally in line with background concentrations.

In order to assess the sensitivity of the LandSim model to a number of key input parameters, a quantitative assessment was undertaken which involved running the model with variations on certain sensitive parameters. Chloride is also a common constituent of landfill leachate and is unretarded, i.e. does not degrade; as such, this analyte was utilised to assess the efficiency of the model. This assessment involved increasing the hydraulic conductivity, porosity and leachate head on liner. The results showed that with a reduction in porosity and an increase in hydraulic conductivity, an increase in chloride concentrations at the off-Site compliance bore may be identified sooner (reduced travel times); however, concentrations were lower and generally in line with background concentrations. The increase in leachate head on liner also had no material impact on the assessment.

The results of the Phase 2 HRA has determined that the Site will have a low impact on the surrounding environment and will not result in the release of hazardous substances above any adopted guideline value. This outcome will be achieved due to the adoption of modern engineering practices including the following:

- Maintenance of leachate elevation within all proposed cells to within the heads specified within this assessment;
- Construction of an engineered basal system which will include:
 - Leachate drainage collection layer and extraction system;
 - 2.0mm HDPE Geomembrane;
 - GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s;
 - Drainage geocomposite;
 - 2.0mm HDPE Geomembrane;
 - GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s;
 - Minimum 0.5 m engineered attenuation layer with a current maximum hydraulic conductivity of 1.6339×10^{-7} m/s (in-situ); and
 - Detailed and extensive Construction Quality Assurance (CQA) process.
- A landfill cap of sufficient standard to limit infiltration and leachate generation; and
- A risk-based programme of leachate and groundwater monitoring to ensure compliance with adopted 'control and compliance limits'.

Overall, the siting and design was shown to be in compliance with BPEM Landfill Standard.



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1 Introduction

1.1 Report Context

Talis Consultants Pty Ltd (Talis) was engaged by the Shire of Ashburton (the Shire) to undertake a Phase 2 Hydrogeological Risk Assessment (Phase 2 HRA) on unallocated Crown Land at 150 Onslow Road, Thalanyji, Western Australia, approximately 36 kilometres (km) to the south of the town of Onslow, (the Site), for the proposed Pilbara Regional Waste Management Facility (PRWMF).

Following the closure of the Onslow Landfill in the latter half of 2015, a Waste Transfer Station (WTS) was constructed at Lot 500 Onslow Road as a replacement service, redirecting waste to the Tom Price Waste Disposal Site. Having to transport the waste out of town prior to disposal has increased operational costs associated with haulage and highlighted the requirement for a more cost effective and efficient waste disposal solution.

With the rapid increase in industrial development and associated growth within the Shire and the Pilbara Region and therefore significant increase in the volume of waste generated, the Shire identified the need for the establishment of new facility that can meet the waste management needs of Onslow and the wider Pilbara region. The PRWMF will provide a range of waste management services including sustainable initiatives such as reuse, recycling and recovery as well as treatment and disposal.

A Site Selection Study was undertaken by the Shire in 2013 and utilised Best Practice siting and design principles to identify a suitable site for the PRWMF. Site selection criteria, constraints mapping and Multi Criteria Analysis (MCA) were utilised to narrow down the list of sites to viable options. Following this process, Lot 150 Onslow Road was recognised as the preferred site and was further investigated through a desktop assessment and relevant site investigations.

The findings of the Shire's Strategic Waste Management Plan (SWMP) and Feasibility Study were that a single landfill developed to Class IV standard, but accepting Class III and Class IV type waste, was the most suitable option due to the long-term regional demand for a Class IV landfill.

The proposed Class IV facility will be designed and constructed to Best Practice Landfill Standards. Additionally, Section 6.1 of the Environmental Protection Authority Victoria's *Best Practice Environmental Management: Siting, design, operation and rehabilitation of landfills* (BPEM, 2015) outlines the requirement for a detailed environmental assessment of a potential landfill site in order to understand its impact on the surrounding environment, including a hydrogeological risk assessment in accordance with Victoria's Environmental Protection Agency (EPA) publication 668 *Hydrogeological assessments (groundwater quality)* (referred to as Guideline 668).

Two levels of hydrogeological risk assessment can be undertaken, simple and complex. A simple risk assessment consists of simple quantitative calculations representing the potential source, pathway and receptors, and is presented as the Phase 1 Hydrogeological Risk Assessment (*TW17084-Onslow Site Investigations Hydrogeological Report.1a* (Phase 1 HRA)). The Phase 2 HRA report constitutes a complex risk assessment carried out in a quantitative manner using stochastic/probabilistic techniques to provide analytical/numerical solutions. Therefore, this report should be read in conjunction with the Phase 1 HRA.

1.2 Hydrogeological Risk Assessment

The objectives of the Phase 1 HRA were to:

- Understand the groundwater regime across the Site;

- Understand the properties of the subsoils and their interaction with groundwater across the Site;
- Understand the potential constraints to the proposed development in relation to groundwater; and
- Understand the potential implications to the surrounding environment and groundwater users should the development proceed.

The Phase 1 HRA detailed these findings.

1.3 Scope of Works

Currently, neither the Best Practice Landfill Standard nor its accompanying Guideline 668 provide guidance on the use of modelling software for hydrogeological risk assessments related to a Waste Management Facility (WMF). Therefore, the following United Kingdom (UK) guidelines have been adopted for the Phase 2 HRA report as it provides guidance on a customised risk-assessment tool (LandSim, 2003) that has been produced specifically for assessing risks to groundwater from a WMF:

- UK's Environment Agency: Hydrogeological Risk Assessments for Landfills, 2003 (LFTGN01); and
- Environmental Permitting (England and Wales) Regulations, 2010 (EPR).

LandSim version 2.5 is an internationally recognised program used to assess potential impacts from new and existing WMFs. The model code has been verified in studies open to peer review and is generally accepted by regulatory bodies as suitable specialist software to assess potential WMF impacts.

The program allows for an assessment of the risks to groundwater from WMFs using site-specific data gained from the Phase 1 HRA and the conceptual design of the PRWMF. It is able to model various scenarios in which groundwater can be contaminated; specifically, the degradation of different components of the engineering and management systems such as geomembrane liners, mineral liners (i.e. engineered clay), and the final landfill cap.

The Phase 2 HRA will be used to determine the potential environmental impacts to groundwater, allowing predictions of engineering performance of the WMF at a range of confidence levels, using stochastic analysis of site conditions, aquifer properties, the adopted engineering barriers and natural attenuation.

LandSim is the preferred computer modelling program for the UK's Environment Agency (UK EA). Section 3.4 of LFTGN01 specifically discusses the use of the LandSim modelling program, while the UK EA also provides a generic report template for a hydrogeological risk assessment, to address the modelling and required output. This report has been largely structured in accordance with the UK EA HRA template to address the development of the hydrogeological conceptual site model (CSM) and subsequent risk posed to human health and environmental values.

In order to assess the potential seepage through the liner during operational and closure stages, modelling has also been undertaken utilising the Hydrologic Evaluation of Landfill Performance (HELP 3.95D) computer program.

2 Site Setting

The setting of the proposed PRWMF is presented within the following section. The information presented has been determined from Site specific investigations and detailed review of published literature and online databases.

2.1 Location and Topography

The Site is located approximately 36 km to the south-west of the town of Onslow within Lot 150 Onslow Road, Onslow (Figure 1). The Lot occupies an area of 434 hectares (ha), however, the proposed WMF footprint only occupies a total area of approximately 26ha.

The Site is accessible from Onslow Road which is a main road and primary distributor. The Site is located to the west of a long sand dune ridge and, therefore, most of the Site is not visible from Onslow Road. An aerial view of the Site is provided in Figure 2.

Landgate is the Statutory Authority that maintains the State's official register of land ownership and survey information. Utilising topographical contour geospatial data sourced from Landgate, the Site is shown to range from 14 m Australian Height Datum (AHD) across the predominantly flat, slightly undulating western portion of the Site to 40 m AHD at various points on the sand ridge, see Figure 3.

2.2 Site and Surrounding Land Use

Under the Shire of Ashburton Town Planning Scheme No.7 (District Scheme) (TPS No.7), the Site and surrounding sites are zoned as 'Conservation, Recreation and Nature Landscape' (*Cane River Conservation Park*), as shown in Figure 4.

2.3 Previous Investigation and Assessment

During the Phase 1 HRA, in order to assess the hydrogeological and geotechnical properties of the Site, the following intrusive works were undertaken:

- Drilling and installation of 13 groundwater monitoring wells into the underlying aquifer; and
- The excavation of 112 trial pits to assess the shallow soils.

The location of the intrusive investigations is presented in Figure 5.

2.4 Local Quaternary Sediments

The Department of Mines, Industry Regulation and Safety (DMIRS) has described the near surface geology across the north-eastern portion of the Site (the sand dune ridge) as "*longitudinal and network dunes and residual sand plains-reddish-brown to yellowish quartz sand.*" The remainder of the Site was described as "*colluvium-poorly sorted clay, silt, sand and gravel; formed by sheet flood and deflation.*"

On Site intrusive investigations undertaken during the Phase 1 HRA showed the underlying soils to consist of the following:

- SAND - Loose to dense, fine to medium grained (PINDAN);
- Sandy clayey SILT/Silty clayey SAND – Loose to dense, fine to medium grained (PINDAN); and
- Cemented GRAVEL/SILCRETE – Cemented gravels in silty sand/sandy silt matrix.



2.5 Regional Geological Setting

2.5.1 Cenozoic Geology

Information supplied within *Bulletin 133 geology of the Carnarvon Basin Western Australia*, Geological Survey of Western Australia, Department of Mines, R.M. Hockling, H.T. Moors, W.J.E. Van De Graff, 1987 (DoM, 1987) suggested that two distinct Tertiary (Cenozoic) aged units were present within the Peedamullah shelf, namely the following:

Merlinleigh Sandstone

The Merlinleigh Sandstone is a coarse to very coarse grained sandstone with limited finer grained sandstone, siltstones, claystone and conglomerates. The unit has undergone duricrusting making it difficult to determine in field. While this was noted to occur on the Peedamullah shelf, its main outcrop is on top of the Kennedy Range and this unit may not be present within the Onslow area (DoM, 1987).

Trealla Limestone

The Trealla Limestone is a unit of thin to massive-bedded, hard limestone, which can show small scale karst features. This unit is widespread in the subsurface of Onslow but is thought to be absent to the southeast of Onslow, where the Site is situated (DoM, 1987).

These units were not thought to have been intersected during the investigation.

2.5.2 Cretaceous Geology

DoM, 1987 has suggested that the Onslow area is underlain by the following Cretaceous formations:

2.5.2.1 Toolonga Calcilutite

The Toolonga Calcilutite disconformably overlies the Gearle Siltstone. It is known to consist of light coloured calcilutite and calcareous siltstone with some claystone, siltstone and sandstone. Its thickness is highly variable, with its absence noted to the east of Onslow, where the Site is situated. A stratigraphic borehole (Minderoo 1) ~20 km to the north west of the Site did not encounter this formation (*Micropalaeontology and Stratigraphy of Minderoo No.1 Bore, Carnarvon Basin, WA*, H.S. Edgell 1963 (Minderoo 1)).

2.5.2.2 Winning Group

The Winning group consists of the following formations:

- Gearle Siltstone;
- Windalia Radiolarite;
- Muderong Shale; and
- Birdrong Sandstone.

The depositional history began during a major transgression in the early Cretaceous and continued through the Cretaceous. It resulted in the formation of basal sand (Birdrong Sandstone) in most areas of the Carnarvon Basin during the onset of the transgression, following which a low energy environment resulted in the deposition of the Muderong Shale. Continued high sea levels and deep weathering resulted in the possible excess of dissolved silica in the ocean, which led to substantial siliceous ocean deposition, forming the Windalia Radiolarite and Gearle Siltstone.

Gearle Siltstone Formation

The Gearle Siltstone conformably overlies the Windalia Radiolarite and conformably underlies the Toolonga Calcilutite. It is known to consist of siltstone and claystone, which can be locally calcareous, and grading into rare limestone beds. It is very similar to the underlying Windalia Radiolarite and can be glauconitic and pyritic. Average thickness ranges from 190 m and 250 m, but a thickness of 599 m has been reported (1:250,000 *Geological Series-Explanatory Notes, Onslow Western Australia, Sheet SF 50-5 International Index*, Geological Survey of Western Australia, Department of Mines, W.J.E. Van De Graff, P.D. Denman, M. Hocking, 1982 (DoM, 1982)).

Windalia Radiolarite Formation

This formation lies conformably between the Muderong Shale and Gearle Siltstone. Previous wells sunk within this formation reported it as a siltstone and claystone, occasionally sandy, with gradations to very fine sandstone. It is also understood that the duricrust experienced within the Onslow area formed primarily on the Windalia Radiolarite and Toolonga Calcilutite (DoM, 1987), while the Windalia Radiolarite is known to occur near surface within the Onslow area. The thickness of this unit ranges between 20m and 140m.

Muderong Shale Formation

The Muderong Shale lies conformably between the Birdrong Sandstone and the Windalia Radiolarite. It is known to consist of siltstone and claystone, shale and silty sandstone with minor limestone. This unit is the principal oil and gas bearing unit in the Barrow Island Oil Field. A thickness of 200 m has been proven for this formation (DME, 2000).

Birdrong Sandstone Formation

The Birdrong Sandstone marks the base of the Cretaceous and is conformably overlain by the Muderong Shale. The formation is known to consist of friable quartz sandstone with minor shales, siltstones and interbedded conglomerates. An average thickness of between 18 m and 30 m was reported, however, a proven thickness of up to 100 m has been recorded (DoM, 1982). Additional information has suggested that this formation may have a thickness of up to 500 m.

2.5.2.3 Nanutarra Formation and Yarraloola Conglomerate

The Nanutarra Formation and Yarraloola Conglomerate are known to consist of sandstone, siltstone and conglomerate.

2.5.3 Site Specific Hardrock Geology

During the Phase 1 HRA, bedrock was generally described as SANDSTONE, interfingered with cemented GRAVEL and clayey SAND horizons. This deposit was considered to be unidentified Cretaceous sediments; however, the Windalia Radiolarite Formation is known to have a sandstone member, grading into the Muderong Shale. A groundwater well (*Main Roads bore Mrd 30 Slk* (<http://wir.water.wa.gov.au/Pages/Water-Information-Reporting.aspx>)) located approximately 7 km north-west of the proposed WMF described the stratigraphy as sandstone underlain by shale. While it described the lithology as Tertiary (sandstone) and Cretaceous (shale), it is possible that this represents the Windalia Radiolarite Sandstone Member and the Muderong Shale. Additionally, the Windalia Radiolarite Formation has been reported to outcrop ~25 km to the south east of the Site. Therefore, it is considered possible that the sandstone represents the Windalia Radiolarite Sandstone Member.

3 Conceptual Site Model

The Phase 1 HRA key findings are provided in the following sections, including the preliminary CSM for the Site. The CSM serves as the foundation for the Site's Phase 2 HRA, which has been updated to reflect the operational active management period of the PRWMF. A graphical representation of this preliminary CSM is presented in Figure 6.

3.1 Policies

The following policies and guidelines were used as the framework for the Phase 1 HRA and Phase 2 HRA:

- Contaminated Sites Act 2003;
- Contaminated Sites Regulation 2006;
- National Environmental Protection (Assessment of Site Contamination) Measure (NEPM 2013); and
- Department of Environmental Regulation (DER), now known as the Department of Water and Environment Regulation (DWER), Assessment and management of contaminated sites, contaminating industries (DER, 2014).

In general accordance with the NEPM 2013, a tier 1 preliminary operational period CSM, in relation to the groundwater resource, was prepared for the Site. The CSM utilised the information from the environmental investigations undertaken, literature reviews, all relevant information provided to Talis and the proposed engineering systems for the PRWMF. The CSM represents the operational period of the PRWMF where active management will be undertaken and identifies potential contamination sources, exposure and transportation pathways and receptors that may exist if the Site is adopted as a PRWMF.

3.2 Contamination Source

Should the PRWMF be established within the Site, the following would be considered the main and primary sources of contamination:

- Landfill waste; and
- Leachate.

3.2.1 Chemicals of Potential Concern

Chemicals of potential concern (COPCs) that can be associated with landfilling vary depending on the buried waste. However, the DER, 2014 lists the following to be COPCs in relation to groundwater:

- Polychlorinated biphenyl (PCB);
- Alkanes;
- Sulphides;
- Metals;
- Organic acids;
- Nutrients (e.g. nitrogen, phosphorus);
- Total Recoverable Hydrocarbons (TRH);
- Polycyclic aromatic hydrocarbons (PAH);
- Ammonia;
- Total Dissolved Solids (TDS);
- Monocyclic aromatic hydrocarbons (MAH) such as benzene, toluene, ethylbenzene and xylene (BTEX); and
- Phenols.

Additionally, Per and Poly fluoroalkyl substance (PFAS) would be deemed a COPC.



3.2.2 Receptors

Should the Site be developed, the onsite receptors which may be impacted by adverse impacts to groundwater may include:

- Onsite – workers and visitors;
- Onsite – groundwater resource; and
- Onsite – flora and visiting fauna.

Further to this, the potential future offsite receptors in relation to groundwater include:

- Offsite – groundwater users down hydraulic gradient, abstracting groundwater for non-potable purposes;
- Offsite – Sensitive ecological receptors (rivers and lakes) and flora and native fauna;
- Offsite – Indian Ocean.

3.2.3 Transportation Mechanisms

In order to reach any aquifer, contamination must pass through the engineering system of the PRWMF and the underlying soils. Potential transportation mechanisms by which this may occur are as follows:

- Leakage through defects within the High-Density Polyethylene Liner (HDPE) liner;
- Advective flow through the engineered mineral liner system;
- Migration of contaminants through the unsaturated zone; and
- Migration of contaminants within groundwater.

Any contaminant that does pass through the HDPE and mineral liner will be subject to some level of attenuation within the unsaturated zone and aquifer, including:

- Retardation by sorption process within the unsaturated zone and aquifer;
- Mechanical dispersion due to the characteristics of the unsaturated zone and aquifer;
- Diffusion of a contaminant from high to low concentrations; and
- Degradation and mass removal by chemical or biological process within a pathway.

3.2.4 Exposure Pathways

Exposure pathways are means by which COPCs impact receptors. Exposure pathways for groundwater include:

- Abstraction of groundwater;
- Dermal contact;
- Ingestion;
- Inhalation;
- Movement down hydraulic gradient in groundwater; and
- Uptake by groundwater dependent ecosystems.

3.3 Qualitative Risk Assessment

Table 3-1 identifies the ‘receptor-exposure-pathways’ relationship, in relation to groundwater, that may exist should a WMF be developed at the Site. The level of risk has been determined by combining consequences and the likelihood using the definitions presented in AS31000:2009 Risk Management-Principles and Guidelines.

Table 3-1: CSM Risk Assessment

Receptor	Exposure Pathway	Pathway (Complete/ Partially complete/ incomplete)	Reasoning	Risk
On-site Human Health Risk				
Site workers, visitors to the Site	Dermal contact or ingestion of groundwater	Partially Complete	It is assumed that groundwater at the Site will not be used for potable purposes. Should groundwater in the future be extracted at the Site for non-potable purposes including irrigation, should a leak occur, there may be exposure to contaminated groundwater. However, modern waste facilities are engineered to reduce the potential for leaks and subsequent groundwater impacts. Further to this, any extraction well should be placed up-hydraulic gradient from the WMF, which will further reduce the risk to site workers. Overall, should groundwater be used in a non-potable or irrigation setting, the risk from exposure to any future groundwater is low.	Low
On-site Ecological Risk				
Flora and visiting fauna	Adsorption of groundwater by flora, dermal contact or ingestion by fauna	Partially complete	Where flora root systems extend into the groundwater, there is a risk they may absorb any contamination that has leached into groundwater. Impacted flora may then be ingested by any visiting fauna to the Site. A review of the current data for the Site has suggested that all root systems are confined to the upper horizons and do not appear to extend into the underlying groundwater. The presence of a well compacted and hard cemented gravel/silcrete layer may also prevent the extension of roots to the underlying sandstone aquifer. However, deep rooted trees may be able to penetrate this layer and draw water from the aquifer, especially due to drought conditions that can exist in the Onslow area. Therefore, there is a potential for flora to be impacted should a leak occur at the Site. However, the development of the Site will also reduce the number of visiting fauna at the Site.	Moderate
Off-site Human Health Risk				
Groundwater users down gradient, including users	Dermal contact or ingestion of groundwater	Incomplete	The investigation has highlighted the potential for groundwater abstraction approximately 4 km to the west of the proposed WMF, with the Mount McCann well identified. This well is primarily across hydraulic gradient from the proposed WMF and is not considered at risk. Several further wells are located down hydraulic gradient; namely Main Roads 30 SLK approximately 7 km down	Low

Receptor	Exposure Pathway	Pathway (Complete/ Partially complete/ incomplete)	Reasoning	Risk
in a non-potable, irrigation and stock water setting.			hydraulic gradient; Cootamundra Dam approximately 12 Km to the north west which, while saying it targets groundwater, may represent a surface water monitoring location; Minderoo No 1 which is a stratigraphic monitoring well and discussed within this report; and Cheetawah Well approximately 11 km to the north west. All wells were at a sufficient distance that the likely risk would be limited. To reduce a WMF'S environmental legacy, all modern facilities incorporate engineering practices that are designed to reduce the potential for impacts to groundwater. However, should a leak occur, the hydrogeological assessment has suggested that groundwater movement is slow within the aquifer and at such large distance, dispersion, diffusion and retardation would likely reduce any contamination level; however, unretarded and persistence contaminants may migrate these distance over time. Overall however, based on the groundwater regime and the adoption of modern engineering practices, the risk to down gradient groundwater users are low.	
Public Drinking Water Source Area	Groundwater flow	Incomplete	A Priority 1 (P1) Public Drinking Water Source Area is located approximately 21 km to the north-east of the Site, which is located hydraulically across gradient. Therefore, based on this body being situated across hydraulic gradient and at such a large distance, the risk posed to it is considered to be low.	Low
Off-site Ecological Risk				
Surface water users where groundwater from beneath the Site recharges a surface water body.	Dermal contact or ingestion of impacted surface water	Incomplete	The Site and surrounds are located within both a surface water and groundwater proclaimed area where, under the RIWI Act, a licence is required to abstract water. No surface water bodies were located at the Site, with the nearest surface water body which may receive groundwater is an unnamed lake located approximately 3.5 km to the west of the Site. This lake is located across gradient from the proposed WMF and will not be hydraulically connected with regards to the Site. Again, any WMF will adopt modern engineering practices and further to this, the hydrogeological assessment has suggested that contaminant transport would be slow due to the aquifer conditions and that significant attenuation and dilution would occur prior to reaching the receptor. Therefore, based on this body being situated across hydraulic gradient and at such a large distance, the risk posed to it is considered to be low.	Low
	Groundwater flow and surface water flow.	Incomplete		Low

Receptor	Exposure Pathway	Pathway (Complete/ Partially complete/ incomplete)	Reasoning	Risk
Ashburton River	Groundwater and surface water flow	Incomplete	The Ashburton River is located approximately 20 km to the north-west of the Site where it may receive groundwater inflow. Given the large distance between the Site and the Ashburton River, and modern engineering practices that will be adopted, should a leak occur it is considered unlikely that any impact would reach the Ashburton River.	Low
Indian Ocean	Groundwater flow	Incomplete	The Indian Ocean is situated approximately 40 km down hydraulic gradient of the Site. Due to the distance, modern engineering practices and the potential for natural attenuation and dilution factors, it is likely that any facility would present a low risk to this water body.	Low
Native Flora and fauna down hydraulic gradient	Adsorption of groundwater by flora, dermal contact or ingestion by fauna	Partially complete	There is a possibility for impacted groundwater to be absorbed by native flora whose root systems extend into the groundwater. Generally, a root system will only extend to approximately three metres; therefore, groundwater would be required to be shallow for this to occur. However, larger trees may push to a greater depth to draw from the groundwater. Should this occur, there is also a potential for native fauna to ingest the impacted flora.	Moderate

4 Landfill Source

Characterisation of the landfill source requires a consideration of the PRWMF design and construction, its leachate management system and leachate quality. This is discussed in detail in the following section. However, it should be noted that no facility currently exists at this time.

4.1 Site Design and Construction

The proposed PRWMF will involve the excavation below ground level to create the necessary landfill void, provision of engineering, operational cover and restoration materials; with eight cells proposed to be phased over the life of the facility. The proposed PRWMF footprint, which was used as part of the modelling exercise, is presented in Figure 7.

The nature of the engineering systems for the proposed facility are presented in Table 4-1:

Table 4-1: PRWMF Engineering

Landfill Component	Description
<i>Primary system</i>	
Landfill Cap	The Site will be restored with a low permeability cap, with a maximum hydraulic conductivity of 1×10^{-9} m/s.
Leachate Drainage	300 mm leachate drainage collection layer with a 225 mm OD primary perforated leachate collection pipe and 160 mm OD secondary perforated collection pipes, connected to a 450 mm OD side slope leachate extraction riser.
Artificial Sealing Liner- HDPE Geomembrane	2.0 mm double textured HDPE geomembrane.
Geosynthetic Clay Liner (GCL)	6 mm GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s.
<i>Secondary system</i>	
Leak Detection Layer	Drainage geocomposite to direct potential seepage to a secondary extraction/monitoring point.
Artificial Sealing Liner- HDPE Geomembrane	2.0 mm double textured HDPE geomembrane.
Geosynthetic Clay Liner (GCL)	6 mm GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s.
Engineered Attenuation Layer	Minimum 0.5 m thick engineered attenuation layer with a maximum hydraulic conductivity of 1.6339×10^{-7} m/s.
Construction Quality Assurance (CQA)	All construction works will be subject to independent third party CQA supervision.

4.1.1 Leachate Management

Leachate management can be separated into two systems. The leachate collection and extraction system is built within the landfill and channels all generated leachate into centralised locations for transport out of the landfill and subsequent treatment in the lined ponds through the natural evaporation process.

The leachate collection and extraction system is essential for transporting the leachate generated out of the landfill. The design of the system requires efficiency and effectiveness during the entire lifespan of the landfill as well as its post-closure aftercare.

The size and design of the leachate evaporation ponds is critical to leachate management. If the pond size is insufficient, then not all the generated leachate will evaporate in a given year and will therefore accumulate year after year..

The design characteristics of the two systems for leachate management are discussed in more detail in the following sub-sections.

4.1.1.1 Leachate Collection and Extraction Systems

The leachate collection layer is formed by a minimum 300mm thickness of imported gravel and enhanced by a network of perforated HDPE pipes.. A series of 160mm secondary pipes, spaced approximately 25m apart, will feed into the 225mm primary collection pipe which will run down the centre of the cell.

Leachate will be extracted from the cells via a 450mm HDPE perimeter sideslope riser with an installed submersible pump. The extraction will be automated with a pneumatic or electric system dependent on the final design. The leachate will be transferred via a solid 110mm/63mm HDPE pipe rising main to the leachate evaporation ponds.

4.2 Leachate Quality and Priority Contaminants

The proposed PRWMF will be a Class IV secure (Category 65) landfill, permitted to accept the following waste streams:

- Clean Fill;
- Type 1 Inert Waste;
- Uncontaminated fill;
- Neutralised acid sulfate soils;
- Putrescible Wastes;
- Contaminated solid waste meeting waste acceptance criteria specified for Class II, Class III or Class IV landfills (where authorised under an Environmental Protection Act licence);
- Type 2 Inert Wastes (with specific licence condition); and
- Type 1, Type 2 and Type 3 Special Wastes.

As the PRWMF is a proposed facility, there are no specific leachate source values available. Consequently, leachate quality data were 'default' leachate concentrations provided within the LandSim model package; these are derived from '*A review of the composition of leachate from domestic wastes in landfill sites*, Robinson, 1995'. This study investigated the composition of leachate from many domestic waste sites within the UK. However, no default values exist within LandSim for organic contaminants and as such, values were sourced from *Attenuation of organic contaminants in leachate by mineral landfill liners*, UK Environment Agency, 2009 and *Implications of Time/Space Variable Leachate Head on Liner Leakage*, Reinhart. Debra R, McCreanor. Philip T, 1999. Additionally, Talis has sourced leachate quality data from a Class IV facility within Australia and these values were also utilised during the assessment. Table 4-2 presents the species and concentrations, with the

‘default’ concentrations primarily utilised for this assessment, and the Class IV values utilised for a ‘sensitivity’ assessment. The default values are generally higher than the Class IV facility concentrations, allowing for a more conservative assessment.

Table 4-2: Leachate Concentrations

Analyte	LandSim Default (mg/l)			Class IV Facilities (mg/l)		
	Min	Mean	Max	Min	Mean	Max
Ammoniacal Nitrogen (as N)	4.37	723	3,640	8	85	156
Nitrate	-	-	-	0.006	0.39	4.3
Nitrite	-	-	-	0.01	0.6	11
Chloride	36.6	2,270	7,760	766	2209	3500
Phosphate	0.01	2.54	22.6	-	-	-
Sodium				170	1199	2200
Sulphate	-	-	-	1600	2442	3500
Arsenic	0.000637	0.00484	1.31	0.002	0.08	0.178
Cadmium	0.0019	0.0101	0.105	<0.0001	0.0009	0.002
Calcium	-	-	-	10	694	1000
Chromium	0.00856	0.0647	1.75	<0.001	0.004	0.01
Copper	0.00489	0.0243	1.13	<0.0002	0.0086	0.06
Lead	0.00957	0.13	1.02	<0.0002	0.0015	0.0059
Magnesium	-	-	-	24	204	300
Manganese	-	-	-	1.2	5	13
Mercury	0.00004	0.00009	0.00195	Not present		
Nickel	0.00883	0.12	2.21	<0.001	0.028	0.097
Zinc	0.00225	0.165	208	0.006	0.077	0.55
Benzene	0.0005	0.00582	0.0116	<0.0005	0.001	0.0023
Toluene	0.021			Not present(single occurrence at 0.0006)		

4.3 Hydrogeological Setting

4.3.1 Unsaturated Zone

Based on the intrusive investigation undertaken during the Phase 1 HRA, the unsaturated zone was described as an initial sand horizon, underlain by sandy clayey silty to silty clay sand underlain by a cemented gravel/silcrete. Specifically, beneath the base of the facility, there will be a minimum thickness of ~2.9 m of this material. Testing of the sandy clayey silt/clayey silty sand material within the unsaturated zone recorded a permeability of between 4.8589×10^{-8} m/s to 6.107×10^{-9} m/s (Phase 1 HRA). The cemented gravel/silcrete presented a similar range for its permeability, reported between 1.6339×10^{-7} m/s and 3.382×10^{-9} m/s.

4.3.2 Aquifer Characteristics

The local aquifer beneath the Site was identified as sandstone, it is considered possible that the sandstone may represent the Windalia Radiolarite Sandstone Member. The sandstone itself was described as fine to medium grained, suggesting it would have limited flow rate via intergranular pores (primary porosity), which is typical for a sandstone. Numerous secondary porosity features include vugs (dissolution), joints and fractures, would likely result in an increase in flow rates. Additionally, during drilling, the sandstone was noted to have interfingering gravels and sands which would also result in an increase in flow rates and may result in preferential pathways for groundwater flow. Therefore, groundwater flow paths would primarily be through these secondary opening features and areas of weathered sandstone (gravel and sand layers) and would likely increase the overall hydraulic conductivity of the aquifer.

Overall, the aquifer can be described as an unconfined sedimentary aquifer.

No superficial aquifer was identified during the Phase 1 HRA. However, there is a potential for a seasonal perched groundwater to exist within sand lenses or the gravelly sand horizon. Additionally, one may exist above the cemented gravel/silcrete horizon. Overall though, should one exist the volume and yield would likely be limited.

4.3.3 Groundwater Gauging Data

On-going groundwater gauging has occurred at the Site following the installation of the groundwater monitoring wells, with pressure transducers installed in the majority of monitoring wells. The groundwater gauging data for this period is summarised in Table 4-3, with hydrographs presented in Appendix A.

Table 4-3: Gauging Data-January 2018-July 2018

Well ID	Well depth (m below ToC)	ToC elevation (m AHD)	Depth to groundwater (m AHD)			Range (m)
			Min	Mean	Max	
BH01	11.17	19.242	7.216	7.378	7.837	0.621
BH02	11.27	21.532	9.810	9.967	10.026	0.216
BH03*	11.15	17.248	5.903	5.944	5.980	0.077
BH04	11.07	13.305	6.615	6.731	6.958	0.343
BH05	11.05	13.076	6.49	6.607	6.657	0.167
BH10	27.46	32.183	21.264	21.412	21.484	0.22
BH11*	26.27	27.322	17.997	18.036	18.080	0.083
BH12	11.04	17.671	6.600	6.716	6.762	0.162
BH13	11.05	16.353	6.760	6.866	6.904	0.144
BH14	11.06	16.781	7.560	7.704	7.74	0.18
BH15	11.16	14.992	6.135	6.273	6.333	0.198
BH16	11.06	16.188	6.545	6.647	6.678	0.133
BH17	11.25	17.443	6.852	6.999	7.047	0.405

ToC – Top of Casing

RL SWL – Relative Level 'Standing Water Level' m AHD

**Data taken from Jan-April only*

4.3.4 Groundwater Flow Direction

Since the installation of monitoring wells and the deployment of pressure transducers, groundwater has shown a consistent flow direction to the north-west (Figure 8 to Figure 13).

4.3.5 Hydraulic Conductivity

In order to assess the hydraulic conductivity of the regional aquifer beneath the Site, during the Phase 1 HRA a series of falling head 'slug' permeability tests were conducted on several of the monitoring wells. Table 4-4 presents the outcome of this testing:

Table 4-4: Hydraulic Conductivity

Monitoring Well	Hydraulic Conductivity (k) (m/day)
BH01	0.048
BH02	Failed
BH03	0.059
BH04	0.017
BH05	0.36
BH12	0.18
BH13	0.018
BH14	0.006
BH15	0.33
BH16	0.003
BH17	0.0013

The analysis has shown that the hydraulic conductivity is generally within the range that would be expected of a fine to medium grained sandstone, with expected values for a fine to medium sandstone in the region of 0.0003 m/day to 0.3 m/day (*Summary of Hydrologic and Physical Properties of Rock and Soil Materials, as analysed by the hydrologic laboratory of the U.S Geological Survey, D.A. Morris and A.I. Johnson, 1967*).

The full saturated thickness of the aquifer was not proven during the investigation, therefore, for the purpose of this assessment a thickness of 20 m to 140 m (maximum reported thickness) was adopted.

4.3.6 Hydraulic Gradient

The hydraulic gradient, which is the change in hydraulic head per unit of distance in a given direction, was calculated for the groundwater gauging events, with results presented in Table 4-5.

Table 4-5: Hydraulic Gradient

Date	Hydraulic Gradient (i)
January 2018	0.00158
March 2018	0.00157
April 2018	0.00156
May 2018*	0.00158

Date	Hydraulic Gradient (i)
June 2018*	0.00154
July 2018*	0.00158

* Due to the amount of data, the gradient was calculated from data on the 18th of each month, corresponding to 1 month following the April monitoring which was the last monitoring round manually gauged.

4.4 Environmental Guidelines

The environmental guidelines utilised for this assessment, and their justifications, were those stipulated within the Phase 1 HRA and were in accordance with the DWER, 2014. Table 4-6 presents the relevant guidelines which are applicable for the Phase 2 HRA.

Table 4-6: Environmental Guidelines

Analyte	Fresh Water ¹ (mg/l)	Non-Potable ² (mg/l)	Long-Term Irrigation ³ (mg/l)	Stock water ⁴ (mg/l)
Ammoniacal Nitrogen (as N)	0.9	0.5	-	-
Nitrate	-	500	-	400
Nitrite	-	30	-	-
Calcium	-	-	-	1,000
Chloride	-	250	-	-
Potassium	-	-	-	-
Sodium	-	-	-	-
Sulphate	-	-	-	1,000
Arsenic	0.024 (As III) 0.013 (As V)	0.1	0.1	0.5
Cadmium	0.0002	0.02	0.01	0.01
Copper	0.0014	20	0.2	0.4
Lead	0.0034	0.3	0.2	0.1
Manganese	1.9	5	0.2	-
Mercury	0.00006	0.01	0.002	0.002
Nickel	0.011	0.2	0.2	1
Zinc	0.008	3	2	20
Benzene	0.95	0.01	-	-
Toluene	-	0.025	-	-
Xylene	0.35#	-	-	-

1: DER 2014 Fresh Waters these investigation levels are based on and are equivalent to the ANZECC 2000 95% Fresh Water guidelines.

2: DER 2014 Non-potable use guidelines (NPUG) which are derived from DoH 2014 guidelines.

3: DER 2014 Long-term Irrigation which are derived from ANZECC & ARM CANZ (2000).

4: Stock Water 2000 guidelines which are derived from ANZECC & ARM CANZ (2000).

*As un-ionised Cyanide

#As o-xylene

4.5 Background Groundwater Quality

Background groundwater quality was presented in the Phase 1 HRA. The assessment highlighted that the aquifer was dominated by sodium chloride ions, was 'brackish' and 'neutral'. Table 4-7 details the background quality of groundwater relevant to this assessment:

Table 4-7: Background Concentrations

Analyte	Background Concentrations (mg/l)		
	Min	Mean	Max
Ammoniacal Nitrogen (as N)	0.02	0.048	0.18
Nitrate	5.41	10.8	14.8
Nitrite	0.01	0.12	0.48
Calcium	47	72	100
Chloride	479	796	1,060
Sodium	219	332	426
Potassium	35	57	81
Sulphate	80	123	158
Arsenic	0.002	0.0025	0.005
Cadmium	NA*		
Copper	0.001	0.017	0.048
Lead	0.001	0.0015	0.002
Manganese	0.006	0.058	0.232
Mercury	NA*		
Nickel	0.001	0.0045	0.01
Zinc	0.015	0.048	0.08
Benzene	NA*		
Toluene	NA*		
Xylene	NA*		

*Indicated results below the laboratory practical quantification limit

5 Hydrogeological Risk Assessment

5.1 The Nature of the Hydrogeological Risk Assessment

LFTGN01 stipulates that the complexity of assessment for a landfill development should be determined based on the potential risk to the surrounding environment and human health. There are two levels of complexity as previously noted, that relate to the assessment of groundwater, these are:

- **Simple Risk Assessment:** Should be completed where there is a feasible 'source-pathway-receptor' linkage and involves the use of generic assessment values. The Phase 1 HRA constitutes this 'simple risk assessment'; and
- **Complex Risk Assessment:** Should be carried out where the site setting is sufficiently sensitive to warrant a detailed assessment, with the assessment using 'stochastic/probabilistic techniques'.

While the Phase 1 HRA suggested an overall low risk to human health and the environment, the development is sufficiently sensitive to warrant this detailed assessment of risk.

5.2 The Proposed Modelling Scenarios

5.2.1 Lifecycle Phase

Any risk assessment must consider future failure and degradation of the active controls (e.g. liners and management controls), as well as the likely contaminant concentrations in the landfill when failure/degradation occurs. Details of the scenarios are given in Table 5-1.

Table 5-1: Hydrogeological Risk Assessment Scenarios

Scenario	Landfill Source	Landfill Cap*	Drainage System	Engineered Liner **
Operational	Based on relevant literature, including default values presented in LandSim; information also ascertained from similar facilities within Australia likely waste stream.	Infiltration assumed to be annual rainfall: Mean 314mm* + with a standard deviation (SD) of 104.8 mm.	Active leachate management. Leachate Head: 0.3 m, 1.0 m (Uniform Distribution).	Double Composite lining system comprising minimum 0.5 m engineered attenuation layer, GCL x2 and HDPE membrane x2. GCL hydraulic conductivity: Maximum: 5×10^{-10} Likley: 2.5×10^{-11} Minimum: 1.9×10^{-11} (Log Triangular) HDPE defects for 'high CQA' and leak detection. Pin Holes (0.1-5 mm ²): Minimum: 0, Maximum: 25 Holes (5-100mm ²): Minimum: 0, Maximum: 5 Tears (1-10,000 mm ²): Minimum: 0, Most Likely: 0.1, Maximum: 2
Post Closure		Site capped and restored with GCL and/or Geomembrane: Mean of 31.5 mm with a SD of 10.5 mm.	Active leachate management. Leachate Head: 0.3 m, 1.0 m (Uniform Distribution).	As above. HDPE liner degradation rate as per LandSim defaults.
Long Term Post Closure		Landfill cap membrane assumed to have completely degraded. Infiltration assumed to be equal to effective rainfall: Mean 104.8 mm with a standard deviation (SD) of 34.9 mm.***	No leachate management.	As above. HDPE liner completely degraded.

*Assumed that the landfill cap will function as designed up until ~250 years. Following this, it is assumed that the cap degrades until approximately 1,000 years, when final infiltration is equal to effective rainfall.

**Assumed that the HDPE basal liner will function as designed until approximately 150 years. Number of defects in the basal liner set to double every 100 years thereafter.

***As evaporation is far greater than precipitation within Onslow area, effective rainfall was set as 1/3 annual rainfall.

5.3 Accidents and their Consequences

The LandSim 2.5 assessment considers the degradation of management and engineering systems. However, it does not consider the potential impacts associated with accidents. The construction of the facility will be subject to an extensive CQA scheme prior to commencement of waste acceptance, which will aid in the prevention of faults within the liner system.

Accidents are considered to be the unintentional incidents that could reasonable occur, which are unforeseeable in terms of their occurrence. The process to evaluate the environmental risk is to assess the potential impacts an accident may have. This was undertaken via a qualitative risk assessment of the potential impacts of certain accident scenarios and the damage to the engineering and management systems, with the assessment presented in Table 5-2.

The assessment has suggested that the likelihood of an accident or failure occurring is 'unlikely' to 'very unlikely'. Therefore, no additional assessment was deemed necessary. This was with the exception of the following:

- There is a possibility for accidents caused by a 'fire' event as the Site is within a bushfire prone zone. Therefore, a bush fire management plan will be prepared and submitted to the Department of Fire and Emergency Services (DFES) prior to commencement of the development.
- There is a possibility for accidents caused by a 'flood' event as the Site could be potentially affected by flooding in the surrounding areas. A levee embankment will be constructed along the southern boundary of Site's operational area, to protect the integrity of the development area. A surface water management plan has been prepared for the Site, to detail the key infrastructure and management strategies.

Table 5-2: Qualitative Assessment of Accidents and their Consequences

Potential Accidents	Likelihood of Occurrence	Implications of Occurrence	Consequence of Occurrence
Regional Flooding	Fairly Probable	Site Inundated. High leachate head with increased leakage through liner. Potential over-topping of control systems. Reduced attenuation potential.	Significant
Subsidence	Very Unlikely	Potential breach of the engineered systems. Increased leachate leakage. Reduced attenuation potential.	Significant
Fires	Fairly Probable	Potential breach of the geomembrane and degradation of the leachate management system. Increased leachate leakage.	Significant
Explosions	Very Unlikely	Potential breach of the engineered system and degradation of the leachate management system. Increased leachate leakage. Reduced attenuation potential.	Severe

Potential Accidents	Likelihood of Occurrence	Implications of Occurrence	Consequence of Occurrence
Major breach of lining system/failure of management systems	Unlikely	Increased leachate leakage. Increased head of leachate. Reduced attenuation potential.	Significant
Spillage of Leachate during removal of leachate from leachate sump	Probable	Release of leachate into the surrounding environment.	Noticeable

5.4 Numerical Modelling

5.4.1 Justification for Modelling Approach and Software

5.4.1.1 HELP Modelling Approach

Modelling has been undertaken utilising the Hydrologic Evaluation of Landfill Performance (HELP 3.95D) computer program to calculate potential seepage through the liner.

The HELP program is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of landfills. The HELP program, Versions 1, 2 and 3 was developed by the US Army Engineer Waterways Experiment Station (WES) for the US Environmental Protection Agency (US EPA). The enhanced HELP 3.95D program version allows for the program to be used by means of a windows user interface and was developed by Dr Klaus Berger at the Institute of Soil Science, University of Hamburg, Germany.

The HELP model requires weather, soil and design data and uses solution techniques that account for the effects of surface storage, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, and seepage through soil, geomembrane or composite liners.

The HELP seepage model is presented in Appendix B.

5.4.1.2 LandSim Modelling Approach

The hydrogeological risk assessment has been carried out using conservative assumptions regarding the 'source-pathway-receptor' linkage.

The UK EA LandSim software (Version 2.5.17) was utilised to provide an estimate of the WMF's lining system efficiency and the potential environmental risks associated with the proposed PRWMF. The LandSim model was used for the following reasons:

- It uses Monte Carlo (stochastic) techniques and so allows a probabilistic appreciation of the Site's performance;
- It provides a consistent approach to the estimation of hydrogeological risks; and
- It aids comprehensive reporting of input values, assumptions and results.

The model code has been verified in studies open to peer review and is generally accepted by regulatory bodies (*Guidance on the Assessment and Interrogation of Subsurface Analytical Contaminant Fate and Transport Models*, National Groundwater and Contaminated Land Centre report NC/99/38/1). LandSim models chemistry,



leachate production and the migration or seepage that may occur in both non engineered and engineered landfills, and is the UK EA preferred method for assessment of the risks to groundwater from landfill sites.

The LandSim model is defined by the domain (total area to be modelled) in which the landfill and receptor is situated. The elements of the risk assessment consider the source term; engineered barrier; geosphere; and biosphere.

- The **source term** inputs are used to define: the geometry of the landfill; the type of engineered barrier; the infiltration into the site the drainage system; the chemical composition of leachate likely to be produced by the waste within the landfill.
- The **engineered barrier** represents the landfill lining system.
- The **geosphere** considers the soil and rock system into which contaminants from the landfill migrate. The unsaturated/saturated pathway parameters include the geological unit, geometry, hydraulic properties and flow model. The contaminants released through the engineered barrier travel along pathways in the geosphere towards the biosphere, including the processes in the geosphere including advection and dispersion of contaminants, retardation and possible breakdown (decay) of the contaminants to other species.
- The **biosphere** is the environment in which exposure to the contaminants occurs.

In order to account for uncertainties in parameter values, LandSim allows input parameters as probability density functions, such as uniform, triangular, log triangular, normal etc. The model is run for 1001 iterations (recommended LTFGN01 guidance value) and the model typically outputs graphical and statistical information relating calculated contaminant concentrations at a specific receptor point. It also measures the likely performance of the liner and the potential volumes of leachate generated.

The LandSim model has been assessed in a stochastic fashion and throughout this assessment the acceptable probability of an undesirable outcome occurring has been set at the 95th percentile in accordance with LTFGN01. The 95th percentile is commonly selected as a reasonable 'worst case', against which it is acceptable to make decisions considering the assumptions and limitations of the modelling process.

5.4.2 Model Parameterisation

The full parameterisation table together with the appropriate probability distributions are presented in Appendix C, which includes properties of the engineered landfill containment system and landfill source (waste inputs and infiltration), background groundwater quality data, leachate quality data, leachate source term, biodegradation and retardation, unsaturated and saturated pathway properties.

Parameter values were determined from information ascertained during the Phase 1 HRA, and the proposed engineering design for the facility. If no Site data exists, then LandSim default values, which represent conservative values, were utilised. Distributions utilised were dependent on that specific parameter; how much the values of a parameter varied; and the count of a certain parameter. Generally, 'triangular' and 'log triangular' distribution were utilised, with 'log triangular' utilised for leachate concentration where enough data supported its adoption.

The potential for dilution of any possible leachate leakage from the proposed development is dependent on several factors, namely the hydraulic conductivity of the mineral element of the lining system; the unsaturated pathway; the aquifer properties; and groundwater flow.

For the lining system, an input probability distribution of 5×10^{-10} m/s, 2.5×10^{-11} m/s, 1.9×10^{-11} m/s (log triangular distribution) was adopted and is based on the standard technical specifications of GCL manufacturers.

The unsaturated pathway has been modelled as a porous medium as it does not possess significant dual porosity-in line with the LandSim manual. The thickness of the unsaturated zone has been modelled with a thickness range of 2.9 m and 5.3 m (uniform distribution), based on the engineering designs for the WMF. The unsaturated zone hydraulic conductivity, based on Site data presented in the Phase 1 HRA, was 1.6339×10^{-7} m/s, 3.382×10^{-9} m/s (log normal distribution).

In relation to the aquifer parameters and groundwater flow, information pertaining to this was determined during the Phase 1 HRA. The hydraulic conductivity was calculated as 4.1667×10^{-6} m/s, 1.50463×10^{-8} m/s (log normal distribution), while the porosity (fraction) was 0.05, 0.3 (log triangular distribution).

5.5 Emission to Groundwater

The results of the LandSim modelling are presented in Appendix D.

5.5.1 Seepage Rates

The assessment of LandSim seepage rates through the engineered barrier system (EBS), based on the leachate heads modelled, highlighted that no leachate (both 50th and 95th percentile) would seep through the EBS during the period that management controls were in place (~60 years). This shows compliance with BPEM, 2015 which requires a modern, well designed facility to have a leakage rate during operation of <10 l/ha/day. Following cessation of active management controls, the rates of leakage through the EBS gradually increased to a maximum volume of ~219 l/ha/day (95th percentile) and ~51 l/ha/day (50th percentile) at ~70 years.

The combined leachate and aquifer flow during the period of management control was shown to be ~57 m³/year (50th percentile), or ~775 m³/year (95th percentile). The facility then reaches a peak of ~303 m³/year (50th percentile), or ~1,110 m³/year (95th percentile) at ~65 years.

5.5.2 Leachate Analysis Default LandSim Values

5.5.2.1 Hazardous Pollutants

The modelling, utilising the default LandSim leachate concentrations, has demonstrated that based on the proposed development, anticipated waste stream, and geological and hydrogeological conditions, there should be no significant release of hazardous contaminants above relevant regulatory guidelines, at both the 50th and 95th percentiles, at the down-gradient monitoring point through the lifecycle of the PRWMF.

5.5.2.2 Non-Hazardous Pollutants

The result of the LandSim modelling has shown that the predicted concentration of the non-hazardous contaminants at the 50th and 95th percentiles do not exceed the relevant guidelines or background concentrations during the operational and post closure managed phases of the facility (~60 years), while concentrations were also shown to remain within background ranges for the duration of the modelling (20,000 years).

The results of the LandSim model have, however, shown that following degradation of the lining system and landfill cap, chloride concentrations, at the 95th percentile, exceeded the current sampled background concentration. The modelling has suggested that this will take ~300 years until an increase in concentration is observed ~1km down gradient of the PRWMF, with a peak concentration at ~3,000 years. This exceedance of background water quality was not present at the 50th percentile, which is deemed the 'most likely' scenario, with the 95th percentile representing the point at which the assessor can be 95 percent certain the actual outcome will be less than the maximum acceptable level (LFTGN01, 2003) i.e. worst case. LandSim modelling



has suggested that chloride concentration would be above the NPUG guideline, i.e. not suitable for non-potable use.

Nitrite (95th percentile) was also shown to exceed background concentrations following cessation of active management control and degradation of the lining system and cap. Values were shown to gradually increase above the non-potable guideline, taking ~ 3,000 years to exceed this guideline. The 50th percentile for nitrite was in line with background concentration during management, post-closure and the duration of the modelling (20,000 years).

Potassium (95th percentile) showed a similar trend to chloride, with concentrations at the off-Site compliance bore noted to gradually increase from ~250 years, followed by a sharp increase at ~550 years. This increase was not noted at the 50th percentile.

5.5.3 Leachate Analysis Class IV Assessment

The model was also run with leachate concentrations amended to align with Class IV facility leachate quality data held by Talis. The engineering design and other parameters of the PRWMF remained the same, and as such, no change to leakage from the EBS etc. was noted. The results of this assessment is presented in Appendix E.

5.5.3.1 Hazardous Pollutants

The modelling, utilising Class IV leachate concentrations, has again demonstrated that based on the proposed development, anticipated waste stream, and geological and hydrogeological conditions, there should be no significant release of hazardous contaminants above relevant guidelines, at both the 50th and 95th percentiles, at the down-gradient monitoring point through the lifecycle of the PRWMF.

5.5.3.2 Non-Hazardous Pollutants

The result of the LandSim modelling has shown that the predicted concentration of the non-hazardous contaminants at the 50th and 95th percentiles do not exceed the relevant guidelines or background concentrations during the operational and post closure managed phases of the facility (~60 years), while concentrations were also shown to remain within background ranges for the duration of the modelling (20,000 years).

Again, this was with the exception of chloride at the 95th percentile. The chloride trend at the 95th percentile suggested that this will take ~300 years until an increase in concentration is observed ~1km down gradient of the PRWMF, with a peak concentration at ~3,000 years. This exceedance again was not present at the 50th percentile, which is deemed the 'most likely' scenario. While not part of the default assessment, sulphate was modelled as part of the Class IV assessment. This showed a similar trend to chloride, with concentration generally within background ranges for ~300 years, following which it gradually increases to a peak concentration around ~3,000 years. After this time, concentrations begin to decrease towards background concentrations. The modelling event showed that sulphate would take ~750 years to increase above the NPUG assessment criteria. Again, this exceedance was not present at the 50th percentile.

Nitrite (95th percentile) also showed a similar trend to the default LandSim assessment, gradually increasing and taking ~3,700 years to exceed the NPUG assessment criteria. Again, the 50th percentile for nitrite was in line with background concentration during management, post-closure and the duration of the modelling (20,000 years).

Sodium (95th percentile) was shown to be in line with background concentrations until ~300 years when a gradual increase may be noted at the off-Site compliance location (~1km down hydraulic gradient of the PRWMF). This increase continued for the duration covered by the LandSim model (20,000 years). The magnitude

of increase was not noted at the 50th percentile, with the concentration at this percentile significantly lower than the 95th percentile result.

5.5.4 Post Closure CSM

Figure 14 presents a graphical representation of the post closure scenario. Overall it has suggested a low risk to the surrounding environment.

5.5.5 Sensitivity Analysis

In order to assess the sensitivity of the LandSim model to a number of key input parameters, a quantitative assessment was undertaken which involved re-evaluating the model with variations of aquifer and leachate head parameters (Model 1 and Model 2). The assessment targeted variation in the groundwater regime, with Model 1 portraying a higher hydraulic conductivity and lower porosity which would result in a faster travel time. Model 2 was evaluated to demonstrate the influence a higher leachate head, coupled with a faster groundwater regime would have on the assessment. These variations are detailed in Table 5-3, while the results are presented in Appendix F and Appendix G respectively.

Table 5-3: Sensitivity Analysis

Input Parameter	Original Value/Range	Value/Range for Sensitivity Analysis	
		Model 1	Model 2
Leachate Head (m)	Min:0.3 Max:1.0 Uniform	Min:0.3 Max:1.0 Uniform	Min:0.5 Max:2.0 Uniform
Aquifer Hydraulic Conductivity (m/s)	Min: 1.50463 x10 ⁻⁸ Max: 4.1667 x10 ⁻⁶ Log Uniform	Min:3.4722 x 10 ⁻⁵ Max:6.9444 x 10 ⁻⁵ Log Uniform	Min:3.4722 x 10 ⁻⁵ Max:6.9444 x 10 ⁻⁵ Log Uniform
Aquifer Porosity (fraction as decimal)	Min:0.05 Max:0.3 Uniform	Min:0.05 Max:0.15 Log Uniform	Min:0.05 Max:0.15 Log Uniform
Liner Hydraulic Conductivity (m/s)	Min:1.9 x 10 ⁻¹¹ Mean:2.5 x 10 ⁻¹¹ Max:5 x 10 ⁻¹⁰ Log Triangular	Min:1.9 x 10 ⁻¹¹ Mean:2.5 x 10 ⁻¹¹ Max:5 x 10 ⁻¹⁰ Log Triangular	Min:1.9 x 10 ⁻¹¹ Mean:2.5 x 10 ⁻¹¹ Max:5 x 10 ⁻¹⁰ Log Triangular
Flexible Membrane Liner (HDPE Geomembrane) Defect rate	Pin holes (0.1-5 mm ²): Min:0, Max:25. Holes (5-100 mm ²): Min:0, Max: 5. Tears (100-10,000 mm ²) Min:0, Most likely:0.1, Max:2.	Pin holes (0.1-5 mm ²): Min:0, Max:25. Holes (5-100 mm ²): Min:0, Max: 5. Tears (100-10,000 mm ²) Min:0, Most likely:0.1, Max:2.	Pin holes (0.1-5 mm ²): Min:0, Max:25. Holes (5-100 mm ²): Min:0, Max: 5. Tears (100-10,000 mm ²) Min:0, Most likely:0.1, Max:2.
Chloride Source Term (mg/l)	Min:36.6 Mean:2,270 Max:7,760	Min: 36.6 Mean: 2,270 Max: 7,760	Min:36.6 Mean:2,270 Max:7,760

Input Parameter	Original Value/Range	Value/Range for Sensitivity Analysis	
		Model 1	Model 2
	Log Triangular	Log Triangular	Log Triangular
Ammoniacal Nitrogen Source Term (mg/l)	Min: 4.37 Mean: 723 Max3,640 Log Triangular	Min: 4.37 Mean: 723 Max3,640 Log Triangular	Min: 4.37 Mean: 723 Max3,640 Log Triangular

Chloride and ammoniacal nitrogen was assessed during the sensitivity analysis. It was considered appropriate to review the concentrations of chloride down gradient of the proposed facility as it is a common constituent of landfill leachate and is unretarded, i.e. does not degrade, and previous modelling had determined that this analyte 'spiked'. Similarly, ammoniacal nitrogen is a common constituent of leachate but will degrade in the environment.

The results of the sensitivity analysis are presented in Appendix E as graphical representations for each model. The assessment showed that for Model 1, the increase in conductivity and porosity was beneficial, with concentrations of both constituents markedly lower than the main model. As expected, the travel times were shorter to the off-Site compliance bore, taking ~150 years before concentrations start to show an increase; with a peak concentration reached at ~300 years. Ammoniacal nitrogen concentrations were in line with background concentrations.

Model 2 highlighted that the leachate head had limited influence on possible releases to the environment, confirming the suitability of the engineering design. Rates for seepage through the EBS was similar to the main model and in compliance with BPEM, 2015; while leachate plus aquifer flow had increased to ~18,476 m³ (95th percentile) and 12,533 m³ (50th percentile) during operation, active management and closure of the facility. The assessment of chloride showed concentrations markedly lower than the main model at the off-Site compliance point, similar to Model 1; while ammoniacal nitrogen was in line with background concentrations.

Overall, the sensitivity analysis has suggested that porosity and hydraulic conductivity are important in the sensitivity of the model, with the main model appearing to be more conservative in this regard, reporting a higher peak concentration of chloride but longer travel times. All models demonstrate that the engineering design is suitable and in line with best practice.

5.5.6 Model Calibration

As the PRWMF is not yet operational, it is not possible to calibrate the model with site specific leachate quality data.

5.6 Essential and Technical Precautions

Essential and technical precautions are those measures required to ensure that the proposed development complies with the BPEM, 2015, which states that any waste facility must be designed to ensure that it is able to protect the environment (i.e. that hazardous substances are not discharged to groundwater in discernible concentrations and that non-hazardous pollutants are not discharged so as to cause pollution). In order to ensure compliance, the following technical precautions will be required.

5.6.1 Capping

The Site will be capped with a low hydraulic conductivity cap to reduce infiltration and to control leachate generation once the facility has ceased accepting waste. Capping should be undertaken in a staged manner throughout the operational lifespan of the facility, as soon as practical, post-completion of filling in an area, to ensure the Site is progressively restored and environmental risks are minimised.

5.6.2 Lining Design

The assessment has demonstrated that the liner design will be sufficient to ensure no hazardous contaminants will impact sensitive receptors, while non-hazardous contaminants will be limited to below guideline levels or background levels. The design will incorporate the following:

1. Leachate drainage collection layer and extraction system;
2. 2.0mm HDPE Geomembrane;
3. GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s;
4. Drainage geocomposite;
5. 2.0mm HDPE Geomembrane;
6. GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s; and
7. Minimum 0.5m engineered attenuation layer with a maximum hydraulic conductivity of 1.6339×10^{-7} m/s.

5.6.3 Leachate Control

Leachate heads will be maintained below 1m.

5.6.4 Groundwater Management

Groundwater levels are at a sufficient depth beneath the base of the proposed WMF to not pose a risk to the waste facility liner and will not require active groundwater management.

5.6.5 Leak Detection System

A geomembrane leak location survey following the installation of the leachate drainage blanket and pipework will be undertaken. All anomalies shall be investigated, and where defects are identified the geomembrane shall be repaired. On completion of the leak detection survey, a report will be prepared as a minimum as described in ASTM D7007, outlining the electrical potential across the cell area, including the location of the internal and external electrodes for each day of surveying, and the location of any detected leaks/defects.

5.6.6 CQA Verification/Validation Reporting

The supervision of cell construction and capping/restoration works should be undertaken under the auspices of third party independent CQA, to ensure works are completed in accordance with the engineering design specifications. A CQA Verification/Validation Report should be prepared for each construction/capping project to confirm compliance with the design specification.

5.7 Hydrogeological Completion Criteria

The LandSim assessment has also allowed for the determination of risk following completion of waste acceptance and the cessation of management controls, including active leachate management, and the degradation of the HDPE liner. This assessment has shown that throughout the post-closure scenario, for a



period of 21,000 years, the risk presented to the environment and human health is low. It did, however, show a spike in certain unretarded compounds, such as chloride, following a large time period (>300 years). It is likely that all contaminants and chemicals will have mobilised prior to this time period and the result is not deemed a risk.

6 Requisite Surveillance

6.1 The Risk Based Monitoring Scheme

The adoption of ongoing monitoring is recommended within BPEM, 2015 to assess the following:

- Establish the groundwater background quality and levels (m AHD);
- Establish the local groundwater flow direction and rate;
- Act as an early indicator of leachate contamination in groundwater prior to off-site migration;
- Measure compliance with the Site licence or notice; and
- Provide an indication of the downstream groundwater quality that a permitted groundwater user may find.

Further to this, as the PRWMF will be a Class IV landfill, an operational licence, issued by the DWER, will be required. To aid in the ongoing assessment of the risk, this licence, among other things, will stipulate the requirement for the ongoing monitoring of groundwater, surface water and leachate quality.

Appropriate monitoring, related to this report, will include groundwater and leachate quality. This monitoring is to ensure compliance with the operational licence conditions and to ensure no adverse environmental harm to the surrounding environment.

6.1.1 Groundwater Monitoring

A groundwater monitoring network currently exists around the perimeter of the proposed facility; however, its design will need bolstered with additional monitoring wells following the construction of the PRWMF. Once the monitoring network has been finalised and installed, the following represents the likely proposed monitoring schedule:

Table 6-1: Groundwater Monitoring

Monitoring Point	Frequency	Measurement and Analytical Suite
All	Monthly	Groundwater depth (m AHD)
All	Quarterly	pH, dissolved oxygen (DO); electrical conductivity (EC); temperature (°C); redox potential (mV); total and dissolved metals [#] ; TRH, BTEX; Nutrients [^] ; TDS and Total suspended Solids (TSS); Major anions and cations ⁺ ; Biological and Chemical oxygen demand (BOD and COD).
	Annual	<i>As above but expanded to include:</i> Organic Acid; Polychlorinated Biphenyls (PCB); Methyl tert-butyl ether (MTBE); Chlorinated Hydrocarbons (CHC); Per and Polyfluoroalkyl substances (PFAS), PAH; Phenols; Organochlorine (OC) and Organophosphate (OP) Pesticides; Microbial pathogens (E.Coli and Enterococci).

+ Major anions and cations include: Calcium, potassium, magnesium, sodium, hardness, hydroxide, carbonate, bicarbonate, total alkalinity, chloride, sulphate

Metals include: Arsenic, cadmium, chromium (III and VI), copper, Iron, Lead, manganese, molybdenum, nickel and zinc.

[^] Nutrients including: Nitrate-nitrogen, ammonia, ammoniacal nitrogen, reactive phosphorus, total nitrogen and total kjeldahl nitrogen.

6.1.2 Leachate Monitoring

Leachate quality monitoring will be undertaken from all collection sumps installed within the PRWMF. The proposed leachate monitoring schedule is presented within Table 6-2.

Table 6-2: Leachate Monitoring

Monitoring Point	Frequency	Measurement and Analytical Suite
Leachate sample collected from the sump of each hydraulically separate cell.	Monthly	Leachate level and volume removed
	Quarterly	pH, DO; EC; temperature (°C); redox potential (mV); total and dissolved metals [#] ; TRH, BTEX; Nutrients [^] ; TSS; Major anions and cations ⁺ ; BOD and COD.
	Annual	<i>As above but expanded to include:</i> Organic Acid; PCB; MTBE; CHC; PFAS; PAH; Phenols; OC and OP Pesticides; Microbial pathogens (E.Coli and Enterococci).

[#] Metals include: Arsenic, cadmium, chromium (III and VI), copper, Iron, Lead, manganese, molybdenum, nickel and zinc.

⁺ Major anions and cations include: Calcium, potassium, magnesium, sodium, hardness, hydroxide, carbonate, bicarbonate, Total Alkalinity, chloride, sulphate

[^] Nutrients including: Nitrate-nitrogen, ammonia, ammoniacal nitrogen, reactive phosphorous, total nitrogen and total kjeldahl nitrogen.

6.2 Control Levels

Control levels are specific assessment criteria that are used to determine if the landfill is performing as designed. They are generally representative of background water quality and allow for the assessment of adverse trends in groundwater, while also acting as an early warning system to enable appropriate investigative or corrective measures to be implemented, particularly where there is potential for a trigger level/compliance limit to be breached. The proposed control levels are presented in Appendix H.

6.3 Trigger Levels and Compliance Limits

Trigger levels/compliance limits represent specific regulatory standards. For WA, the DER, 2014 presents assessment criteria which are generally protective of specific groundwater uses and ecological receptors, and generally represent these trigger levels/compliance limits. This will be bolstered with guidelines presented in NEPM, 2013 and PFAS National Environmental Management Plan, Heads of EPA Australia and New Zealand (HEPA), 2018. As such, and based on our understanding of the surrounding environment, the following criteria should be adopted:

- DWER, 2014 Freshwater with a 95% protection;
- DWER, 2014 Marine Waters with a 95% protection;
- HEPA, 2018 Freshwater and Interim Marine Waters with a 95% protection;
- DWER, 2014 Non-potable guidelines;
- DWER, 2014 Long-term irrigation; and
- Stock water Guidelines.

The trigger levels/compliance limits are presented in Appendix I. These will require, however, to be reviewed on a regular basis and updated in line with any regulatory changes.



6.4 Annual Environmental and Annual Compliance Report

Following each operational calendar year, and by a date stipulated within any operational licence, both an Annual Environmental Report (AER) and Annual Compliance Report (ACR) should be created and submitted to the DWER. This report will detail the measures and actions taken to prevent off-site impacts or pollution from the Site over the previous calendar year; while the compliance report should states whether the facility has operated in compliance with the licence during the operational year.

7 Conclusion

7.1 Compliance with the Best Practice Landfill Standards

The installation of a waste management facility has the potential to pose a risk to the surrounding environment and down-gradient groundwater users due to the generation of leachate that may contain both hazardous and non-hazardous substances. BPEM, 2015 stipulates that 'Once a landfill's site has been selected, it must be designed to ensure that it is able to protect the environment'. It also states that 'the principle functions of a landfill liner system are to limit contaminant migration to groundwater' and 'the design objective of the liner and leachate collection system is to protect the beneficial uses of all groundwater'.

To achieve compliance with the Best Practice Landfill Standards, leachate levels and volumes will be controlled at the facility with extracted leachate managed via onsite evaporation ponds. The engineering design will include the installation of artificial sealing liners with a double composite GCL/HDPE geomembrane lining system and an attenuation layer. The lining system will be installed under a high standard of CQA supervision, to ensure the engineered barrier will be of a sufficient quality, thickness and attenuation properties to avoid the release of hazardous contaminants, while also limiting the release of non-hazardous substances. Overall, the design of the waste facility is in accordance with the requirements presented within BPEM, 2015.

7.2 Environmental Compliance with the Best Practice Landfill Standards

The results of the risk assessment has established that the Site will have a low impact to the surrounding environment and will not result in the release of hazardous substances above any adopted guideline value, which would result in pollution and adverse impacts to groundwater users and ecological communities. Technical precautions to ensure compliance include:

- Construction of an engineered barrier system, which will include:
 - Leachate drainage collection layer and extraction system;
 - 2.0mm HDPE Geomembrane;
 - GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s;
 - Drainage geocomposite;
 - 2.0mm HDPE Geomembrane;
 - GCL with a maximum hydraulic conductivity of 2.5×10^{-11} m/s; and
 - Minimum 0.5 m engineered attenuation layer with a maximum hydraulic conductivity of 1.6339×10^{-7} m/s (in-situ).
- A landfill cap of sufficient standard to limit infiltration and leachate generation;
- Third party independent CQA Supervision and Verification/Validation;
- Maintenance of leachate elevation within all proposed cells to within the heads specified within this assessment; and
- A risk-based programme of leachate and groundwater monitoring to ensure compliance with adopted 'control and compliance limits'.

Subject to the maintenance of leachate elevation/heads as specified within this assessment, and implementation of Best Practice Landfill Standards and operational procedures, the Site complies with the BPEM, 2015 objective 'to protect the environment by managing environmental risks'.



7.3 Recommendations

Following commencement of waste acceptance at the PRWMF, it is recommended calibration of the LandSim model is undertaken utilising on-site data, including site specific leachate data. This should be undertaken following four years of operation, then every four years following, as per LFTGN01 recommendations.



References

Commonwealth Scientific and Industrial Research Organisation Australian Soil Resource Information System (ASRIS)

A. Crostella, R. P. Iasky, K. A. Blundell, A. R. Yasin, and K. A. R. Ghorri, 2000, Petroleum Geology of the Peedamullah Shelf and Onslow Terrace, Northern Carnarvon Basin Western Australia, Geological Survey of Western Australia, Department of Minerals and Energy

Department of Environment Regulation Assessment and management of contaminated sites, Contaminated site guidelines, 2014

Department of Health, Contaminated Sites Ground and Surface Water Chemical Screening Guidelines, 2014

Department of Mines, Industry Regulation and Safety Geological Survey of Western Australia

Department of Mines Industry and Resource Safety (DMIRS)- GeoVIEW Platform
(<https://geoview.dmp.wa.gov.au/GeoViews/?Viewer=GeoVIEW>)

Department of Water Carnarvon Artesian Basin, Water Management Plan, Department of Water, 2007

Department of Water Hydrogeological Atlas, website <http://atlases.water.wa.gov.au/idelve/hydroatlas/>

Department of Water, Operational policy 5.17 Metropolitan domestic garden bores, 2011

Department of Water, Pilbara Regional Water Plan 2010-2030

H.S. Edgell 1963, Micropalaeontology and Stratigraphy of Minderoo No.1 Bore, Carnarvon Basin, WA,

R.M. Hocking, H.T. Moors, W.J.E. Van De Graff, 1987, Bulletin 133 geology of the Carnarvon Basin Western Australia, Geological Survey of Western Australia, Department of Mines

McWhorter and Sunada 1997, Groundwater Hydrology and Hydraulics

D.A. Morris and A.I. Johnson, 1967, Summary of Hydrologic and Physical Properties of Rock and Soil Materials, as analysed by the hydrologic laboratory of the U.S Geological Survey.

NationalMap (<https://nationalmap.gov.au/>)

PFAS National Environmental Management Plan, Heads of EPA Australia and New Zealand, 2018

Reinhart. Debra R, McCreanor. Philip T, Implications of Time/Space Variable Leachate Head on Liner Leakage.

Rights in Water and Irrigation Act 1914

South Wales (NSW) Environmental Protection Agency (EPA) Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases, 2012

Shire of Ashburton Town Planning Scheme No.7 (District Scheme).

Talis Consultants Pty Ltd, Phase 1 Hydrogeological Risk Assessment, TW17084-Onslow Site Investigations Hydrogeological Report.1a.



UK Environment Agency, Attenuation of organic contaminants in leachate by mineral landfill liners, 2009

West, T.R., 1995, Geology applied to engineering.

W.J.E.Van De Graff, P.D.Denman, M. Hocking, 1982, 1:250,000 Geological Series-Explanatory Notes, Onslow Western Australia, Sheet SF 50-5 International Index, Geological Survey of Western Australia, Department of Mines



Figures

Figure 1: Locality

Figure 2: Site Aerial

Figure 3: Topography

Figure 4: Zoning

Figure 5: Intrusive Investigation Locations

Figure 6: Conceptual Site Model

Figure 7: Proposed PRWMF Footprint

Figure 8: Groundwater Contours – January 2018

Figure 9: Groundwater Contours - March 2018

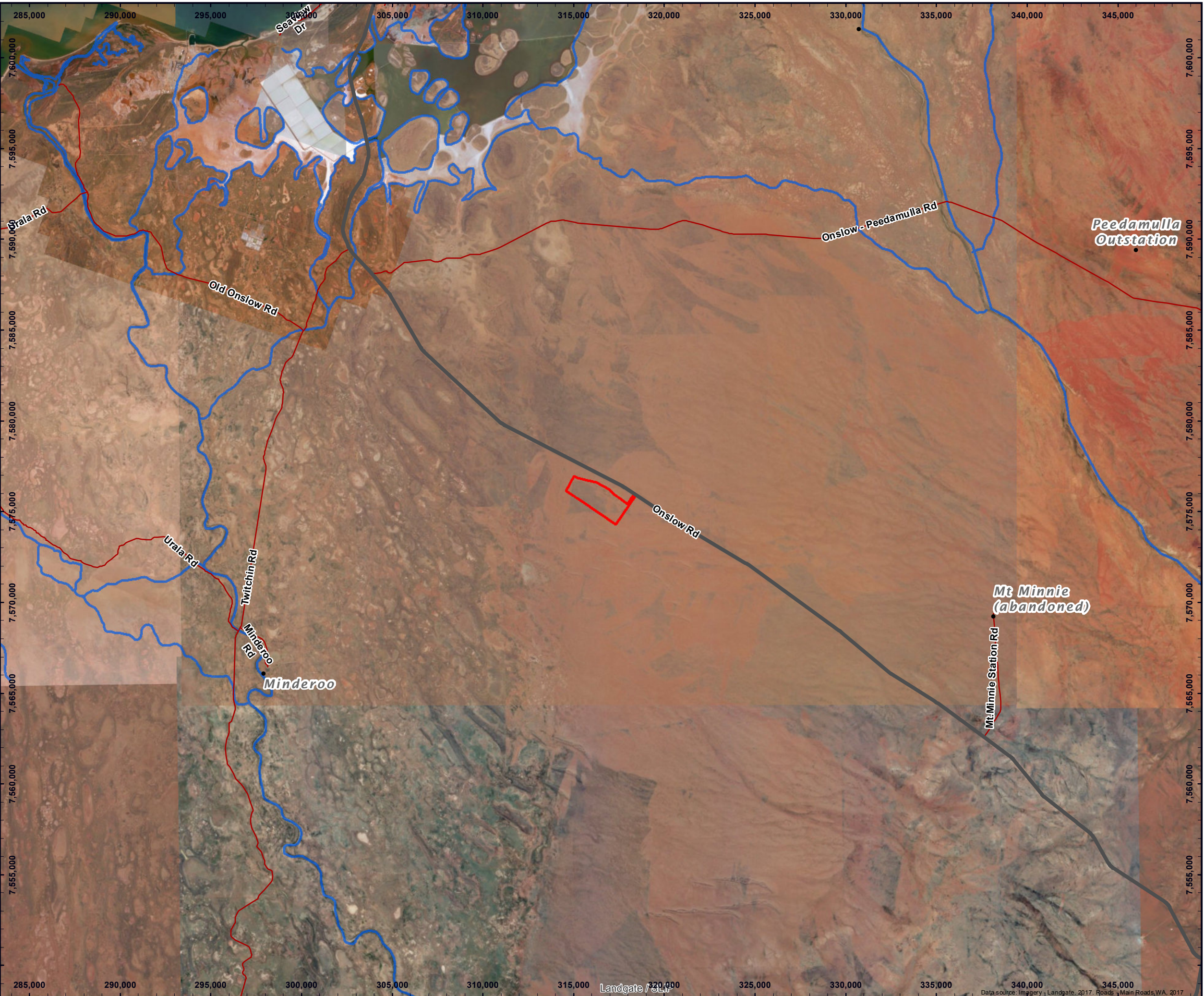
Figure 10: Groundwater Contours - April 2018

Figure 11: Groundwater Contours - May 2018

Figure 12: Groundwater Contours – June 2018

Figure 13: Groundwater Contours - July 2018

Figure 14: Post Closure Conceptual Site Model



LEGEND

- Site Boundary
- Primary Distributor Road
- Access Road
- River

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LOCALITY

0 20 40 80 120 160 km

SITE LOCATION

Phase 2 HRA
Onslow PRWMF
Lot 150 Onslow Road
Onslow, WA 6710

0 1 2 3 4 8 km
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994
Scale @ A3:1:200,000

Prepared: F Walker	Date: 17/08/2018
Checked: J. Skiba	Project No: TW18036
Reviewed: N King	Revision: A

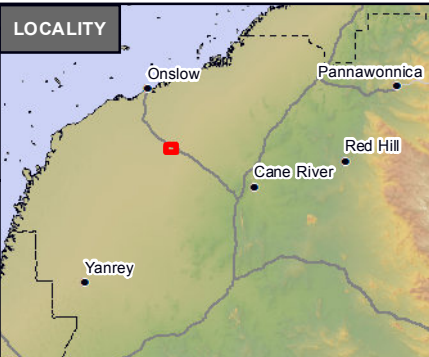
Figure 01



LEGEND

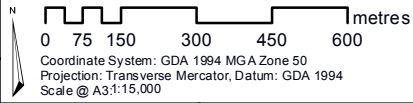
Site Boundary

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AERIAL PLAN

Phase 2 HRA
Onslow PRWMF
Lot 150 Onslow Road
Onslow, WA 6710



Prepared: F Walker	Date: 17/08/2018
Checked: J. Skiba	Project No: TW18036
Reviewed: N King	Revision: A



Figure 02



LEGEND

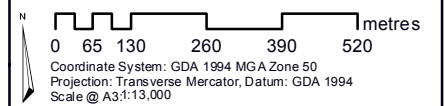
- Site Boundary
- Elevation (mAHd)

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TOPOGRAPHY

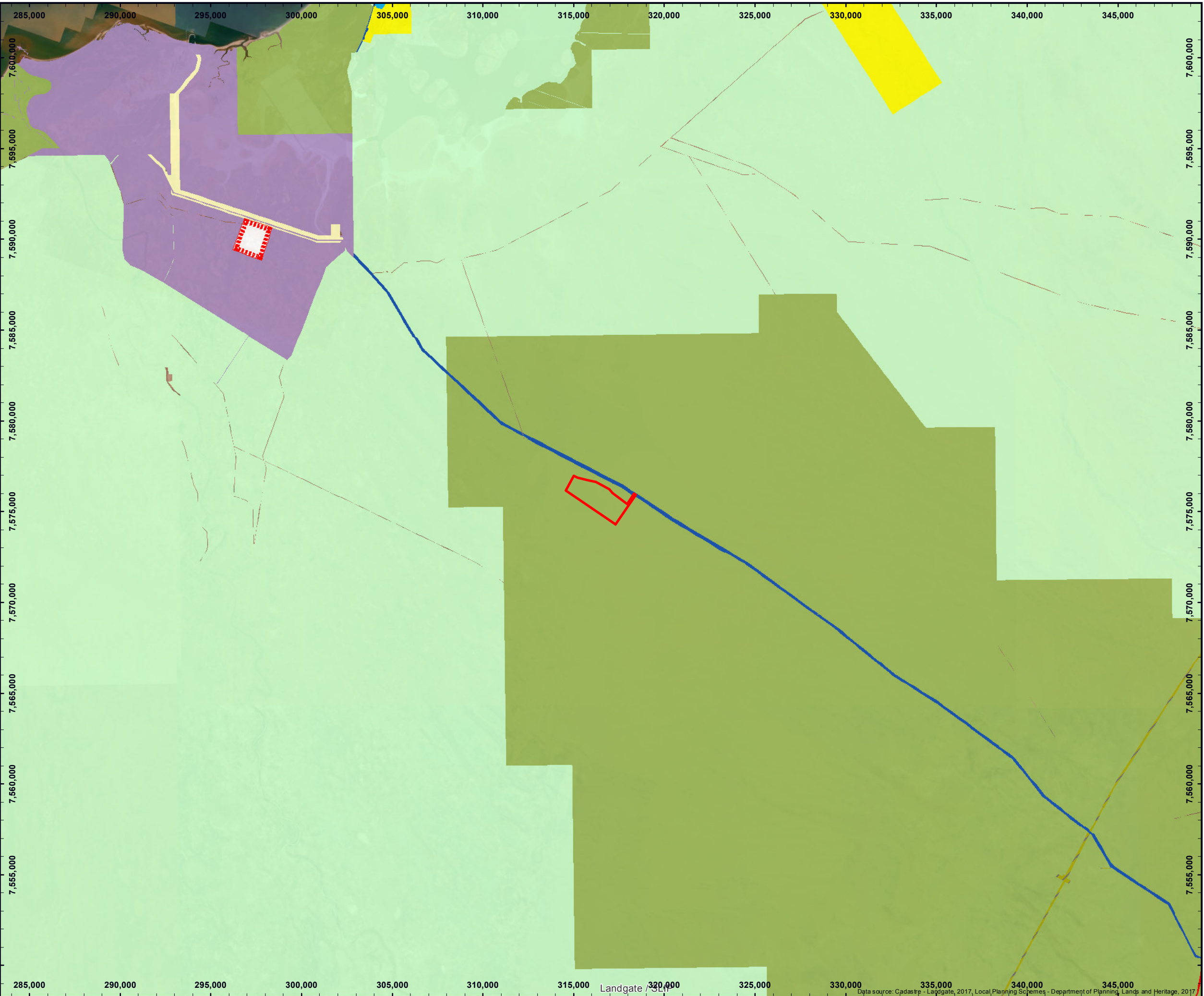
Phase 2 HRA
Onslow PRWMF
Lot 150 Onslow Road
Onslow, WA 6710



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Checked: J. Skiba	Project No: TW18036
Reviewed: N King	Revision: A



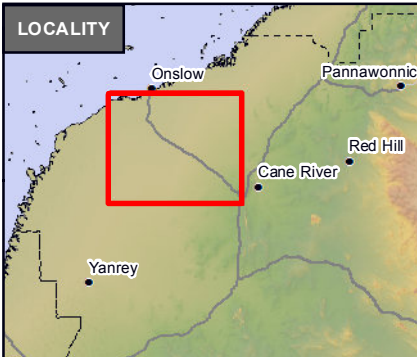
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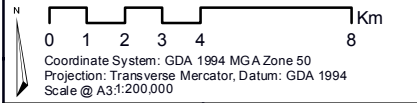
- Site Boundary
- Local Planning Scheme**
 - Conservation, recreation and nature landscape
 - District Road
 - Industrial
 - Infrastructure Zone
 - Mixed Business
 - Other Purposes - Infrastructure
 - Public Purposes
 - Rural
 - Special Use
 - State/Regional Road

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ZONING

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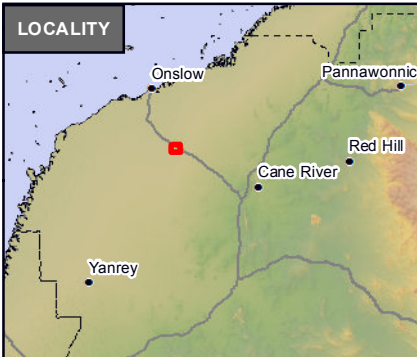
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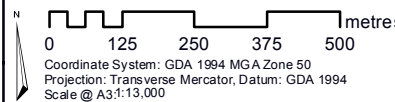
-  Site Boundary
-  Groundwater Monitoring Well

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BORE LOCATIONS

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Lot 150 Onslow Road
Onslow, WA 6710



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Figure 05

LEGEND

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LOCALITY



CONCEPTUAL SITE MODEL

Phase 2 HRA
Onslow PRWMF
Lot 150 Onslow Road, Onslow, WA 6710

Scale: Figure not to scale
Coordinate System: n/a

Date:	17/08/2018
Scale @ A3:	Not to scale
Prepared:	F Walker
Checked:	F Daly
Reviewed:	N King

Revision: Rev A
Project No: TW18036

Figure 06





LEGEND

- Site Boundary
- Perimeter Drain
- Levee Protection Embankment
- Site Access Road
- Future Specialist Waste and Resource Recovery Area
- Pond
- Tyre Monocell
- Liquid Waste Fixation Pit
- WASTE Perimeter Bund
- Hardstand Area

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LOCALITY

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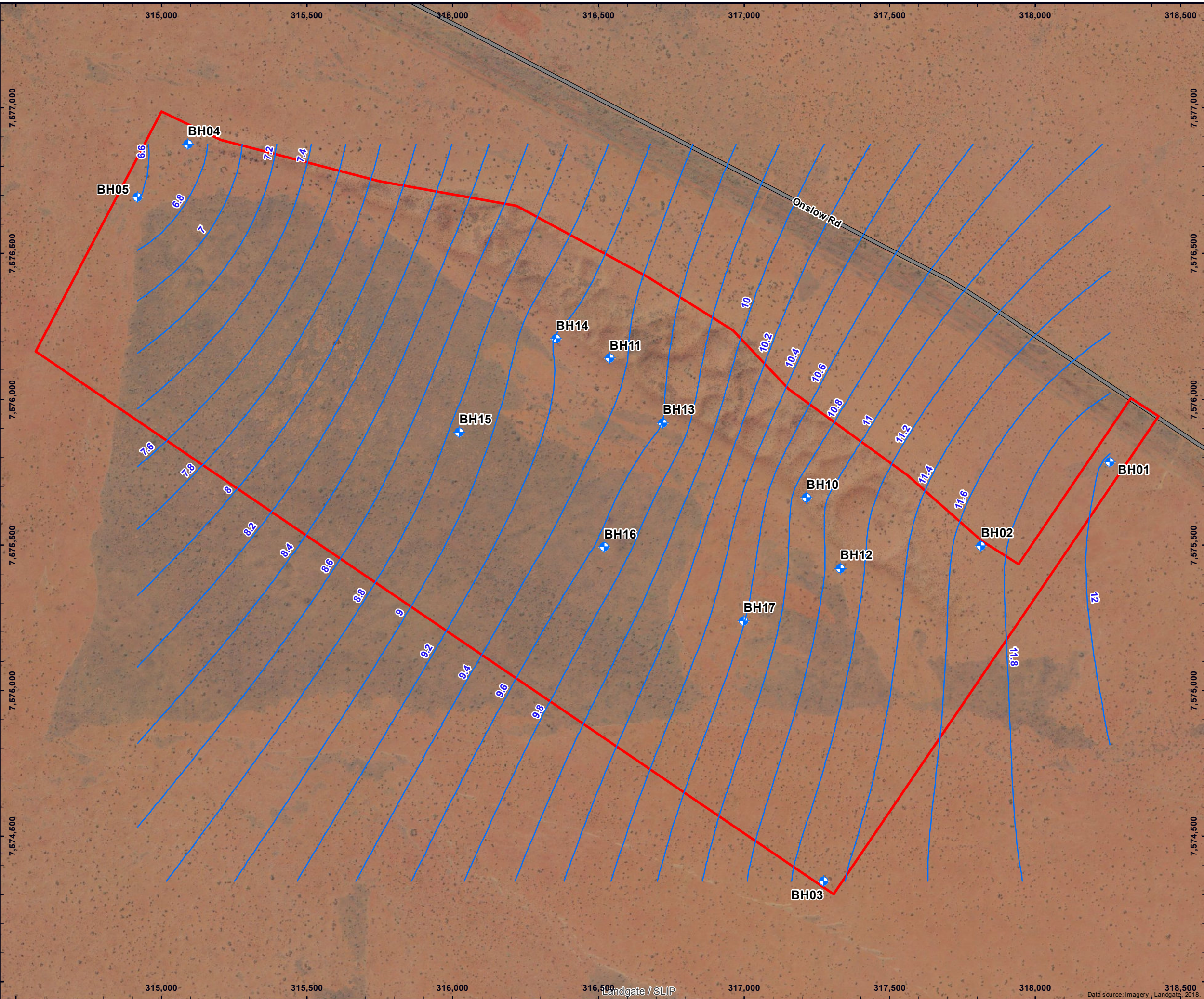
PROPOSED LANDFILL FOOTPRINT

Phase 2 HRA
Onslow PRWMF
Lot 150 Onslow Road
Onslow, WA 6710

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Projection: Transverse Mercator, Datum: GDA 1994
Scale @ A3:1:13,000

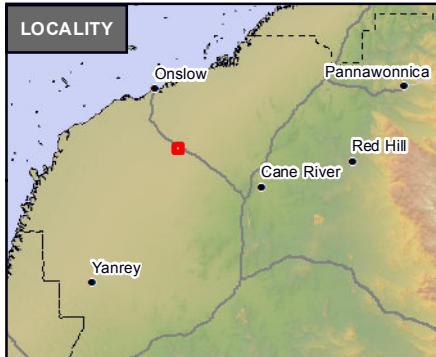
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Figure 07



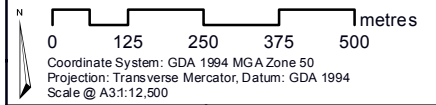
- LEGEND**
- Site Boundary
 - ◆ Groundwater Monitoring Well
 - Groundwater Contours (RL SWL mAHD)

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**GROUNDWATER CONTOURS
JANUARY 2018**

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Onslow, WA 6710



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Figure 08



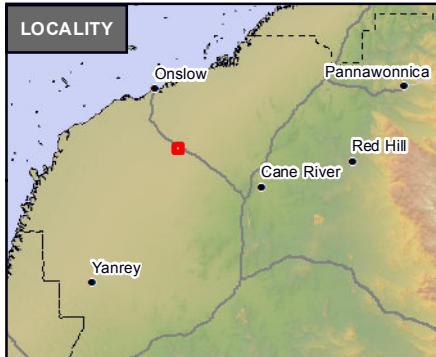
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Site Boundary

Groundwater Monitoring Well

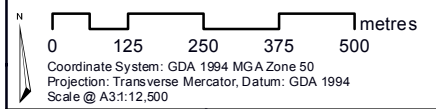
Groundwater Contours (RL SWL mAHD)

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GROUNDWATER CONTOURS
MARCH 2018

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Figure 09



LEGEND

- Site Boundary
- ◆ Groundwater Monitoring Well
- Groundwater Contours (RL SWL mAHD)

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LOCALITY

0 20 40 80 120 160 km

GROUNDWATER CONTOURS

APRIL 2018

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Onslow, WA 6710

0 125 250 375 500 metres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994
Scale @ A3:1:12,500

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Checked: J. Skiba	Project No: TW18036
Reviewed: N King	Revision: A

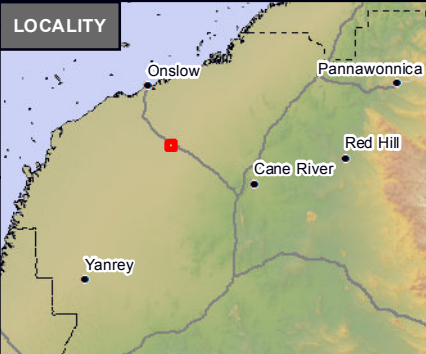
Figure 10



LEGEND

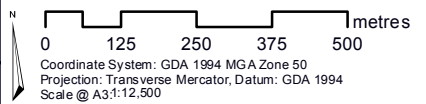
- Site Boundary
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GROUNDWATER CONTOURS
MAY 2018

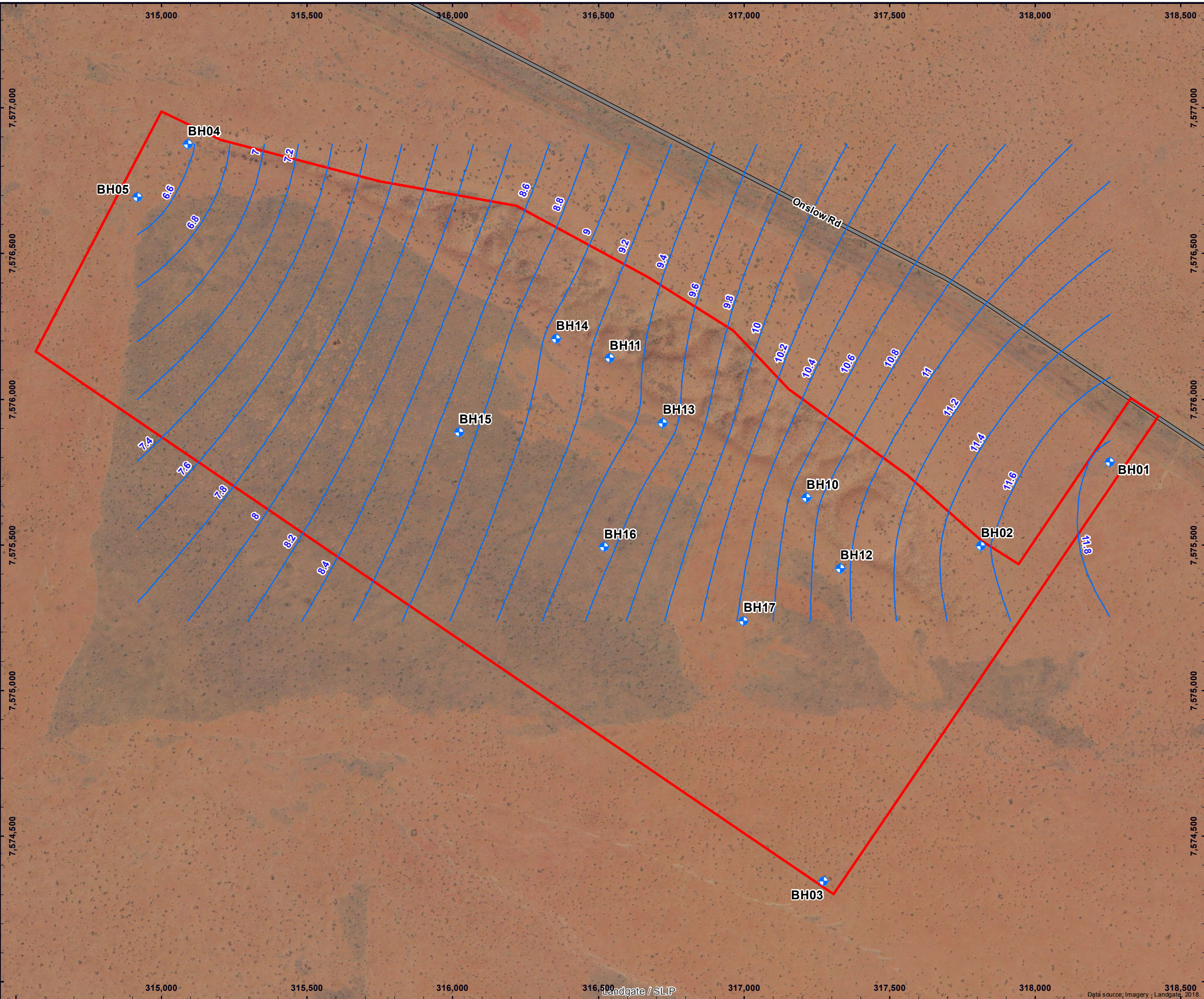
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Lot 150 Onslow Road
Onslow, WA 6710



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Reviewed: N King	Revision: A



Figure 11



LEGEND

- Site Boundary
- ◆ Groundwater Monitoring Well
- Groundwater Contours (RL SWL mAHD)

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LOCALITY

0 20 40 80 120 160 km

GROUNDWATER CONTOURS

JUNE 2018

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0 125 250 375 500 metres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator, Datum: GDA 1994
Scale @ A3:1:12,500

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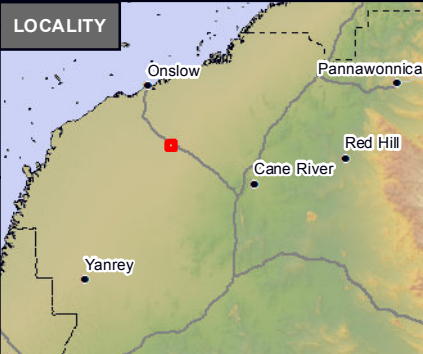
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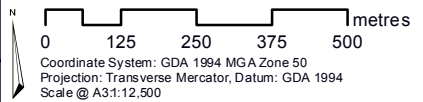
- Site Boundary
- Groundwater Monitoring Well
- Groundwater Contours (RL SWL mAHD)

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GROUNDWATER CONTOURS
JULY 2018

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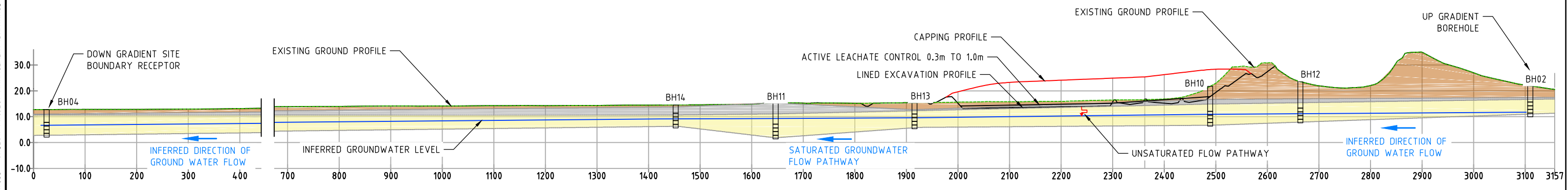
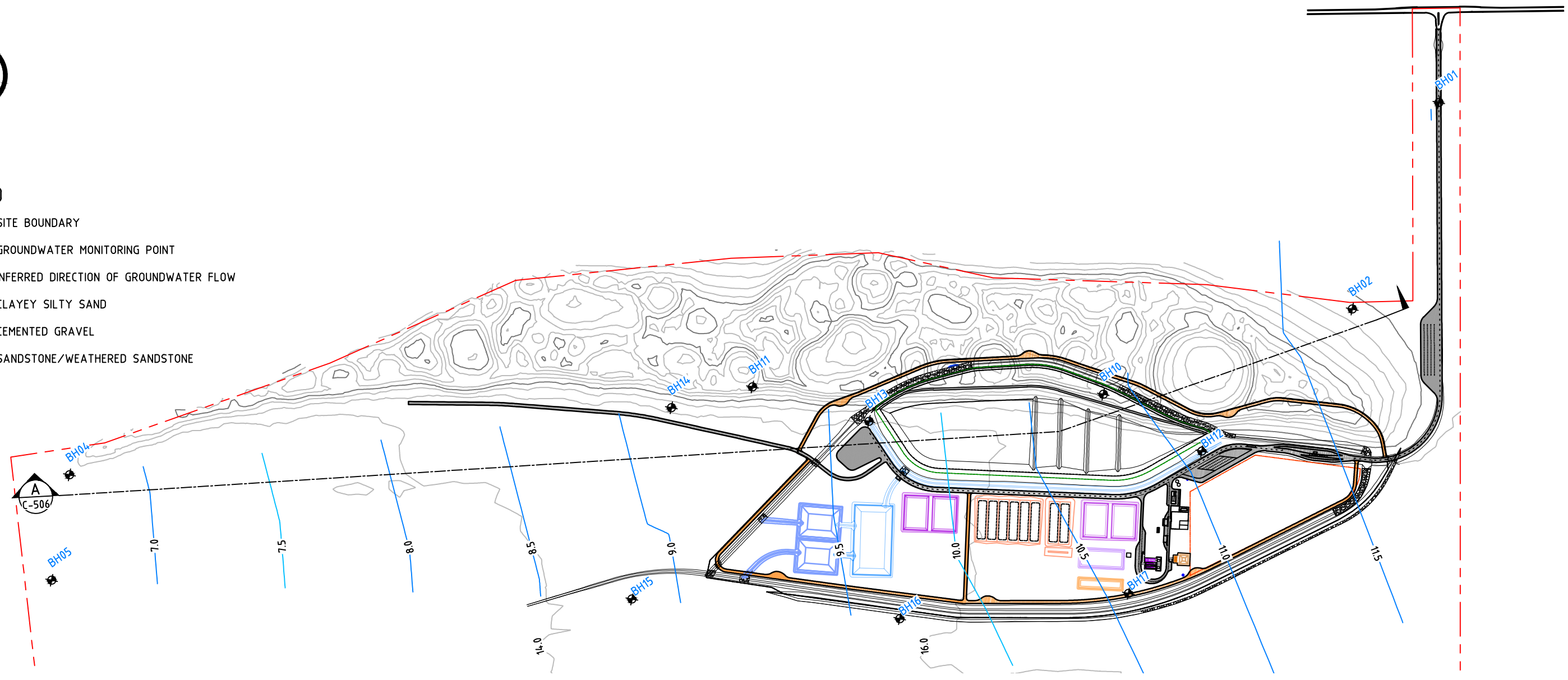


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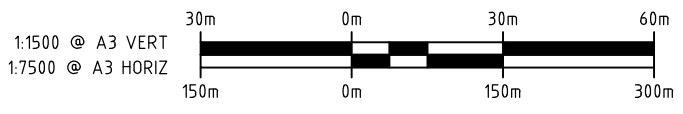


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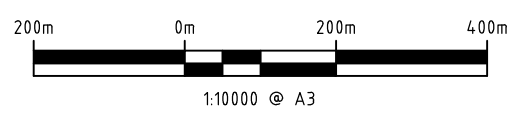
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- BH02 GROUNDWATER MONITORING POINT
- INFERRED DIRECTION OF GROUNDWATER FLOW
- CLAYEY SILTY SAND
- CEMENTED GRAVEL
- SANDSTONE/WEATHERED SANDSTONE



A TYPICAL SECTION
SCALE: AS SHOWN



PRELIMINARY ONLY
NOT FOR CONSTRUCTION



VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50



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CIVIL ENGINEERING
ENVIRONMENTAL SERVICES
SPATIAL INTELLIGENCE
WASTE MANAGEMENT

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PO Box 454, Leederville WA 6903

Client: SHIRE OF ASHBURTON

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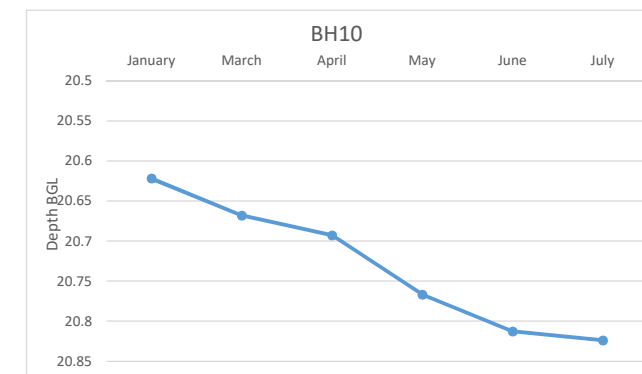
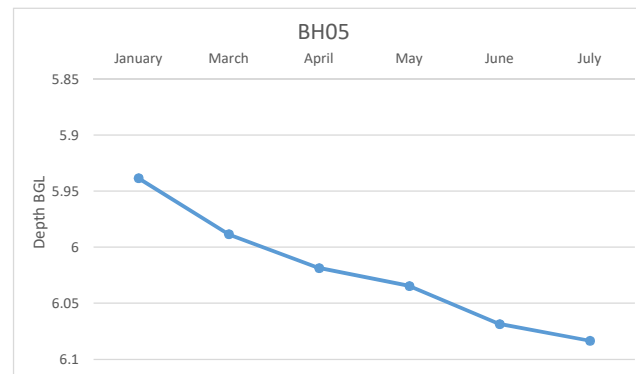
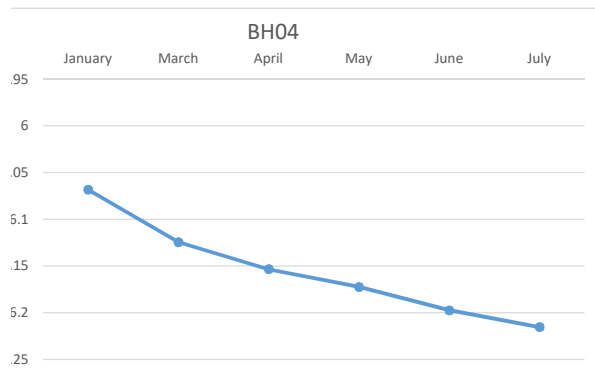
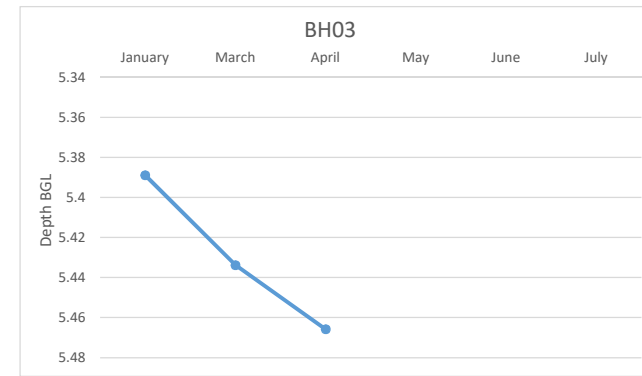
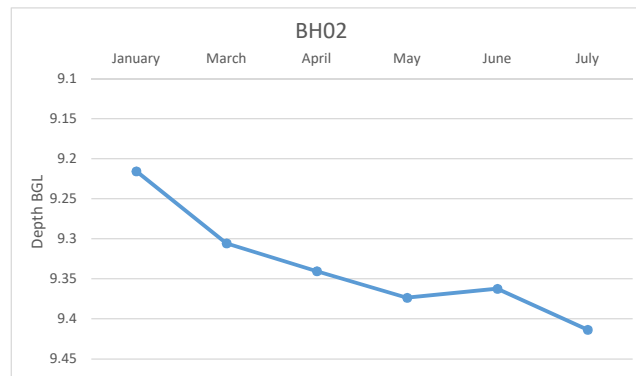
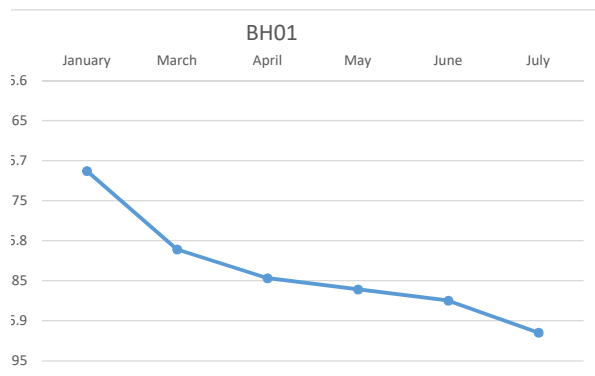
Project: PILBARA REGIONAL WASTE MANAGEMENT FACILITY

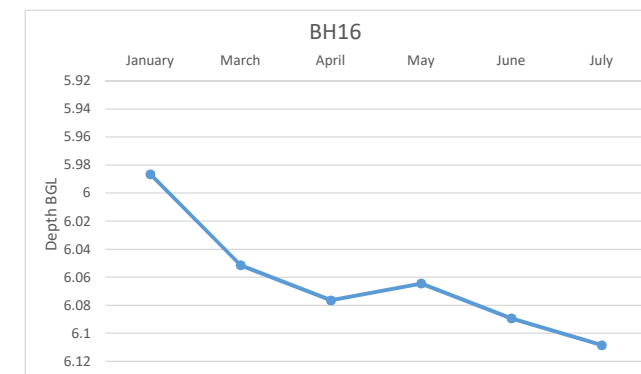
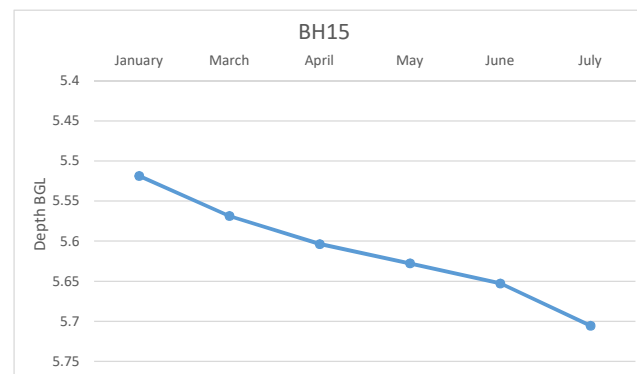
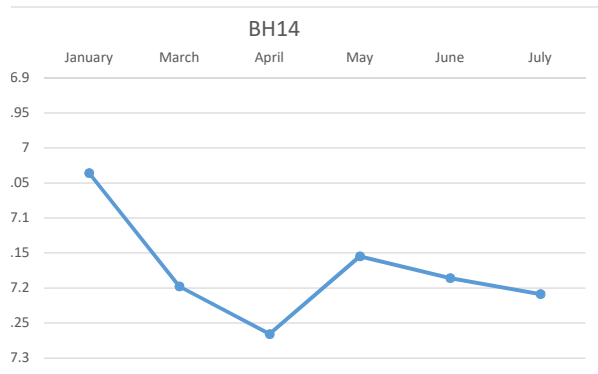
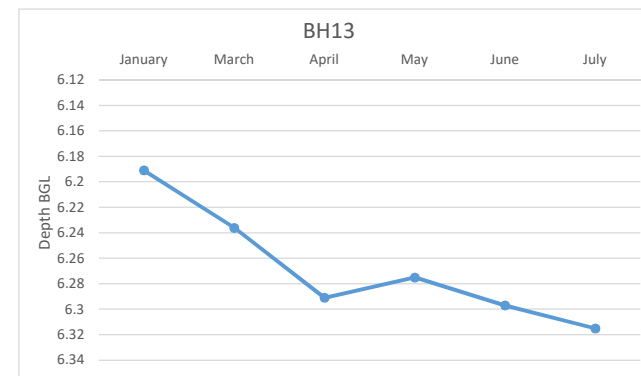
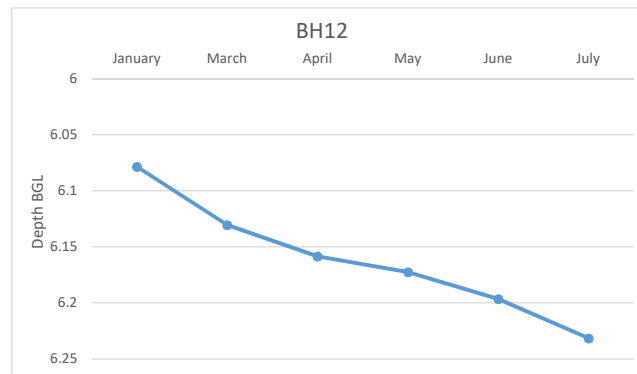
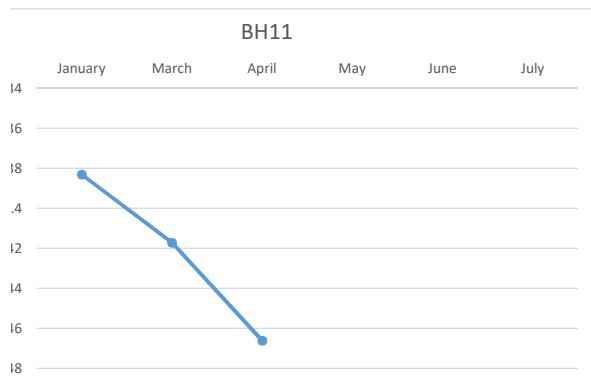
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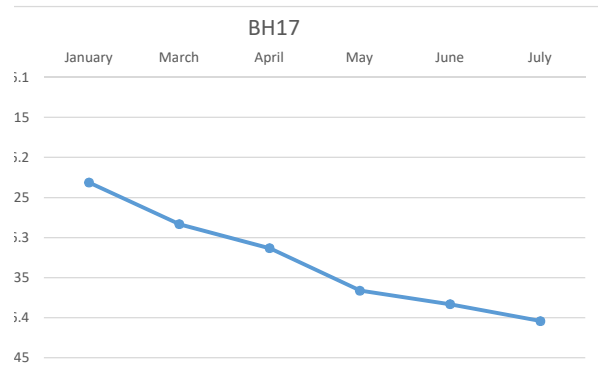
Drawn by:	AB	Job No:	TW17053
Checked by:	LM	File No:	TW17053-C110
Approved by:		Drg. No:	
Scale:	1:10,000 @ A3	FIGURE 14	A
Date:	23.10.18		



Appendix A: Hydrographs









Appendix B: HELP Model



Assets | Engineering | Environment | Noise | Spatial | Waste

Seepage Assessment

Liner Performance



Prepared for Shire of Ashburton

October 2018

Project Number: TW18036



DOCUMENT CONTROL

Version	Description	Date	Author	Reviewer
0a	Internal Review	26/07/18	CP	LM
1a	Released to Client	26/10/18	CP	LM

Approval for Release

Name	Position	File Reference
Ronan Cullen	Director & Waste Management Section Leader	TW18036 - Seepage Assessment.1a

Signature



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Appendices

Appendix A : No Cap Operational Phase HELP Simulations

Appendix B : Capped & Restored Landfill HELP Simulations

1 Introduction

Talis Consultants Pty Ltd (Talis) was commissioned by the Shire of Ashburton (the Shire) to prepare the Approval documentation for the Pilbara Regional Waste Management Facility (the Site). As part of the supporting documentation, Talis has undertaken a Seepage Assessment to evaluate the proposed liner performance. This document describes the manner in which the assessment has been carried out and presents the overall findings.

1.1 Site Description

The Shire is progressing with the development of a new regional waste management facility located at 150 Onslow Road, Talandji, Western Australia. With the rapid increase in industrial development and its associated growth within the Shire and Pilbara Region, there will be a significant increase in the volume of waste generated. Therefore, the Shire identified the need for the establishment of a new facility that can meet the waste management needs of Onslow and the wider Pilbara region.

The project, referred to as the Pilbara Regional Waste Management Facility (PRWMF), will provide a range of waste management services including sustainable initiatives such as reuse, recycling and recovery as well as treatment and disposal. The proposed Class IV facility and its associated infrastructure will be designed and constructed to Environmental Protection Authority (EPA) Victoria's Best Practice Environmental Management Guidelines for the Siting, Design, Operation and Rehabilitation of Landfills (August 2015) (Best Practice Landfill Standards)¹. It will consist of a double composite-lined landfill with leachate collection that will accept up to Class IV waste types over a lifespan of 50 years.

1.2 Geology and Hydrogeology

In 2017, Talis was commissioned by the Shire to undertake a geotechnical investigation of the Site. As part of the works, a total of 112 trial pits (TP01-TP112) were excavated across the Site to assess the shallow subsurface, and to allow the collection of bulk soil samples for laboratory testing. The trial excavations described the underlying soil horizon to primarily be a SAND, with its structure described as fine to medium grained, rounded to sub rounded, dry and loose with occasional roots. It was also described as a SILTY SAND/SANDY SILT of low plasticity. This horizon is colloquially known as 'Pindan'. This horizon was encountered to a maximum depth of between 0.5m and 5m below ground level.

The conditions were recorded to be generally homogenous across the Site. Therefore, the following generalised profile has been determined for the Site:

- SAND – loose, fine to medium grained (Pindan) generally corresponding to the sand dune ridge;
- Sandy clayey SILT/Silty clayey SAND – loose to dense, fine to medium grained, rounded to sub-rounded, red brown and dry (Pindan); underlain by
- Cemented GRAVEL/SILCRETE – cemented gravels in silty sand/sandy silt matrix – hard, red brown and white, becoming brown with depth, and dry; underlain by
- SANDSTONE interfingering with cemented gravel – medium grained, occasional clasts, siliceous veins and vugs, dry, red to yellow.

¹ Siting, Design, Operation and Rehabilitation of Landfills, EPA Victoria, Publication 788.3, August 2015.

A Phase 1 Hydrogeological Investigation was undertaken in December 2017 to assess both the groundwater regime beneath the Site and the risk to environmental values and adjacent properties in relation to the construction of the proposed development of a waste management facility at the Site. A total of twelve soil bores were drilled into the regional groundwater aquifer, with six converted into groundwater monitoring wells and six converted into combined groundwater monitoring wells and landfill gas wells. Further to this, a total of 112 trial pits were excavated into the shallow soils, in order to assess the soils for geotechnical purposes as well as the interaction with the surface water flow, rainfall and the underlying aquifer.

The hard rock geology encountered during the investigation was recorded as the Windalia Radiolarite Formation, which forms part of the Carnarvon Artesian Basin. Permanent superficial/perched aquifers were not encountered during the investigation, though one may exist seasonally. The permeability assessment of the superficial soils highlighted a value of between 9.0×10^{-6} m/s and 1.0×10^{-6} m/s for the silty sand horizon and between 4.8589×10^{-8} m/s and 6.107×10^{-9} m/s for the sandy silt horizon. The cemented gravel/silcrete recorded a permeability of between 1.6339×10^{-7} m/s and 3.382×10^{-9} m/s. The maximum hydraulic conductivity was calculated to be 0.36m/day; however, rates vary across the Site and may be greater in some locations. The ranges were within the expected range for a fine to medium grained sandstone.

1.3 Conceptual Site Model

The Class IV landfill at the Site has been designed and will be constructed according to Best Practice Landfill Standards. The key design aspects that directly relate to the Seepage Assessment of the landfill are discussed in the sub-sections below.

1.3.1 Proposed Basal Lining System

A double composite lining system is proposed for the Class IV landfill with a leachate collection layer above the primary lining system, and a leak detection layer above the secondary lining system. The silty/clayey 'Pindan Sand' as identified in the geotechnical investigation at the Site will be utilised as an engineered attenuation layer as part of the basal lining design below the geosynthetic lining system. The proposed lining system to meet the requirements of the Best Practice Landfill Guidelines is outlined below:

- Primary Lining System:
 - Best Practice Landfill Guidelines infers that the top of the leachate collection layer should have a geotextile layer to prevent fine particles from the waste mass filtering into the gravel and blocking the pore space and adversely affecting the permeability.
 - Above the composite lining system, a 300mm thick layer of permeable gravel with an associated network of perforated collection pipes will act as the leachate collection system. The composite lining system will be protected from the leachate collection system and overlying materials with a non-woven protection/cushion geotextile. The protection/cushion geotextile will be specified to account for the grading of the gravel and long term loading from waste disposal operations;
 - 2mm High Density Polyethylene (HDPE) geomembrane will act as an artificial sealing liner to form the upper part of the primary lining system; and
 - A low permeability Geosynthetic Clay Liner (GCL) consisting of layer of bentonite needle punched between two layers of geotextile.
- Secondary Lining System:
 - A Leak Detection Layer consisting of a drainage geocomposite to direct potential seepage to a secondary extraction/monitoring sump;
 - 2mm HDPE geomembrane will overlie the lower GCL as an artificial sealing liner to form the upper part of the secondary lining system;

- A low permeability GCL consisting of layer of bentonite needle punched between two layers of geotextiles, will be installed in direct contact with the engineered attenuation layer as part of the secondary composite lining system; and
- A minimum 500mm thick engineered attenuation layer sourced from onsite 'Pindan Sand' will be constructed on the base and side slopes of the landfill to form an engineered attenuation layer above the naturally occurring in situ attenuation soils.

The landfill is designed to be a minimum of 3m above the highest natural groundwater level recorded in the development area at its lowest point, 1m higher than the Best Practice Landfill Standards minimum level. Lastly, the landfill is designed with 1 vertical rise (V):3 horizontal run (H) side slopes, with the basal gradients at not less than 3 percent (%) to collection pipes and leachate collection pipes at not less than 1% towards the extraction sump.

This proposed liner design is in accordance with the Best Practice Landfill Standards, which states that the best available technology should be used to control seepage to an amount not exceeding 10 litres per hectare per day (L/ha/day). The double composite basal containment liner as previously described was utilised to define the soil and material characteristics within the model.

1.3.2 Proposed Capping System

A low permeability capping system has been designed as follows, from the top down:

- Top soil/Mulch/Growth Medium;
- 1.2m restoration soils;
- Drainage geonet (where required as determined following Phase 2 Hydrogeological Risk Assessment modelling);
- 1.5mm linear low-density polyethylene (LLDPE) geomembrane liner;
- A GCL will provide the rainwater exclusion layer for the landfill; and
- 300mm gas collection/regulating layer above the waste fill.

In addition, the restoration profile is designed in accordance with Best Practice Landfill Standards, with 1V:5H and 1V:20H final slopes to facilitate stable and free draining profiles post closure of the landfill. The proposed capping system as previously described was utilised to define the soil and material characteristics within the model.



2 Seepage Modelling

With regards to liner performance, Best Practice Landfill Standards requires that the best available technology should be used to control seepage to an amount not exceeding 10L/ha/day. In order to assess the potential seepage through the liner, modelling has been undertaken utilising the Hydrologic Evaluation of Landfill Performance (HELP 3.95D) computer program.

The HELP program is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of landfills.

The HELP program, Versions 1, 2 and 3 was developed by the US Army Engineer Waterways Experiment Station (WES) for the US Environmental Protection Agency (USEPA). The enhanced HELP 3.95D program version allows for the program to be used by means of a windows user interface and was developed by Dr Klaus Berger at the Institute of Soil Science, University of Hamburg, Germany.

2.1 Design Inputs

The HELP model requires weather, soil and design data and uses solution techniques that account for the effects of surface storage, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, and seepage through soil, geomembrane or composite liners. Input parameters utilised in the modelling are described in the following sub-sections.

2.1.1 Future Landfill Footprint

The future landfill development area covers an area of 13.72ha. For the uncapped operational phase the seepage has been modelled with zero (0%) potential runoff and will be modelled over an area of 4.40ha. This area denotes the maximum potential area for the active generation of leachate and represents the combined area of the three largest cells designed for the landfill if they were open and uncapped. For the capped and restored landfill the seepage has been modelled over the entire landfill area and with the potential for 100% runoff.

HELP modelling requires a user-defined Curve Number (CN) which is an empirical parameter for predicting runoff, the HELP user guide provides a table for typical runoff curves based on the stand of grass and soil texture. Given the geology of the Site and the selected maximum leaf area index, the maximum runoff curve number of 90 was used to represent high potential of runoff during storm events during the capped phase. The lowest runoff curve number accepted in the HELP model, 0.1, was assigned to the operational uncapped phase to represent little to no runoff occurring during storm events. The HELP model parameters can be observed in Table 2-1.

Table 2-1: General Landfill Information

Parameter	Worst-case Operational Phase Area No Cap	Future Landfill Area Capped
Landfill Area	4.40ha	13.72ha
Percent area where runoff is possible	0%	100%
Curve Number	0.1	90

2.1.2 Weather Data

Historical weather data was sourced from Australian Government, Bureau of Meteorology website utilising data from the Onslow Airport weather station data (Station ID: 005017), which is located approximately 4 kilometres

(km) from the coast and approximately 30km from the Site. According to the Onslow Airport weather station, the average annual rainfall for Onslow is reported as 314.4mm. The mean maximum annual temperature is 32.0 degrees Celsius (°C), while the mean minimum annual temperature is 19.1°C. In addition, the annual average daily solar radiation is 22.5 megajoules per square metre (MJ/m²). Though Onslow Airport weather records date back to 1940, solar radiation data has only been recorded since 2007. Therefore, only the suite of climate records from years 2007 to 2018 (11 years) were used to run the simulations in the HELP model.

2.1.3 Evapotranspiration

The evapotranspiration is calculated in the HELP model based on the transfer and balance of energy in the environment, utilising the additional climate data of humidity and wind speed, along with soil evaporative zone depth, maximum leaf area index and growing season data.

The relative humidity data from the Onslow Airport weather station is summarised in Table 2-2.

Table 2-2: Relative Humidity Monthly Averages

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean 9am Relative Humidity (%)	54	59	58	55	58	63	61	54	46	42	44	47
Mean 3pm Relative Humidity (%)	51	53	49	44	45	45	44	39	38	38	43	46

However, the monthly average data must be reconfigured for input into the HELP model, which requires the average relative humidity per quarter as opposed to monthly averages. This data is shown in Table 2-3.

Table 2-3: Relative Humidity Quarterly Averages

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Average 9am Relative Humidity per Quarter (%)	57	59	54	44
Average 3pm Relative Humidity per Quarter (%)	51	45	40	42
Average Daily Relative Humidity per Quarter (%)	54	52	47	43

The evaporative zone depth has been defined as 2.5 centimetres (cm) for the uncapped operational phase. In reality, the evaporative zone depth would vary during the uncapped operational phase due to varying compaction rates, exposure to the weather, types of wastes, and initial moisture content. According to the HELP model user guidelines, if the top soils are of the sand and silt variety, then the evaporative zone depth would be around 20cm. Therefore, the evaporative zone depth for the capped landfill phase has been defined as 20cm since these materials are present at the Site and would likely be used during the capping works.

The HELP model utilises a maximum leaf area index to define the ratio of the leaf area of actively transpiring vegetation. The HELP model was developed for grasses; typical values of the maximum leaf area index are presented in



Table 2-4. The uncapped operational phase of the landfill was modelled with a zero (0) representing bare ground leaf area index. The capped and restored landfill was modelled with a one (1) indicating poor stand of grass leaf area index.

Table 2-4 Typical Values of the Maximum Leaf Area Index (LAI)

Vegetation Type	Maximum LAI
Bare ground	0.0
Poor stand of grass	1.0
Fair stand of grass	2.0
Good stand of grass	3.5
Excellent stand of grass	5.0
Shrubbery	4 -12
Deciduous forest	7 -15
Coniferous forest	10 -20

In the HELP model user guidelines, the growing season for grasses is defined as when normal mean daily temperature rises above 10°C to 12.8°C. According to the climate data for Onslow, the normal mean daily temperature is always above 12.8°C. The wet season for the Pilbara region occurs from December to April each year, but due to arid-desert like conditions there is no reliable growing season. Fire, grazing and weather interact in complex ways to affect land condition. Controlled burning of spinifex pastures provides the most benefit to areas with an average annual rainfall of at least 200mm. Spinifex germination and re-establishment can reach 6-8cm in diameter about 3 months after germinating rains, if soil moisture levels are sufficient to sustain continuing growth (Department of Primary Industries and Regional Development - DPIRD, 2018). Therefore for the purpose of modelling, the growing season was defined as occurring between December and July. A summary of the evapotranspiration parameters utilised in the HELP model simulations are presented in Table 2-5.

Table 2-5: Summary of Evapotranspiration Parameters

Parameter	Future Landfill Area No Cap	Future Landfill Area Capped
Evaporative zone depth	2.5cm	20cm
Maximum leaf area index	0 (Bare ground)	1 (Poor stand of Grass)
Growing (Wet) Season (Julian Date)	December to July (335 – 212)	
Mean 9am wind speed	17.40km/h	
Mean 3pm wind speed	23.24km/h	
Average yearly average wind speed	20.32km/h	

2.1.4 Landfill Liner & Capping System

In order to run the required simulations through the HELP model, the composite basal containment liner and low permeability cap design as described in Section 1.3 must be recorded in the model using default layer types. These layer types have standard soil and material characteristics including total pore volume, field capacity, wilting point and saturated hydraulic conductivity. Default software values were used for the model with some exceptions for the saturated hydraulic conductivity to allow for more conservatism, as described in Section 2.1.4.1.

2.1.4.1 Saturated Hydraulic Conductivity

According to the HELP program user guidelines, the saturated hydraulic conductivity describes the rate at which water drains through a saturated soil under a unit pressure gradient. The default value for the gravel layer used in the model was 0.3cm/sec, which is higher than the typical value required. Therefore, the saturated hydraulic

conductivity was reduced to 0.1cm/sec for gravel (1×10^{-3} m/s). The default saturated hydraulic conductivity for a drainage geonet is 33cm/sec, which was considered relatively high. The default values within the HELP program does not take into account of the degradation of the material over time, therefore, a reduction factor will be applied to the default value to determine a more conservative saturated hydraulic conductivity. In order to determine the approximate reduction factor, the following equation determines the allowable transmissivity value by applying a series of reduction factors to a default/ultimate transmissivity rate.

$$q_{allow} = q_{ult} \left[\frac{1}{RF_{IN} \times RF_{CR} \times RF_{CC} \times RF_{BC}} \right] \quad \text{Eq. 1}$$

where q_{allow} = allowable transmissivity rate to be used for final design purposes
 q_{ult} = ultimate transmissivity rate
 RF_{IN} = reduction factor for elastic deformation, or intrusion, of the adjacent geosynthetics into the core space of the geonet
 RF_{CR} = reduction factor for creep deformation of the geonet and/or adjacent geosynthetics into the core space of the geonet
 RF_{CC} = reduction factor for chemical clogging and/or precipitation of chemicals in the core space of the geonet
 RF_{BC} = reduction factor for biological clogging in the core space of the geonet

**Note: Reduction factors ranges as per Designing with Geosynthetics, Fourth Edition by Robert M. Koerner, 1999.*

Table 2-6 outlines modified saturated hydraulic conductivity values used in the HELP model, including a summary of the reduction factors selected for the two drainage geonets that will be used for the landfill at the Site.

Table 2-6: Summary of Modified Saturated Hydraulic Conductivity

Parameter	Drainage Geonet No. 1† Capping	Drainage Geonet No. 2* Leak Detection Layer	Leachate Drainage/Gravel Layer
RF_{IN}	1.75	1.40	
RF_{CR}	1.80	1.30	
RF_{CC}	2.00	1.30	
RF_{BC}	2.00	1.20	
Cumulative Reduction Factor	0.35	0.08	
Default Saturated Hydraulic Conductivity (cm/sec)	33	33	0.3
Modified Saturated Hydraulic Conductivity (cm/sec)	11.6	2.6	0.1

†Recommended reduction factor for "Retaining walls, seeping rock, and soil slopes" Application Area

* Recommended reduction factor values for "Secondary leachate collection (landfills)" Application Area.

The saturated hydraulic conductivity used for Drainage Geonet No. 1 within the landfill capping system is 11.6cm/sec and for Drainage Geonet No. 2 within the leak detection layer of the landfill basal lining system is 2.6cm/sec.



2.1.4.2 Soil & Material Characteristics

Table 2-7 outlines the layer types and properties used to simulate the uncapped operational phase. Table 2-8 summaries the layer types and properties used to simulate the capped and restored landfill.



Table 2-7: Summary of Soil & Material Characteristics for Uncapped Operational Phase

Layer No.	Layer Type	Description	Thickness	Total Pore Volume	Field Capacity	Wilting Point	Sat. Hydraulic Conductivity
			(cm)	(Vol/Vol)	(Vol/Vol)	(Vol/Vol)	(cm/s)
1	Vertical Percolation Layer	Waste	250	0.671	0.292	0.077	0.001
2	Vertical Percolation Layer	Separation Geotextile	0.3	0.85	0.01	0.005	10
3	Lateral Drainage Layer	Leachate Drainage/Gravel	30	0.397	0.032	0.013	0.1*
4	Geomembrane	HDPE Geomembrane	0.2	-	-	-	2×10^{-13}
5	Vertical Percolation Layer	Geosynthetic Clay Liner (GCL)	0.6	0.75	0.747	0.4	3×10^{-9}
6	Lateral Drainage Layer	Drainage Geonet	0.6	0.85	0.01	0.005	2.6*
7	Geomembrane	HDPE Geomembrane	0.2	-	-	-	2×10^{-13}
8	Vertical Percolation Layer	Geosynthetic Clay Liner (GCL)	0.6	0.75	0.747	0.4	3×10^{-9}
9	Vertical Percolation Layer	Engineered Attenuation Layer	50	0.501	0.284	0.135	1.9×10^{-4}
10	Vertical Percolation Layer	In-situ Pindan Sand	250	0.463	0.232	0.116	3.7×10^{-4}

Note: Liner sloped at 3% into collection pipe as per minimum Best Practice Landfill Standards.

Maximum drainage length is 135m.

The protection geotextile was not modelled because a lateral drainage layer cannot be on top of a vertical percolation layer.

No recirculation of leachate simulated. Leachate from lateral drainage layer assumed extracted to evaporation pond.

**Saturated Hydraulic Conductivity has been modified from the HELP program default values.*



Table 2-8: Summary of Soil & Material Characteristics for Capped & Restored Landfill

Layer No.	Layer Type	Description	Thickness	Total Pore Volume	Field Capacity	Wilting Point	Sat. Hydraulic Conductivity
			(cm)	(Vol/Vol)	(Vol/Vol)	(Vol/Vol)	(cm/s)
1	Vertical Percolation Layer	Restoration Soil	120	0.463	0.232	0.116	3.7×10^{-4}
2	Vertical Percolation Layer	Drainage Geonet	0.6	0.850	0.01	0.005	11.6*
3	Geomembrane	LLDPE Geomembrane	0.15	-	-	-	4.0×10^{-13}
4	Vertical Percolation Layer	Geosynthetic Clay Liner (GCL)	0.6	0.75	0.747	0.4	3.0×10^{-9}
5	Vertical Percolation Layer	Regulation/Gas Collection Layer	30	0.463	0.232	0.116	3.7×10^{-4}
6	Vertical Percolation Layer	Waste	1,250	0.671	0.292	0.077	0.001
7	Vertical Percolation Layer	Separation Geotextile	0.3	0.85	0.01	0.005	10
8	Lateral Drainage Layer	Leachate Drainage/Gravel	30	0.397	0.032	0.013	0.1*
9	Geomembrane	HDPE Geomembrane	0.2	-	-	-	2.0×10^{-13}
10	Vertical Percolation Layer	Geosynthetic Clay Liner (GCL)	0.6	0.75	0.747	0.4	3.0×10^{-9}
11	Lateral Drainage Layer	Drainage Geonet	0.6	0.85	0.01	0.005	2.6*
12	Geomembrane	HDPE Geomembrane	0.2	-	-	-	2.0×10^{-13}
13	Vertical Percolation Layer	Geosynthetic Clay Liner (GCL)	0.6	0.75	0.747	0.4	3.0×10^{-9}
14	Vertical Percolation Layer	Engineered Attenuation Layer	50	0.501	0.284	0.135	1.9×10^{-4}
15	Vertical Percolation Layer	In situ Pindan Sand	250	0.463	0.232	0.116	3.7×10^{-4}

Note: Liner sloped at 3% into collection pipe as per minimum Best Practice Landfill Standards.

Maximum drainage length is 135m.

The protection geotextile was not modelled because a lateral drainage layer cannot be on top of a vertical percolation layer.

No recirculation of leachate simulated. Leachate from lateral drainage layer assumed extracted to evaporation pond.

**Saturated Hydraulic Conductivity has been modified from the HELP program default values.*

The HELP model also requires inputs corresponding to installation quality, pinhole density, and installation defect density. Pinhole density is defined as the number of defects with a hole diameter equal to or smaller than the geomembrane thickness. Installation defect density is described as the number of defects with holes 1cm², possibly resulting from seaming faults and punctures. The placement quality represents the closeness of contact between the geomembrane and the drainage limiting soil. Scenarios were modelled using the values presented in Table 2-9 to account for placement quality, pinhole density and installation defects.

Table 2-9: Summary of Installation Quality Parameters

Placement Quality	Pinhole Density	Installation Defects
Excellent	2	2
Good	5	5
Poor	25	25

The assumptions for placement and installation quality as defined by the HELP model software are as follows:

- **Excellent** - Assumes exceptional contact between the geomembrane and the adjacent soil that limits drainage rate;
- **Good** - Assumes good field installation with well-prepared, smooth soil surface and geomembrane wrinkle control to ensure good contact between the geomembrane and the adjacent soil that limits drainage rate; and
- **Poor** - Assumes poor field installation with less well-prepared, smooth soil surface and/or geomembrane wrinkling providing poor contact between the geomembrane and the adjacent soil that limits drainage rate, resulting in a larger gap for spreading and greater seepage.

The final parameter input for the HELP model is a user-defined runoff curve number. The HELP model user guidelines provide a table for typical runoff curves based on the stand of grass and the soil texture. Given the geology of the Site and the selected maximum leaf area index, a large runoff curve number of 90 was used to represent a high potential of runoff during storm events. The lowest runoff curve number accepted in the HELP model is 0.1, which was assigned to the operational uncapped phase to represent little to no runoff occurring during storm events.

2.2 Simulation Results

The HELP model assumes Darcian flow by gravity influences through homogeneous soil and waste layers. It does not consider preferential flow through channels, cracks, root holes or animal burrows. Geomembranes are assumed to leak primarily through holes in the liner. The model assumes the holes are uniformly distributed and the head is distributed across the liner. The model does not consider aging of the liner, and therefore the number and size of the holes do not vary as a function of time.

2.2.1 Uncapped Operational Phase

The modelled seepage rates for the uncapped operational phase of the landfill with no capping and incident rainfall directly falling on the waste surface with Excellent, Good and Poor geomembrane installation quality (and defects as shown in Table 2-9) are summarised in Table 2-10.

Table 2-10: Summary of Seepage Rates for Uncapped Operational Phase

Month	Seepage Rate as a function on Geomembrane Installation / Placement Quality (mm/m ² /year)								
	Seepage Through Layer No. 4			Seepage Through Layer No. 7			Seepage Through Layer No. 10		
	Excellent	Good	Poor	Excellent	Good	Poor	Excellent	Good	Poor
Jan	0.0000	0.0001	0.0011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Feb	0.0000	0.0001	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mar	0.0000	0.0001	0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Apr	0.0000	0.0001	0.0015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
May	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Jun	0.0000	0.0001	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Jul	0.0000	0.0000	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sep	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Oct	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dec	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Average Annual	0.00021	0.00058	0.01021	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006

Note: HELP model results do not output individual annual monthly percolation data greater than 4 (four) decimal places.
The minimum default average annual percolation rate through a layer is 0.00006 mm/m²/year.

As outlined previously, Layer No. 4 and No. 7 represent the two geomembranes that will be installed as part of the double-composite basal lining system. Layer No. 10 represents the final layer of Pindan sands. The seepage rates for all three layers have been presented to show the performance of the proposed double-composite basal lining system and ensure that there would be negligible seepage through the final layer.

The average annual total seepage/percolation through Layer No. 4 for Excellent, Good and Poor geomembrane installation quality are 0.00021, 0.00058 and 0.01021mm/m²/year, respectively. The secondary lateral drainage layer captures this seepage and no seepage is detected through Layer No. 7 or through Layer No. 10. The minimum default average annual percolation rate through a layer of 0.00006mm/m²/year has been recorded for all installation qualities for Layer No. 7 and Layer No. 10. The HELP simulation results for the uncapped operational phase are presented in Appendix A.

2.2.2 Capped Restored Phase

The modelled seepage rates for the capped and restored landfill with Excellent, Good and Poor geomembrane installation quality and defects (as shown in Table 2-9), are summarised in Table 2-11.

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Table 2-11: Summary of Seepage Rates for Capped & Restored Landfill

Month	Seepage Rate as a function on Geomembrane Installation / Placement Quality (mm/m ² /year)								
	Seepage Through Layer No. 9			Seepage Through Layer No. 12			Seepage Through Layer No. 15		
	Excellent	Good	Poor	Excellent	Good	Poor	Excellent	Good	Poor
Jan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Feb	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mar	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Apr	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
May	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Jun	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Jul	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sep	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Oct	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nov	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Dec	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Average Annual	0.00006	0.00007	0.00022	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006

Note: HELP model results do not output individual annual monthly percolation data greater than 4 (four) decimal places.
The minimum default average annual percolation rate through a layer is 0.00006 mm/m²/year.

As outlined previously, Layer No. 9 and No. 12 represent the two geomembranes that will be installed as part of the double-composite basal lining system. Layer No. 15 represents the final layer of Pindan sands. The seepage rates for all three layers have been presented to show the performance of the proposed double-composite basal lining system and ensure that there would be negligible seepage through the final layer.

The average annual total seepage/percolation through Layer No. 9 for Excellent, Good and Poor geomembrane installation quality are 0.00006, 0.00007 and 0.00022mm/m²/year, respectively. The secondary lateral drainage layer captures this seepage and no seepage is detected through Layer No. 12 or through Layer No. 15. The minimum default average annual percolation rate through a layer of 0.00006mm/m²/year has been recorded for all installation qualities for Layer No. 12 and Layer No. 15. The HELP simulation results for the capped phase are presented in Appendix B.

2.2.3 Summary of Results

As expected the results show that there is increased seepage through the liner the greater the number of defects that are present, and the reduction in quality of the liner installation. Best Practice Landfill Standards requires the liner performance, using best available technology to control seepage to an amount not exceeding 10L/ha/day. Table 2-12 presents the summary of liner performance (seepage rates) with respect to the liner configuration and the 11 years of climatic input data as described in Section 2.1.

Table 2-12: Summary of Liner Performance for all Scenarios

Scenario	Maximum Seepage as a function on Geomembrane Installation / Placement Quality		
	Excellent	Good	Poor
No Cap - Operational (mm/m²/year)	0.00021	0.00058	0.01021
No Cap - Operational (L/ha/day)	0.00575	0.01589	0.27973
Capped - Restored (mm/m²/year)	0.00006	0.00007	0.00022
Capped - Restored (L/ha/day)	0.00164	0.00192	0.00603

Note: 1mm/m²/day = 10,000L/ha/day.

The seepage rate through Layer No. 4 represented the maximum seepage for Operational Phase and the seepage rate through Layer No. 9 represented the maximum seepage for Capped Phase.

The seepage rate for the operational phase ranges from 0.00575 to 0.27973L/ha/day. The seepage rate for the closed and restored landfill ranges from 0.00164 to 0.00603L/ha/day.

The results show that the liner performance seepage rate is several orders of magnitude below the 10 L/ha/day, and therefore the proposed liner design meets the Best Practice Landfill Standards for both the operational and capped phases of the landfill.



3 Discussion

The HELP manual identifies that direct infiltration into the landfill is determined indirectly from a surface water balance, accounting for evaporation and plant transpiration, and that operational activities will actively control the head of leachate on the liner through the extraction of leachate via the lateral drainage/leachate collection layer.

Active leachate management (collection/extraction) under a best practice operational regime should therefore be undertaken to ensure any potential leachate head on the base of the liner is minimised, thus reducing likelihood of seepage through the liner.

As the simulation results indicate, there is increased seepage through the liner the greater the number of defects that are present. Therefore, in order to limit any potential seepage through the liner, the construction of the lining system should be undertaken under a construction quality assurance scheme to minimise damage/defects to the engineered liner during installation.



References

Bureau of Meteorology (BOM), Climate statistics for Australian locations, 'Onslow Airport weather station data (Station ID: 005017)', 5 July 2018, (accessed July 2018) <http://www.bom.gov.au/climate/data/>

Department of Primary Industries and Regional Development (BPIRD), 'Spinifex rangeland pastures and fire', 13 April 2018. (accessed July 2018), <https://www.agric.wa.gov.au/rangelands/spinifex-rangeland-pastures-and-fire>

Koerner, Robert M. 'Designing with Geosynthetics', Fourth Edition, 1999, Prentice Hall.

The Hydrologic Evaluation of Landfill Performance (HELP) Model (HELP-D), HELP3.95D, University of Hamburg.



Appendix A: No Cap Operational Phase HELP Simulations

[illegible]

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PRECIPITATION DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Precipitation\P - 2007 - 2018 (11 years).d4
TEMPERATURE DATA FILE:       \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Temperature\T- 2007 - 2018 (11 years).d7
SOLAR RADIATION DATA FILE:   \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Solar Radiation\SR - 2007 - 2018 (11 years).d13
EVAPOTRANSPIRATION DATA F. 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Evapotranspiration\Evapotranspiration - Operational.d11
SOIL AND DESIGN DATA FILE 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Layers\Layers - Excellent - Operational Geonet
modified.d10
OUTPUT DATA FILE:            \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Simulation Results\Excellent Installation Operational
Geonet Modified.out
DAILY OUTPUT DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Simulation Results\Excellent Installation Operational
Geonet Modified.DAY
MONTHLY OUTPUT DATA FILE:     \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Simulation Results\Excellent Installation Operational
Geonet Modified.MON
YEARLY OUTPUT DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Simulation Results\Excellent Installation Operational
Geonet Modified.YR
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1  DATE (yyyymmdd)
2  AIR TEMPERATURE (* INDICATES FREEZING TEMPERATURES)
3  FROZEN SOIL STATE (* INDICATES FROZEN SOIL)
4  PRECIPITATION (MM)
5  RUNOFF (MM)
6  POTENTIAL EVAPOTRANSPIRATION (MM)
7  ACTUAL EVAPOTRANSPIRATION (MM)
8  WATER CONTENT OF THE EVAPORATIVE ZONE (MM)
9  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 4 (CM)
10 DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (RECIRC. + COLLECT.) (MM)
11 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
12 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 7 (CM)
13 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (RECIRC. + COLLECT.) (MM)
14 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
15 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)

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1  DATE OF ULTIMO (yyyymmdd)
2  PRECIPITATION (MM)
3  RUNOFF (MM)
4  POTENTIAL EVAPOTRANSPIRATION (MM)
5  ACTUAL EVAPOTRANSPIRATION (MM)
6  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 4 (CM)
7  DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (WITHOUT RECIRC.) (MM)
8  RECIRC#1: LAT. DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1 (MM)
9  LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)

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10 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 7 (CM)
11 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (WITHOUT RECIRC.) (MM)
12 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1 (MM)
13 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
14 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)

COLUMNS OF YEARLY OUTPUT DATA FILE:

1 DATE OF ULTIMO (yyyy1231)
2 PRECIPITATION (MM)
3 RUNOFF (MM)
4 POTENTIAL EVAPOTRANSPIRATION (MM)
5 ACTUAL EVAPOTRANSPIRATION (MM)
6 DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (WITHOUT RECIRC.) (MM)
7 RECIRC#1: LAT. DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1 (MM)
8 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
9 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (WITHOUT RECIRC.) (MM)
10 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1 (MM)
11 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
12 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)
13 CHANGE IN TOTAL WATER STORAGE (MM)
14 CHANGE IN SOIL WATER STORAGE (MM)
15 CHANGE IN INTERCEPTION WATER STORAGE (MM)
16 CHANGE IN SNOW WATER STORAGE (MM)
17 ANNUAL WATER BUDGET BALANCE (MM)

TITLE: Onslow Landfill Good Operational

WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: TEMPERATURE DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: SOLAR RADIATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

LAYER DATA 1

VALID FOR 11 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 18

THICKNESS = 250.00 CM
POROSITY = 0.6710 VOL/VOL
FIELD CAPACITY = 0.2920 VOL/VOL
WILTING POINT = 0.0770 VOL/VOL

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 INITIAL SOIL WATER CONTENT = 0.2898 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-02 CM/SEC
 NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 20

THICKNESS = 0.30 CM
 POROSITY = 0.8500 VOL/VOL
 FIELD CAPACITY = 0.0100 VOL/VOL
 WILTING POINT = 0.0050 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0234 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 10.00 CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 21

THICKNESS = 30.00 CM
 POROSITY = 0.3970 VOL/VOL
 FIELD CAPACITY = 0.0320 VOL/VOL
 WILTING POINT = 0.0130 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0320 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3000 CM/SEC
 SLOPE = 3.00 PERCENT
 DRAINAGE LENGTH = 135.0 METERS

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.20 CM
 EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
 FML PINHOLE DENSITY = 2.00 HOLES/HECTARE
 FML INSTALLATION DEFECTS = 2.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 2 - EXCELLENT

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
 POROSITY = 0.7500 VOL/VOL
 FIELD CAPACITY = 0.7470 VOL/VOL
 WILTING POINT = 0.4000 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 0.60 CM
 POROSITY = 0.8500 VOL/VOL
 FIELD CAPACITY = 0.0100 VOL/VOL
 WILTING POINT = 0.0050 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 2.600 CM/SEC
 SLOPE = 3.00 PERCENT

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DRAINAGE LENGTH = 135.0 METERS

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35
THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 2.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 2.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 2 - EXCELLENT

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17
THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9
THICKNESS = 50.00 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1900E-03 CM/SEC

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8
THICKNESS = 250.00 CM
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 11 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.10
FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 4.4000 HECTARES
EVAPORATIVE ZONE DEPTH = 2.5 CM
INITIAL WATER IN EVAPORATIVE ZONE = 0.193 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 1.678 CM
FIELD CAPACITY OF EVAPORATIVE ZONE = 0.730 CM

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LOWER LIMIT OF EVAPORATIVE STORAGE = 0.193 CM
 SOIL EVAPORATION ZONE DEPTH = 2.5 CM
 INITIAL SNOW WATER = 0.000 CM
 INITIAL INTERCEPTION WATER = 0.000 CM
 INITIAL WATER IN LAYER MATERIALS = 146.532 CM
 TOTAL INITIAL WATER = 146.532 CM
 TOTAL SUBSURFACE INFLOW = 0.00 MM/YR

EVAPOTRANSPIRATION DATA 1

VALID FOR 11 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

Onslow Western Australia
 STATION LATITUDE = -21.67 DEGREES
 MAXIMUM LEAF AREA INDEX = 1.00
 START OF GROWING SEASON (JULIAN DATE) = 335
 END OF GROWING SEASON (JULIAN DATE) = 212
 EVAPORATIVE ZONE DEPTH = 2.5 CM
 AVERAGE ANNUAL WIND SPEED = 20.32 KPH
 AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 54.0 %
 AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 52.0 %
 AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 47.0 %
 AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 43.0 %

MONTHLY TOTALS (MM) FOR YEAR 2007

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.4 43.4	0.0 0.6	19.6 0.0	15.2 0.2	3.2 0.0	0.0 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	354.11 208.29	311.12 255.15	306.67 289.85	267.42 338.56	230.92 363.91	192.66 357.59
ACTUAL EVAPOTRANSPIRATION	0.40 17.69	0.00 4.06	2.74 0.00	3.72 0.20	4.33 0.00	3.62 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 19.138	0.000 3.291	0.637 0.000	11.884 0.000	10.884 0.000	0.015 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.536	0.000 0.092	0.018 0.000	0.344 0.000	0.305 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.510	0.000 0.170	0.036 0.000	0.465 0.000	0.457 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2007

	MM	CU. METERS	PERCENT
PRECIPITATION	82.60	3634.400	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3476.242	152954.641	
ACTUAL EVAPOTRANSPIRATION	36.758	1617.335	44.50
DRAINAGE COLLECTED FROM LAYER 3	45.8500	2017.400	55.51
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000088	0.004	0.00
AVG. HEAD ON TOP OF LAYER 4	1.0802		
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.001	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-0.008	-0.341	-0.01
SOIL WATER AT START OF YEAR	1474.282	64868.391	
SOIL WATER AT END OF YEAR	1474.274	64868.047	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.003	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.2 1.0	65.8 7.0	201.2 0.0	21.2 15.0	0.0 23.6	47.2 3.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	359.35 209.70	296.75 244.70	283.49 283.22	257.00 345.35	233.61 325.55	189.17 367.69
ACTUAL EVAPOTRANSPIRATION	0.20 5.20	3.47 1.38	30.86 5.00	17.93 4.14	0.05 7.87	6.38 1.13
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 9.012	13.847 0.074	44.741 1.226	166.882 9.128	10.387 0.598	26.895 16.869
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.253	0.415 0.002	1.254 0.036	4.833 0.256	0.291 0.017	0.779 0.473
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.398	0.512 0.009	1.080 0.064	1.863 0.375	0.595 0.051	0.992 0.659
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	385.40	16957.605	100.00
RUNOFF	0.000	0.000	0.00

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POTENTIAL EVAPOTRANSPIRATION	3395.577	149405.391	
ACTUAL EVAPOTRANSPIRATION	83.602	3678.482	21.69
DRAINAGE COLLECTED FROM LAYER 3	299.6603	13185.055	77.75
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000283	0.012	0.00
AVG. HEAD ON TOP OF LAYER 4	7.1739		
DRAINAGE COLLECTED FROM LAYER 6	0.0002	0.010	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	2.137	94.049	0.55
SOIL WATER AT START OF YEAR	1474.274	64868.047	
SOIL WATER AT END OF YEAR	1476.411	64962.094	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.007	0.00

MONTHLY TOTALS (MM) FOR YEAR 2009

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	275.6 5.2	110.0 6.2	16.0 0.0	0.0 0.0	2.8 1.4	42.6 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	349.46 212.63	278.58 246.06	318.14 279.87	251.97 344.95	219.54 357.01	180.40 378.63
ACTUAL EVAPOTRANSPIRATION	12.27 10.25	28.91 5.31	6.28 1.64	0.00 0.00	2.06 1.40	5.41 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	14.156 21.184	238.675 0.414	102.824 0.019	0.569 0.008	0.009 0.005	10.510 0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.397	7.407	2.882	0.016	0.000	0.304
	0.594	0.012	0.001	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.646	3.717	1.511	0.032	0.000	0.403
	0.613	0.019	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2009

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	459.80	20231.201	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3417.241	150358.609	
ACTUAL EVAPOTRANSPIRATION	73.523	3235.028	15.99
DRAINAGE COLLECTED FROM LAYER 3	388.3755	17088.523	84.47
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000372	0.016	0.00
AVG. HEAD ON TOP OF LAYER 4	9.6774		
DRAINAGE COLLECTED FROM LAYER 6	0.0003	0.014	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-2.099	-92.365	-0.46
SOIL WATER AT START OF YEAR	1476.411	64962.094	
SOIL WATER AT END OF YEAR	1474.312	64869.727	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

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SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

MONTHLY TOTALS (MM) FOR YEAR 2010

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	13.6 0.6	0.0 3.4	0.0 10.8	0.0 0.0	3.6 4.8	9.6 37.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	352.46 215.58	296.94 234.55	310.20 291.00	258.06 357.25	218.87 335.26	193.73 349.69
ACTUAL EVAPOTRANSPIRATION	2.47 3.52	3.21 2.36	0.00 3.02	0.00 3.22	1.42 0.81	3.54 13.36
LATERAL DRAINAGE COLLECTED FROM LAYER 3	7.406 0.184	0.498 0.002	0.011 5.849	0.006 0.067	0.004 0.008	4.336 17.942
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.208 0.005	0.015 0.000	0.000 0.169	0.000 0.002	0.000 0.000	0.126 0.503
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.357 0.010	0.028 0.000	0.000 0.246	0.000 0.003	0.000 0.000	0.206 0.818
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 2010

	MM	CU. METERS	PERCENT
PRECIPITATION	83.60	3678.400	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3413.590	150197.938	
ACTUAL EVAPOTRANSPIRATION	36.926	1624.758	44.17
DRAINAGE COLLECTED FROM LAYER 3	36.3133	1597.786	43.44
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000083	0.004	0.00
AVG. HEAD ON TOP OF LAYER 4	0.8574		
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.001	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	10.360	455.850	12.39
SOIL WATER AT START OF YEAR	1474.312	64869.727	
SOIL WATER AT END OF YEAR	1484.672	65325.578	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

MONTHLY TOTALS (MM) FOR YEAR 2011

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	81.6 24.8	285.0 0.8	68.0 0.2	32.0 0.2	17.2 0.0	111.2 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	315.49 210.56	271.10 255.28	285.68 276.54	236.90 330.74	207.24 348.32	179.71 366.65
ACTUAL EVAPOTRANSPIRATION	38.39 16.52	81.84 0.80	11.83 0.20	8.14 0.20	10.83 0.00	9.25 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	28.215 43.422	55.896 0.219	197.814 0.009	47.809 0.005	12.864 0.004	67.094 0.003
LATERAL DRAINAGE RECIRCULATED	0.000	0.000	0.000	0.000	0.000	0.000

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FROM LAYER 3 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.791	1.735	5.544	1.385	0.361	1.943
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.217	0.006	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.606	1.634	1.723	1.014	0.430	1.639
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.758	0.011	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2011

	MM	CU. METERS	PERCENT
PRECIPITATION	621.00	27323.988	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3284.212	144505.328	
ACTUAL EVAPOTRANSPIRATION	178.009	7832.392	28.66
DRAINAGE COLLECTED FROM LAYER 3	453.3533	19947.543	73.00
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000403	0.018	0.00
AVG. HEAD ON TOP OF LAYER 4	10.8185		
DRAINAGE COLLECTED FROM LAYER 6	0.0003	0.015	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-10.362	-455.943	-1.67
SOIL WATER AT START OF YEAR	1484.672	65325.578	

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SOIL WATER AT END OF YEAR	1474.310	64869.637	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0004	-0.019	0.00

MONTHLY TOTALS (MM) FOR YEAR 2012

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.8 1.2	1.2 0.8	5.8 0.2	0.2 1.4	0.2 0.0	43.2 11.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.54 220.25	299.67 270.49	300.61 292.60	267.30 354.03	225.50 347.06	191.39 369.21
ACTUAL EVAPOTRANSPIRATION	18.73 1.97	1.10 0.77	5.90 0.24	0.03 0.59	0.37 0.81	5.97 1.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	21.099 2.646	26.892 0.010	0.064 0.005	0.008 0.004	0.005 0.003	33.788 0.984
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.591 0.074	0.806 0.000	0.002 0.000	0.000 0.000	0.000 0.000	0.979 0.028
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.653 0.150	0.819 0.000	0.003 0.000	0.000 0.000	0.000 0.000	0.920 0.067
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 2012

	MM	CU. METERS	PERCENT
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PRECIPITATION	132.00	5808.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3465.644	152488.344	
ACTUAL EVAPOTRANSPIRATION	37.473	1648.801	28.39
DRAINAGE COLLECTED FROM LAYER 3	85.5074	3762.327	64.78
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000119	0.005	0.00
AVG. HEAD ON TOP OF LAYER 4	2.0669		
DRAINAGE COLLECTED FROM LAYER 6	0.0001	0.002	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	9.020	396.871	6.83
SOIL WATER AT START OF YEAR	1474.310	64869.637	
SOIL WATER AT END OF YEAR	1483.330	65266.508	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-0.004	0.00

MONTHLY TOTALS (MM) FOR YEAR 2013

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	48.4 0.0	67.2 0.4	0.0 0.0	5.0 1.4	28.0 0.0	118.4 0.4
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	355.54 218.62	299.43 254.64	300.51 283.27	260.76 352.51	200.61 341.10	185.66 370.61

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ACTUAL EVAPOTRANSPIRATION	17.08 0.00	35.76 0.40	0.00 0.00	1.92 1.02	8.94 0.38	16.89 0.23
LATERAL DRAINAGE COLLECTED FROM LAYER 3	37.329 94.346	13.116 0.349	21.309 0.007	0.015 0.005	7.812 0.003	21.139 0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	1.046 2.644	0.407 0.010	0.597 0.000	0.000 0.000	0.219 0.000	0.612 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.713 1.473	0.390 0.019	0.879 0.000	0.000 0.000	0.223 0.000	0.412 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2013

	MM	CU. METERS	PERCENT
PRECIPITATION	269.20	11844.802	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3423.241	150622.594	
ACTUAL EVAPOTRANSPIRATION	82.618	3635.196	30.69
DRAINAGE COLLECTED FROM LAYER 3	195.4322	8599.017	72.60
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000196	0.009	0.00
AVG. HEAD ON TOP OF LAYER 4	4.6141		
DRAINAGE COLLECTED FROM LAYER 6	0.0001	0.006	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00

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AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-8.851	-389.427	-3.29
SOIL WATER AT START OF YEAR	1483.330	65266.508	
SOIL WATER AT END OF YEAR	1474.479	64877.082	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.007	0.00

MONTHLY TOTALS (MM) FOR YEAR 2014

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	9.6 0.0	4.4 0.8	0.4 1.6	19.6 0.2	53.8 4.6	9.8 2.6
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	332.65 217.86	299.36 265.75	301.24 285.67	241.39 351.41	220.23 351.93	189.38 376.28
ACTUAL EVAPOTRANSPIRATION	1.43 0.91	4.94 0.45	1.92 1.95	1.39 0.20	5.70 2.50	9.28 2.54
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.109 0.419	6.126 0.000	0.023 0.000	0.167 0.000	59.861 0.000	5.528 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.003 0.012	0.190 0.000	0.001 0.000	0.005 0.000	1.678 0.000	0.160 0.000

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STD. DEVIATION OF DAILY	0.012	0.195	0.000	0.020	0.751	0.204
HEAD ON TOP OF LAYER 4	0.024	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2014

	MM	CU. METERS	PERCENT
PRECIPITATION	107.40	4725.600	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3433.140	151058.172	
ACTUAL EVAPOTRANSPIRATION	33.210	1461.261	30.92
DRAINAGE COLLECTED FROM LAYER 3	72.2320	3178.208	67.26
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000110	0.005	0.00
AVG. HEAD ON TOP OF LAYER 4	1.7069		
DRAINAGE COLLECTED FROM LAYER 6	0.0000	0.002	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	1.957	86.115	1.82
SOIL WATER AT START OF YEAR	1474.479	64877.082	
SOIL WATER AT END OF YEAR	1476.436	64963.195	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.012	0.00

MONTHLY TOTALS (MM) FOR YEAR 2015

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

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PRECIPITATION	2.6 0.0	153.4 0.4	150.4 0.0	49.4 0.0	9.8 0.0	13.0 8.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.68 212.80	283.17 252.67	279.46 306.14	218.07 360.41	201.54 359.22	195.25 362.97
ACTUAL EVAPOTRANSPIRATION	3.14 4.73	17.02 0.14	20.93 0.26	13.97 0.00	11.44 0.00	5.74 1.03
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 2.277	12.544 0.012	188.158 0.006	90.328 0.004	9.091 0.003	1.328 0.674
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.064	0.389 0.000	5.274 0.000	2.616 0.000	0.255 0.000	0.038 0.019
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.127	0.678 0.000	1.212 0.000	0.609 0.000	0.463 0.000	0.126 0.063
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2015

	MM	CU. METERS	PERCENT
PRECIPITATION	387.20	17036.807	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3359.374	147812.453	
ACTUAL EVAPOTRANSPIRATION	78.403	3449.722	20.25
DRAINAGE COLLECTED FROM LAYER 3	304.4246	13394.684	78.62
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000298	0.013	0.00

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AVG. HEAD ON TOP OF LAYER 4	7.2133		
DRAINAGE COLLECTED FROM LAYER 6	0.0002	0.010	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	4.372	192.377	1.13
SOIL WATER AT START OF YEAR	1476.436	64963.195	
SOIL WATER AT END OF YEAR	1480.808	65155.574	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.010	0.00

MONTHLY TOTALS (MM) FOR YEAR 2016

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.2 1.6	0.0 1.0	17.0 0.2	20.4 0.0	182.2 2.2	4.0 191.8
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	316.75 208.27	313.61 244.17	294.22 281.54	261.66 342.66	213.89 351.42	177.55 385.76
ACTUAL EVAPOTRANSPIRATION	5.43 1.60	1.96 1.00	0.51 0.04	4.88 0.16	48.38 0.90	4.00 35.84
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.283 0.593	0.011 0.001	0.151 0.000	11.658 0.000	47.580 0.000	105.882 20.608
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.036 0.017	0.000 0.000	0.004 0.000	0.338 0.000	1.334 0.000	3.067 0.578
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.070 0.034	0.000 0.000	0.023 0.000	0.459 0.000	0.880 0.000	1.551 0.942
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2016

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	422.60	18594.406	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3391.501	149226.047	
ACTUAL EVAPOTRANSPIRATION	104.695	4606.585	24.77
DRAINAGE COLLECTED FROM LAYER 3	187.7691	8261.839	44.43
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000199	0.009	0.00
AVG. HEAD ON TOP OF LAYER 4	4.4773		
DRAINAGE COLLECTED FROM LAYER 6	0.0001	0.006	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	130.135	5725.957	30.79
SOIL WATER AT START OF YEAR	1480.808	65155.574	
SOIL WATER AT END OF YEAR	1610.944	70881.531	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0004	0.016	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	44.0 0.6	35.0 0.0	0.6 0.0	1.2 3.2	0.0 18.8	1.6 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	311.22 226.04	292.94 264.30	296.25 287.82	250.50 355.03	225.27 344.10	193.24 382.72
ACTUAL EVAPOTRANSPIRATION	18.32 0.23	8.55 0.37	0.60 0.00	0.69 3.20	0.51 2.78	1.60 3.70
LATERAL DRAINAGE COLLECTED FROM LAYER 3	145.156 0.000	39.275 0.000	4.360 0.000	0.000 0.000	0.000 10.701	0.000 1.569
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	4.069 0.000	1.219 0.000	0.122 0.000	0.000 0.000	0.000 0.310	0.000 0.044
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.378 0.000	0.775 0.000	0.250 0.000	0.000 0.000	0.000 0.475	0.000 0.088
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2017

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	105.00	4620.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3429.427	150894.781	

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ACTUAL EVAPOTRANSPIRATION	40.548	1784.098	38.62
DRAINAGE COLLECTED FROM LAYER 3	201.0616	8846.712	191.49
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000213	0.009	0.00
AVG. HEAD ON TOP OF LAYER 4	4.8029		
DRAINAGE COLLECTED FROM LAYER 6	0.0002	0.007	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-136.610	-6010.856	-130.11
SOIL WATER AT START OF YEAR	1610.944	70881.531	
SOIL WATER AT END OF YEAR	1474.333	64870.672	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0008	0.036	0.00

FINAL WATER STORAGE AT END OF YEAR 2017

LAYER	(CM)	(VOL/VOL)
----	-----	-----
1	72.4623	0.2898
2	0.0120	0.0401
3	0.9602	0.0320
4	0.0000	0.0000
5	0.4482	0.7470
6	0.0060	0.0100
7	0.0000	0.0000
8	0.4482	0.7470
9	14.2000	0.2840
10	58.0000	0.2320
TOTAL WATER IN LAYERS	146.537	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	146.537	

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PEAK DAILY VALUES FOR YEARS 2007 THROUGH 2017

	(MM)	(CU. METERS)
PRECIPITATION	238.40	10489.600
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	15.84378	697.12622
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000014	0.00062
AVERAGE HEAD ON TOP OF LAYER 4	137.665	
MAXIMUM HEAD ON TOP OF LAYER 4	238.925	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	17.7 METERS	
DRAINAGE COLLECTED FROM LAYER 6	0.00001	0.00060
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 7	0.000	
MAXIMUM HEAD ON TOP OF LAYER 7	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00001
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.6255
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0770

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

AVERAGE MONTHLY VALUES (MM) FOR YEARS 2007 THROUGH 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	49.55 7.13	65.64 1.95	43.55 1.18	14.93 1.96	27.35 5.04	36.42 23.13
STD. DEVIATIONS	80.40 14.04	89.20 2.47	69.16 3.22	15.88 4.44	53.92 8.26	42.52 57.00
RUNOFF						

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TOTALS	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATIONS	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
POTENTIAL EVAPOTRANSPIRATION						

TOTALS	336.567 214.599	294.789 253.434	297.861 287.047	251.911 348.445	217.929 347.715	188.011 369.800
STD. DEVIATIONS	18.055 5.639	12.875 10.687	11.732 8.015	14.823 8.872	11.107 11.030	6.249 10.759
ACTUAL EVAPOTRANSPIRATION						

TOTALS	10.713 5.693	16.978 1.549	7.416 1.123	4.789 1.175	8.547 1.586	6.517 5.347
STD. DEVIATIONS	11.778 6.352	24.609 1.689	10.058 1.641	6.121 1.551	13.867 2.289	4.155 10.826
LATERAL DRAINAGE COLLECTED FROM LAYER 3						

TOTALS	23.1593 17.5656	36.9891 0.3974	50.9175 0.6474	29.9387 0.8383	14.4088 1.0296	25.1379 5.3323
STD. DEVIATIONS	42.4993 28.8124	69.1842 0.9715	76.8527 1.7635	53.5841 2.7495	20.2459 3.2127	33.5188 8.4988
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1						

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4						

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0001 0.0000	0.0001 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
LATERAL DRAINAGE COLLECTED FROM LAYER 6						

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0001 0.0000	0.0001 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1						

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 7						

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 10						

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

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STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.6491	1.1439	1.4272	0.8671	0.4039	0.7281
	0.4923	0.0111	0.0188	0.0235	0.0298	0.1495
STD. DEVIATIONS	1.1912	2.1479	2.1541	1.5520	0.5675	0.9708
	0.8076	0.0272	0.0511	0.0771	0.0930	0.2382

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2007 THROUGH 2017

	MM	CU. METERS	PERCENT
PRECIPITATION	277.80 (187.475)	12223.2	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
POTENTIAL EVAPOTRANSPIRATION	3408.108 (52.4596)	149956.77	
ACTUAL EVAPOTRANSPIRATION	71.433 (43.3038)	3143.06	25.714
LATERAL DRAINAGE COLLECTED FROM LAYER 3	206.36177 (141.50090)	9079.918	74.28429
DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00021 (0.00011)	0.009	0.00008
AVERAGE HEAD ON TOP OF LAYER 4	4.954 (3.432)		
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.00015 (0.00011)	0.007	0.00005
DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00006 (0.00000)	0.003	0.00002
AVERAGE HEAD ON TOP OF LAYER 7	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00006 (0.00000)	0.003	0.00002
CHANGE IN WATER STORAGE	0.005 (2.3623)	0.21	0.002

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**      HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
**
**      HELP Version 3.95 D      (10 August 2012)
**              developed at
**      Institute of Soil Science, University of Hamburg, Germany
**              based on
**      US HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
**      DEVELOPED BY ENVIRONMENTAL LABORATORY
**      USAE WATERWAYS EXPERIMENT STATION
**      FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
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Onslow HRA 2\Data\HELP Simulation\Temperature\T- 2007 - 2018 (11 years).d7
SOLAR RADIATION DATA FILE:   \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
Onslow HRA 2\Data\HELP Simulation\Solar Radiation\SR - 2007 - 2018 (11 years).d13
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Modified.out
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Modified.DAY
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Modified.MON
YEARLY OUTPUT DATA FILE:     \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
Onslow HRA 2\Data\HELP Simulation\Simulation Results\Good Installation Operational Geonet
Modified.YR
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1  DATE (yyyymmdd)
2  AIR TEMPERATURE (* INDICATES FREEZING TEMPERATURES)
3  FROZEN SOIL STATE (* INDICATES FROZEN SOIL)
4  PRECIPITATION (MM)
5  RUNOFF (MM)
6  POTENTIAL EVAPOTRANSPIRATION (MM)
7  ACTUAL EVAPOTRANSPIRATION (MM)
8  WATER CONTENT OF THE EVAPORATIVE ZONE (MM)
9  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 4 (CM)
10 DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (RECIRC. + COLLECT.) (MM)
11 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
12 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 7 (CM)
13 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (RECIRC. + COLLECT.) (MM)
14 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
15 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)

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1  DATE OF ULTIMO (yyyymmdd)
2  PRECIPITATION (MM)
3  RUNOFF (MM)
4  POTENTIAL EVAPOTRANSPIRATION (MM)
5  ACTUAL EVAPOTRANSPIRATION (MM)
6  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 4 (CM)
7  DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (WITHOUT RECIRC.) (MM)
8  RECIRC#1: LAT. DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1 (MM)
9  LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)

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10	HEAD #2:	AVERAGE HEAD ON TOP OF LAYER 7 (CM)
11	DRAIN #2:	LATERAL DRAINAGE FROM LAYER 6 (WITHOUT RECIRC.) (MM)
12	RECIRC#2:	LAT. DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1 (MM)
13	LEAK #2:	PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
14	LEAK #3:	PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)

COLUMNS OF YEARLY OUTPUT DATA FILE:

1	DATE OF ULTIMO (yyyy1231)
2	PRECIPITATION (MM)
3	RUNOFF (MM)
4	POTENTIAL EVAPOTRANSPIRATION (MM)
5	ACTUAL EVAPOTRANSPIRATION (MM)
6	DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (WITHOUT RECIRC.) (MM)
7	RECIRC#1: LAT. DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1 (MM)
8	LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
9	DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (WITHOUT RECIRC.) (MM)
10	RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1 (MM)
11	LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
12	LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)
13	CHANGE IN TOTAL WATER STORAGE (MM)
14	CHANGE IN SOIL WATER STORAGE (MM)
15	CHANGE IN INTERCEPTION WATER STORAGE (MM)
16	CHANGE IN SNOW WATER STORAGE (MM)
17	ANNUAL WATER BUDGET BALANCE (MM)

TITLE: Onslow Landfill Good Operational

WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: TEMPERATURE DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: SOLAR RADIATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

LAYER DATA 1

VALID FOR 11 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER	
MATERIAL TEXTURE NUMBER 18	
THICKNESS	= 250.00 CM
POROSITY	= 0.6710 VOL/VOL
FIELD CAPACITY	= 0.2920 VOL/VOL
WILTING POINT	= 0.0770 VOL/VOL

Good_Operational_HELP Results - Geonet Modified
 INITIAL SOIL WATER CONTENT = 0.2898 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-02 CM/SEC
 NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.30	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0234	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		10.00	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 21

THICKNESS	=	30.00	CM
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0320	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		0.3000	CM/SEC
SLOPE	=	3.00	PERCENT
DRAINAGE LENGTH	=	135.0	METERS

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.20	CM
EFFECTIVE SAT. HYD. CONDUCT.=		0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	5.00	HOLES/HECTARE
FML INSTALLATION DEFECTS	=	5.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.60	CM
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7470	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		0.3000E-08	CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.60	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		2.600	CM/SEC
SLOPE	=	3.00	PERCENT

Good_Operational_HELP Results - Geonet Modified
DRAINAGE LENGTH = 135.0 METERS

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35
THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 5.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 5.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17
THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 9
THICKNESS = 50.00 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1900E-03 CM/SEC

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8
THICKNESS = 250.00 CM
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 11 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.10
FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 4.4000 HECTARES
EVAPORATIVE ZONE DEPTH = 2.5 CM
INITIAL WATER IN EVAPORATIVE ZONE = 0.193 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 1.678 CM
FIELD CAPACITY OF EVAPORATIVE ZONE = 0.730 CM

Good_Operational_HELP Results - Geonet Modified

LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.193	CM
SOIL EVAPORATION ZONE DEPTH	=	2.5	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL INTERCEPTION WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	146.532	CM
TOTAL INITIAL WATER	=	146.532	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION DATA 1

VALID FOR 11 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

Onslow	Western Australia
STATION LATITUDE	= -21.67 DEGREES
MAXIMUM LEAF AREA INDEX	= 1.00
START OF GROWING SEASON (JULIAN DATE)	= 335
END OF GROWING SEASON (JULIAN DATE)	= 212
EVAPORATIVE ZONE DEPTH	= 2.5 CM
AVERAGE ANNUAL WIND SPEED	= 20.32 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 54.0 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 52.0 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 47.0 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 43.0 %

MONTHLY TOTALS (MM) FOR YEAR 2007

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.4 43.4	0.0 0.6	19.6 0.0	15.2 0.2	3.2 0.0	0.0 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	354.11 208.29	311.12 255.15	306.67 289.85	267.42 338.56	230.92 363.91	192.66 357.59
ACTUAL EVAPOTRANSPIRATION	0.40 17.69	0.00 4.06	2.74 0.00	3.72 0.20	4.33 0.00	3.62 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 19.138	0.000 3.291	0.637 0.000	11.884 0.000	10.884 0.000	0.015 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

 MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.536	0.000 0.092	0.018 0.000	0.344 0.000	0.305 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.510	0.000 0.170	0.036 0.000	0.465 0.000	0.457 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

 ANNUAL TOTALS FOR YEAR 2007

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	82.60	3634.400	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3476.242	152954.641	
ACTUAL EVAPOTRANSPIRATION	36.758	1617.335	44.50
DRAINAGE COLLECTED FROM LAYER 3	45.8499	2017.397	55.51
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000158	0.007	0.00
AVG. HEAD ON TOP OF LAYER 4	1.0802		
DRAINAGE COLLECTED FROM LAYER 6	0.0001	0.004	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-0.008	-0.341	-0.01
SOIL WATER AT START OF YEAR	1474.282	64868.391	
SOIL WATER AT END OF YEAR	1474.274	64868.047	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002	0.00

Good_Operational_HELP Results - Geonet Modified

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.2 1.0	65.8 7.0	201.2 0.0	21.2 15.0	0.0 23.6	47.2 3.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	359.35 209.70	296.75 244.70	283.49 283.22	257.00 345.35	233.61 325.55	189.17 367.69
ACTUAL EVAPOTRANSPIRATION	0.20 5.20	3.47 1.38	30.86 5.00	17.93 4.14	0.05 7.87	6.38 1.13
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 9.012	13.847 0.074	44.741 1.226	166.882 9.128	10.387 0.598	26.895 16.869
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.253	0.415 0.002	1.254 0.036	4.833 0.256	0.291 0.017	0.779 0.473
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.398	0.512 0.009	1.080 0.064	1.863 0.375	0.595 0.051	0.992 0.659
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	385.40	16957.605	100.00
RUNOFF	0.000	0.000	0.00

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POTENTIAL EVAPOTRANSPIRATION	3395.577	149405.391	
ACTUAL EVAPOTRANSPIRATION	83.602	3678.482	21.69
DRAINAGE COLLECTED FROM LAYER 3	299.6599	13185.037	77.75
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000811	0.036	0.00
AVG. HEAD ON TOP OF LAYER 4	7.1739		
DRAINAGE COLLECTED FROM LAYER 6	0.0007	0.033	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	2.137	94.049	0.55
SOIL WATER AT START OF YEAR	1474.274	64868.047	
SOIL WATER AT END OF YEAR	1476.411	64962.094	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.001	0.00

MONTHLY TOTALS (MM) FOR YEAR 2009

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	275.6 5.2	110.0 6.2	16.0 0.0	0.0 0.0	2.8 1.4	42.6 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	349.46 212.63	278.58 246.06	318.14 279.87	251.97 344.95	219.54 357.01	180.40 378.63
ACTUAL EVAPOTRANSPIRATION	12.27 10.25	28.91 5.31	6.28 1.64	0.00 0.00	2.06 1.40	5.41 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	14.156 21.184	238.674 0.414	102.824 0.019	0.569 0.008	0.009 0.005	10.510 0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Good_Operational_HELP Results - Geonet Modified

LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.397	7.407	2.882	0.016	0.000	0.304
	0.594	0.012	0.001	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.646	3.717	1.511	0.032	0.000	0.403
	0.613	0.019	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2009

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	459.80	20231.201	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3417.241	150358.609	
ACTUAL EVAPOTRANSPIRATION	73.523	3235.028	15.99
DRAINAGE COLLECTED FROM LAYER 3	388.3747	17088.486	84.47
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.001177	0.052	0.00
AVG. HEAD ON TOP OF LAYER 4	9.6773		
DRAINAGE COLLECTED FROM LAYER 6	0.0011	0.049	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-2.099	-92.365	-0.46
SOIL WATER AT START OF YEAR	1476.411	64962.094	
SOIL WATER AT END OF YEAR	1474.312	64869.727	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

Good_Operational_HELP Results - Geonet Modified

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

MONTHLY TOTALS (MM) FOR YEAR 2010

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	13.6 0.6	0.0 3.4	0.0 10.8	0.0 0.0	3.6 4.8	9.6 37.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	352.46 215.58	296.94 234.55	310.20 291.00	258.06 357.25	218.87 335.26	193.73 349.69
ACTUAL EVAPOTRANSPIRATION	2.47 3.52	3.21 2.36	0.00 3.02	0.00 3.22	1.42 0.81	3.54 13.36
LATERAL DRAINAGE COLLECTED FROM LAYER 3	7.406 0.184	0.498 0.002	0.011 5.849	0.006 0.067	0.004 0.008	4.336 17.942
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.208 0.005	0.015 0.000	0.000 0.169	0.000 0.002	0.000 0.000	0.126 0.503
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.357 0.010	0.028 0.000	0.000 0.246	0.000 0.003	0.000 0.000	0.206 0.818
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Good_Operational_HELP Results - Geonet Modified
ANNUAL TOTALS FOR YEAR 2010

	MM	CU. METERS	PERCENT
PRECIPITATION	83.60	3678.400	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3413.590	150197.938	
ACTUAL EVAPOTRANSPIRATION	36.926	1624.758	44.17
DRAINAGE COLLECTED FROM LAYER 3	36.3133	1597.784	43.44
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000140	0.006	0.00
AVG. HEAD ON TOP OF LAYER 4	0.8574		
DRAINAGE COLLECTED FROM LAYER 6	0.0001	0.003	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	10.360	455.850	12.39
SOIL WATER AT START OF YEAR	1474.312	64869.727	
SOIL WATER AT END OF YEAR	1484.672	65325.578	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.001	0.00

MONTHLY TOTALS (MM) FOR YEAR 2011

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	81.6 24.8	285.0 0.8	68.0 0.2	32.0 0.2	17.2 0.0	111.2 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	315.49 210.56	271.10 255.28	285.68 276.54	236.90 330.74	207.24 348.32	179.71 366.65
ACTUAL EVAPOTRANSPIRATION	38.39 16.52	81.84 0.80	11.83 0.20	8.14 0.20	10.83 0.00	9.25 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	28.215 43.422	55.895 0.219	197.814 0.009	47.809 0.005	12.864 0.004	67.094 0.003
LATERAL DRAINAGE RECIRCULATED	0.000	0.000	0.000	0.000	0.000	0.000

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FROM LAYER 3 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000	0.000	0.001	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000	0.000	0.001	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.791	1.735	5.544	1.385	0.361	1.943
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.606	1.634	1.723	1.014	0.430	1.639
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2011

	MM	CU. METERS	PERCENT
PRECIPITATION	621.00	27323.988	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3284.212	144505.328	
ACTUAL EVAPOTRANSPIRATION	178.009	7832.392	28.66
DRAINAGE COLLECTED FROM LAYER 3	453.3526	19947.514	73.00
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.001208	0.053	0.00
AVG. HEAD ON TOP OF LAYER 4	10.8185		
DRAINAGE COLLECTED FROM LAYER 6	0.0012	0.051	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-10.362	-455.943	-1.67
SOIL WATER AT START OF YEAR	1484.672	65325.578	

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SOIL WATER AT END OF YEAR	1474.310	64869.637	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0006	-0.025	0.00

MONTHLY TOTALS (MM) FOR YEAR 2012

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.8 1.2	1.2 0.8	5.8 0.2	0.2 1.4	0.2 0.0	43.2 11.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.54 220.25	299.67 270.49	300.61 292.60	267.30 354.03	225.50 347.06	191.39 369.21
ACTUAL EVAPOTRANSPIRATION	18.73 1.97	1.10 0.77	5.90 0.24	0.03 0.59	0.37 0.81	5.97 1.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	21.099 2.646	26.892 0.010	0.064 0.005	0.008 0.004	0.005 0.003	33.788 0.984
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.591 0.074	0.806 0.000	0.002 0.000	0.000 0.000	0.000 0.000	0.979 0.028
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.653 0.150	0.819 0.000	0.003 0.000	0.000 0.000	0.000 0.000	0.920 0.067
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 2012

	MM	CU. METERS	PERCENT
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PRECIPITATION	132.00	5808.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3465.644	152488.344	
ACTUAL EVAPOTRANSPIRATION	37.473	1648.801	28.39
DRAINAGE COLLECTED FROM LAYER 3	85.5073	3762.322	64.78
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000252	0.011	0.00
AVG. HEAD ON TOP OF LAYER 4	2.0669		
DRAINAGE COLLECTED FROM LAYER 6	0.0002	0.008	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	9.020	396.871	6.83
SOIL WATER AT START OF YEAR	1474.310	64869.637	
SOIL WATER AT END OF YEAR	1483.330	65266.508	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-0.005	0.00

MONTHLY TOTALS (MM) FOR YEAR 2013

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	48.4 0.0	67.2 0.4	0.0 0.0	5.0 1.4	28.0 0.0	118.4 0.4
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	355.54 218.62	299.43 254.64	300.51 283.27	260.76 352.51	200.61 341.10	185.66 370.61

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ACTUAL EVAPOTRANSPIRATION	17.08 0.00	35.76 0.40	0.00 0.00	1.92 1.02	8.94 0.38	16.89 0.23
LATERAL DRAINAGE COLLECTED FROM LAYER 3	37.329 94.346	13.116 0.349	21.309 0.007	0.015 0.005	7.812 0.003	21.139 0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	1.046 2.644	0.407 0.010	0.597 0.000	0.000 0.000	0.219 0.000	0.612 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.713 1.473	0.390 0.019	0.879 0.000	0.000 0.000	0.223 0.000	0.412 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2013

	MM	CU. METERS	PERCENT
PRECIPITATION	269.20	11844.802	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3423.241	150622.594	
ACTUAL EVAPOTRANSPIRATION	82.618	3635.196	30.69
DRAINAGE COLLECTED FROM LAYER 3	195.4319	8599.003	72.60
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000513	0.023	0.00
AVG. HEAD ON TOP OF LAYER 4	4.6141		
DRAINAGE COLLECTED FROM LAYER 6	0.0004	0.020	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00

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AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-8.851	-389.427	-3.29
SOIL WATER AT START OF YEAR	1483.330	65266.508	
SOIL WATER AT END OF YEAR	1474.479	64877.082	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.007	0.00

MONTHLY TOTALS (MM) FOR YEAR 2014

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	9.6 0.0	4.4 0.8	0.4 1.6	19.6 0.2	53.8 4.6	9.8 2.6
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	332.65 217.86	299.36 265.75	301.24 285.67	241.39 351.41	220.23 351.93	189.38 376.28
ACTUAL EVAPOTRANSPIRATION	1.43 0.91	4.94 0.45	1.92 1.95	1.39 0.20	5.70 2.50	9.28 2.54
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.109 0.419	6.126 0.000	0.023 0.000	0.167 0.000	59.861 0.000	5.528 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.003 0.012	0.190 0.000	0.001 0.000	0.005 0.000	1.678 0.000	0.160 0.000

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STD. DEVIATION OF DAILY	0.012	0.195	0.000	0.020	0.751	0.204
HEAD ON TOP OF LAYER 4	0.024	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2014

	MM	CU. METERS	PERCENT
PRECIPITATION	107.40	4725.600	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3433.140	151058.172	
ACTUAL EVAPOTRANSPIRATION	33.210	1461.261	30.92
DRAINAGE COLLECTED FROM LAYER 3	72.2319	3178.203	67.26
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000224	0.010	0.00
AVG. HEAD ON TOP OF LAYER 4	1.7069		
DRAINAGE COLLECTED FROM LAYER 6	0.0002	0.007	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	1.957	86.115	1.82
SOIL WATER AT START OF YEAR	1474.479	64877.082	
SOIL WATER AT END OF YEAR	1476.436	64963.195	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.012	0.00

MONTHLY TOTALS (MM) FOR YEAR 2015

JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC

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PRECIPITATION	2.6 0.0	153.4 0.4	150.4 0.0	49.4 0.0	9.8 0.0	13.0 8.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.68 212.80	283.17 252.67	279.46 306.14	218.07 360.41	201.54 359.22	195.25 362.97
ACTUAL EVAPOTRANSPIRATION	3.14 4.73	17.02 0.14	20.93 0.26	13.97 0.00	11.44 0.00	5.74 1.03
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 2.277	12.544 0.012	188.157 0.006	90.328 0.004	9.091 0.003	1.328 0.674
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.064	0.389 0.000	5.274 0.000	2.616 0.000	0.255 0.000	0.038 0.019
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.127	0.678 0.000	1.212 0.000	0.609 0.000	0.463 0.000	0.126 0.063
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2015

	MM	CU. METERS	PERCENT
PRECIPITATION	387.20	17036.807	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3359.374	147812.453	
ACTUAL EVAPOTRANSPIRATION	78.403	3449.722	20.25
DRAINAGE COLLECTED FROM LAYER 3	304.4240	13394.656	78.62
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000846	0.037	0.00

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AVG. HEAD ON TOP OF LAYER 4	7.2133		
DRAINAGE COLLECTED FROM LAYER 6	0.0008	0.034	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	4.372	192.377	1.13
SOIL WATER AT START OF YEAR	1476.436	64963.195	
SOIL WATER AT END OF YEAR	1480.808	65155.574	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.011	0.00

MONTHLY TOTALS (MM) FOR YEAR 2016

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.2 1.6	0.0 1.0	17.0 0.2	20.4 0.0	182.2 2.2	4.0 191.8
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	316.75 208.27	313.61 244.17	294.22 281.54	261.66 342.66	213.89 351.42	177.55 385.76
ACTUAL EVAPOTRANSPIRATION	5.43 1.60	1.96 1.00	0.51 0.04	4.88 0.16	48.38 0.90	4.00 35.84
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.283 0.593	0.011 0.001	0.151 0.000	11.658 0.000	47.580 0.000	105.882 20.608
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.036 0.017	0.000 0.000	0.004 0.000	0.338 0.000	1.334 0.000	3.067 0.578
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.070 0.034	0.000 0.000	0.023 0.000	0.459 0.000	0.880 0.000	1.551 0.942
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2016

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	422.60	18594.406	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3391.501	149226.047	
ACTUAL EVAPOTRANSPIRATION	104.695	4606.585	24.77
DRAINAGE COLLECTED FROM LAYER 3	187.7688	8261.825	44.43
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000512	0.023	0.00
AVG. HEAD ON TOP OF LAYER 4	4.4773		
DRAINAGE COLLECTED FROM LAYER 6	0.0004	0.019	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	130.135	5725.957	30.79
SOIL WATER AT START OF YEAR	1480.808	65155.574	
SOIL WATER AT END OF YEAR	1610.944	70881.531	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0004	0.016	0.00

Good_Operational_HELP Results - Geonet Modified

MONTHLY TOTALS (MM) FOR YEAR 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	44.0 0.6	35.0 0.0	0.6 0.0	1.2 3.2	0.0 18.8	1.6 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	311.22 226.04	292.94 264.30	296.25 287.82	250.50 355.03	225.27 344.10	193.24 382.72
ACTUAL EVAPOTRANSPIRATION	18.32 0.23	8.55 0.37	0.60 0.00	0.69 3.20	0.51 2.78	1.60 3.70
LATERAL DRAINAGE COLLECTED FROM LAYER 3	145.156 0.000	39.275 0.000	4.360 0.000	0.000 0.000	0.000 10.701	0.000 1.569
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	4.069 0.000	1.219 0.000	0.122 0.000	0.000 0.000	0.000 0.310	0.000 0.044
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.378 0.000	0.775 0.000	0.250 0.000	0.000 0.000	0.000 0.475	0.000 0.088
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2017

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	105.00	4620.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3429.427	150894.781	

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ACTUAL EVAPOTRANSPIRATION	40.548	1784.098	38.62
DRAINAGE COLLECTED FROM LAYER 3	201.0612	8846.694	191.49
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.000563	0.025	0.00
AVG. HEAD ON TOP OF LAYER 4	4.8029		
DRAINAGE COLLECTED FROM LAYER 6	0.0005	0.022	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-136.610	-6010.856	-130.11
SOIL WATER AT START OF YEAR	1610.944	70881.531	
SOIL WATER AT END OF YEAR	1474.333	64870.672	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0009	0.038	0.00

FINAL WATER STORAGE AT END OF YEAR 2017

LAYER	(CM)	(VOL/VOL)
----	-----	-----
1	72.4623	0.2898
2	0.0120	0.0401
3	0.9602	0.0320
4	0.0000	0.0000
5	0.4482	0.7470
6	0.0060	0.0100
7	0.0000	0.0000
8	0.4482	0.7470
9	14.2000	0.2840
10	58.0000	0.2320
TOTAL WATER IN LAYERS	146.537	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	146.537	

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PEAK DAILY VALUES FOR YEARS 2007 THROUGH 2017

	(MM)	(CU. METERS)
PRECIPITATION	238.40	10489.600
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	15.84375	697.12506
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000058	0.00253
AVERAGE HEAD ON TOP OF LAYER 4	137.665	
MAXIMUM HEAD ON TOP OF LAYER 4	238.925	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	17.7 METERS	
DRAINAGE COLLECTED FROM LAYER 6	0.00006	0.00247
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 7	0.000	
MAXIMUM HEAD ON TOP OF LAYER 7	0.665	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00001
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.6255
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0770

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

AVERAGE MONTHLY VALUES (MM) FOR YEARS 2007 THROUGH 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	49.55 7.13	65.64 1.95	43.55 1.18	14.93 1.96	27.35 5.04	36.42 23.13
STD. DEVIATIONS	80.40 14.04	89.20 2.47	69.16 3.22	15.88 4.44	53.92 8.26	42.52 57.00
RUNOFF						

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TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
POTENTIAL EVAPOTRANSPIRATION						

TOTALS	336.567	294.789	297.861	251.911	217.929	188.011
	214.599	253.434	287.047	348.445	347.715	369.800
STD. DEVIATIONS	18.055	12.875	11.732	14.823	11.107	6.249
	5.639	10.687	8.015	8.872	11.030	10.759
ACTUAL EVAPOTRANSPIRATION						

TOTALS	10.713	16.978	7.416	4.789	8.547	6.517
	5.693	1.549	1.123	1.175	1.586	5.347
STD. DEVIATIONS	11.778	24.609	10.058	6.121	13.867	4.155
	6.352	1.689	1.641	1.551	2.289	10.826
LATERAL DRAINAGE COLLECTED FROM LAYER 3						

TOTALS	23.1593	36.9890	50.9174	29.9387	14.4088	25.1378
	17.5656	0.3974	0.6474	0.8383	1.0296	5.3323
STD. DEVIATIONS	42.4992	69.1840	76.8525	53.5840	20.2459	33.5187
	28.8124	0.9715	1.7635	2.7495	3.2127	8.4988
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1						

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4						

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0001	0.0002	0.0002	0.0001	0.0000	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
LATERAL DRAINAGE COLLECTED FROM LAYER 6						

TOTALS	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0001	0.0002	0.0002	0.0001	0.0000	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1						

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 7						

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 10						

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.6491	1.1439	1.4272	0.8671	0.4039	0.7281
	0.4923	0.0111	0.0188	0.0235	0.0298	0.1495
STD. DEVIATIONS	1.1912	2.1478	2.1541	1.5520	0.5675	0.9708
	0.8076	0.0272	0.0511	0.0771	0.0930	0.2382

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2007 THROUGH 2017

	MM	CU. METERS	PERCENT
PRECIPITATION	277.80 (187.475)	12223.2	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
POTENTIAL EVAPOTRANSPIRATION	3408.108 (52.4596)	149956.77	
ACTUAL EVAPOTRANSPIRATION	71.433 (43.3038)	3143.06	25.714
LATERAL DRAINAGE COLLECTED FROM LAYER 3	206.36140 (141.50063)	9079.901	74.28415
DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00058 (0.00039)	0.026	0.00021
AVERAGE HEAD ON TOP OF LAYER 4	4.954 (3.432)		
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.00052 (0.00039)	0.023	0.00019
DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00006 (0.00000)	0.003	0.00002
AVERAGE HEAD ON TOP OF LAYER 7	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00006 (0.00000)	0.003	0.00002
CHANGE IN WATER STORAGE	0.005 (2.3623)	0.21	0.002

[illegible]

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PRECIPITATION DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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TEMPERATURE DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Temperature\T- 2007 - 2018 (11 years).d7
SOLAR RADIATION DATA FILE:  \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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EVAPOTRANSPIRATION DATA F. 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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SOIL AND DESIGN DATA FILE 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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modified.YR
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1  DATE (yyyymmdd)
2  AIR TEMPERATURE (* INDICATES FREEZING TEMPERATURES)
3  FROZEN SOIL STATE (* INDICATES FROZEN SOIL)
4  PRECIPITATION (MM)
5  RUNOFF (MM)
6  POTENTIAL EVAPOTRANSPIRATION (MM)
7  ACTUAL EVAPOTRANSPIRATION (MM)
8  WATER CONTENT OF THE EVAPORATIVE ZONE (MM)
9  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 4 (CM)
10 DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (RECIRC. + COLLECT.) (MM)
11 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
12 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 7 (CM)
13 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (RECIRC. + COLLECT.) (MM)
14 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
15 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)

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1  DATE OF ULTIMO (yyyymmdd)
2  PRECIPITATION (MM)
3  RUNOFF (MM)
4  POTENTIAL EVAPOTRANSPIRATION (MM)
5  ACTUAL EVAPOTRANSPIRATION (MM)
6  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 4 (CM)
7  DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (WITHOUT RECIRC.) (MM)
8  RECIRC#1: LAT. DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1 (MM)
9  LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
10 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 7 (CM)

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11 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (WITHOUT RECIRC.) (MM)
 12 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1 (MM)
 13 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
 14 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)

COLUMNS OF YEARLY OUTPUT DATA FILE:

1 DATE OF ULTIMO (yyyy1231)
 2 PRECIPITATION (MM)
 3 RUNOFF (MM)
 4 POTENTIAL EVAPOTRANSPIRATION (MM)
 5 ACTUAL EVAPOTRANSPIRATION (MM)
 6 DRAIN #1: LATERAL DRAINAGE FROM LAYER 3 (WITHOUT RECIRC.) (MM)
 7 RECIRC#1: LAT. DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1 (MM)
 8 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 4 (MM)
 9 DRAIN #2: LATERAL DRAINAGE FROM LAYER 6 (WITHOUT RECIRC.) (MM)
 10 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1 (MM)
 11 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 7 (MM)
 12 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 10 (MM)
 13 CHANGE IN TOTAL WATER STORAGE (MM)
 14 CHANGE IN SOIL WATER STORAGE (MM)
 15 CHANGE IN INTERCEPTION WATER STORAGE (MM)
 16 CHANGE IN SNOW WATER STORAGE (MM)
 17 ANNUAL WATER BUDGET BALANCE (MM)

TITLE: Onslow Landfill Good Operational

WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA FOR Onslow Western Australia
 WAS ENTERED FROM A TEXT FILE.

NOTE: TEMPERATURE DATA FOR Onslow Western Australia
 WAS ENTERED FROM A TEXT FILE.

NOTE: SOLAR RADIATION DATA FOR Onslow Western Australia
 WAS ENTERED FROM A TEXT FILE.

LAYER DATA 1

VALID FOR 11 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
 COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 18

THICKNESS = 250.00 CM
 POROSITY = 0.6710 VOL/VOL
 FIELD CAPACITY = 0.2920 VOL/VOL
 WILTING POINT = 0.0770 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2898 VOL/VOL

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EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-02 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.30	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0234	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		10.00	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 21

THICKNESS	=	30.00	CM
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0320	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		0.3000	CM/SEC
SLOPE	=	3.00	PERCENT
DRAINAGE LENGTH	=	135.0	METERS

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.20	CM
EFFECTIVE SAT. HYD. CONDUCT.=		0.2000E-12	CM/SEC
FML PINHOLE DENSITY	=	25.00	HOLES/HECTARE
FML INSTALLATION DEFECTS	=	25.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	4 - POOR	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.60	CM
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7470	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		0.3000E-08	CM/SEC

LAYER 6

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.60	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.=		2.600	CM/SEC
SLOPE	=	3.00	PERCENT
DRAINAGE LENGTH	=	135.0	METERS

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 25.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 25.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 4 - POOR

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 9

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 9

THICKNESS = 50.00 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1900E-03 CM/SEC

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS = 250.00 CM
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 11 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.10
FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 4.4000 HECTARES
EVAPORATIVE ZONE DEPTH = 2.5 CM
INITIAL WATER IN EVAPORATIVE ZONE = 0.193 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 1.678 CM
FIELD CAPACITY OF EVAPORATIVE ZONE = 0.730 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 0.193 CM

Poor_Operational_HELP Results - Geonet Modified

SOIL EVAPORATION ZONE DEPTH	=	2.5	CM
INITIAL SNOW WATER	=	0.000	CM
INITIAL INTERCEPTION WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	146.532	CM
TOTAL INITIAL WATER	=	146.532	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION DATA 1

VALID FOR 11 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Onslow Western Australia

STATION LATITUDE	=	-21.67	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	335	
END OF GROWING SEASON (JULIAN DATE)	=	212	
EVAPORATIVE ZONE DEPTH	=	2.5	CM
AVERAGE ANNUAL WIND SPEED	=	20.32	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	54.0	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.0	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	47.0	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	43.0	%

MONTHLY TOTALS (MM) FOR YEAR 2007

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	0.4 43.4	0.0 0.6	19.6 0.0	15.2 0.2	3.2 0.0	0.0 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	354.11 208.29	311.12 255.15	306.67 289.85	267.42 338.56	230.92 363.91	192.66 357.59
ACTUAL EVAPOTRANSPIRATION	0.40 17.69	0.00 4.06	2.74 0.00	3.72 0.20	4.33 0.00	3.62 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 19.137	0.000 3.291	0.637 0.000	11.884 0.000	10.884 0.000	0.015 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.001	0.000 0.000	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.001	0.000 0.000	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Operational_HELP Results - Geonet Modified

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.536	0.000 0.092	0.018 0.000	0.344 0.000	0.305 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.510	0.000 0.170	0.036 0.000	0.465 0.000	0.457 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2007

	MM	CU. METERS	PERCENT
PRECIPITATION	82.60	3634.400	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3476.242	152954.641	
ACTUAL EVAPOTRANSPIRATION	36.758	1617.335	44.50
DRAINAGE COLLECTED FROM LAYER 3	45.8480	2017.314	55.51
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.002038	0.090	0.00
AVG. HEAD ON TOP OF LAYER 4	1.0802		
DRAINAGE COLLECTED FROM LAYER 6	0.0020	0.087	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-0.008	-0.341	-0.01
SOIL WATER AT START OF YEAR	1474.282	64868.391	
SOIL WATER AT END OF YEAR	1474.274	64868.047	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.002	0.00

Poor_Operational_HELP Results - Geonet Modified

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	0.2 1.0	65.8 7.0	201.2 0.0	21.2 15.0	0.0 23.6	47.2 3.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	359.35 209.70	296.75 244.70	283.49 283.22	257.00 345.35	233.61 325.55	189.17 367.69
ACTUAL EVAPOTRANSPIRATION	0.20 5.20	3.47 1.38	30.86 5.00	17.93 4.14	0.05 7.87	6.38 1.13
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000 9.012	13.847 0.074	44.739 1.226	166.874 9.128	10.386 0.598	26.895 16.868
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.001 0.000	0.002 0.000	0.009 0.000	0.000 0.000	0.001 0.001
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.001 0.000	0.002 0.000	0.009 0.000	0.001 0.000	0.001 0.001
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000 0.253	0.415 0.002	1.254 0.036	4.833 0.256	0.291 0.017	0.779 0.473
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000 0.398	0.512 0.009	1.080 0.064	1.863 0.375	0.595 0.051	0.992 0.659
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
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PRECIPITATION	385.40	16957.605	100.00
RUNOFF	0.000	0.000	0.00

Poor_Operational_HELP Results - Geonet Modified

POTENTIAL EVAPOTRANSPIRATION	3395.577	149405.391	
ACTUAL EVAPOTRANSPIRATION	83.602	3678.482	21.69
DRAINAGE COLLECTED FROM LAYER 3	299.6459	13184.421	77.75
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.014648	0.645	0.00
AVG. HEAD ON TOP OF LAYER 4	7.1735		
DRAINAGE COLLECTED FROM LAYER 6	0.0146	0.642	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	2.137	94.049	0.55
SOIL WATER AT START OF YEAR	1474.274	64868.047	
SOIL WATER AT END OF YEAR	1476.411	64962.094	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.008	0.00

MONTHLY TOTALS (MM) FOR YEAR 2009

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	275.6 5.2	110.0 6.2	16.0 0.0	0.0 0.0	2.8 1.4	42.6 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	349.46 212.63	278.58 246.06	318.14 279.87	251.97 344.95	219.54 357.01	180.40 378.63
ACTUAL EVAPOTRANSPIRATION	12.27 10.25	28.91 5.31	6.28 1.64	0.00 0.00	2.06 1.40	5.41 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	14.156 21.183	238.660 0.414	102.818 0.019	0.568 0.008	0.009 0.005	10.510 0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001 0.001	0.015 0.000	0.005 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.001	0.015 0.000	0.005 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED	0.000	0.000	0.000	0.000	0.000	0.000

Poor_Operational_HELP Results - Geonet Modified

FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.397	7.406	2.882	0.016	0.000	0.304
	0.594	0.012	0.001	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.646	3.717	1.511	0.032	0.000	0.403
	0.613	0.019	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2009

	MM	CU. METERS	PERCENT
PRECIPITATION	459.80	20231.201	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3417.241	150358.609	
ACTUAL EVAPOTRANSPIRATION	73.523	3235.028	15.99
DRAINAGE COLLECTED FROM LAYER 3	388.3539	17087.570	84.46
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.022013	0.969	0.00
AVG. HEAD ON TOP OF LAYER 4	9.6768		
DRAINAGE COLLECTED FROM LAYER 6	0.0220	0.966	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0001		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-2.099	-92.365	-0.46
SOIL WATER AT START OF YEAR	1476.411	64962.094	
SOIL WATER AT END OF YEAR	1474.312	64869.727	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

Poor_Operational_HELP Results - Geonet Modified

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

MONTHLY TOTALS (MM) FOR YEAR 2010

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	13.6 0.6	0.0 3.4	0.0 10.8	0.0 0.0	3.6 4.8	9.6 37.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	352.46 215.58	296.94 234.55	310.20 291.00	258.06 357.25	218.87 335.26	193.73 349.69
ACTUAL EVAPOTRANSPIRATION	2.47 3.52	3.21 2.36	0.00 3.02	0.00 3.22	1.42 0.81	3.54 13.36
LATERAL DRAINAGE COLLECTED FROM LAYER 3	7.406 0.184	0.498 0.002	0.011 5.848	0.006 0.067	0.004 0.008	4.336 17.942
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.001
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.001
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.208 0.005	0.015 0.000	0.000 0.169	0.000 0.002	0.000 0.000	0.126 0.503
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.357 0.010	0.028 0.000	0.000 0.246	0.000 0.003	0.000 0.000	0.206 0.818
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2010

Poor_Operational_HELP Results - Geonet Modified

	MM	CU. METERS	PERCENT
PRECIPITATION	83.60	3678.400	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3413.590	150197.938	
ACTUAL EVAPOTRANSPIRATION	36.926	1624.758	44.17
DRAINAGE COLLECTED FROM LAYER 3	36.3121	1597.731	43.44
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.001650	0.073	0.00
AVG. HEAD ON TOP OF LAYER 4	0.8573		
DRAINAGE COLLECTED FROM LAYER 6	0.0015	0.065	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	10.360	455.841	12.39
SOIL WATER AT START OF YEAR	1474.312	64869.727	
SOIL WATER AT END OF YEAR	1484.672	65325.566	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.001	0.00

MONTHLY TOTALS (MM) FOR YEAR 2011

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	81.6 24.8	285.0 0.8	68.0 0.2	32.0 0.2	17.2 0.0	111.2 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	315.49 210.56	271.10 255.28	285.68 276.54	236.90 330.74	207.24 348.32	179.71 366.65
ACTUAL EVAPOTRANSPIRATION	38.39 16.52	81.84 0.80	11.83 0.20	8.14 0.20	10.83 0.00	9.25 0.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	28.213 43.420	55.894 0.219	197.804 0.009	47.807 0.005	12.863 0.004	67.091 0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Operational_HELP Results - Geonet Modified

PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001 0.002	0.003 0.000	0.011 0.000	0.002 0.000	0.001 0.000	0.003 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.001 0.002	0.002 0.000	0.011 0.000	0.002 0.000	0.001 0.000	0.003 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.791 1.217	1.734 0.006	5.544 0.000	1.385 0.000	0.361 0.000	1.943 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.606 0.758	1.634 0.011	1.723 0.000	1.014 0.000	0.430 0.000	1.639 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2011

	MM -----	CU. METERS -----	PERCENT -----
PRECIPITATION	621.00	27323.988	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3284.212	144505.328	
ACTUAL EVAPOTRANSPIRATION	178.009	7832.392	28.66
DRAINAGE COLLECTED FROM LAYER 3	453.3310	19946.564	73.00
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.022297	0.981	0.00
AVG. HEAD ON TOP OF LAYER 4	10.8179		
DRAINAGE COLLECTED FROM LAYER 6	0.0223	0.983	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0001		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-10.362	-455.931	-1.67
SOIL WATER AT START OF YEAR	1484.672	65325.566	

Poor_Operational_HELP Results - Geonet Modified

SOIL WATER AT END OF YEAR	1474.310	64869.637	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0004	-0.019	0.00

MONTHLY TOTALS (MM) FOR YEAR 2012

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.8 1.2	1.2 0.8	5.8 0.2	0.2 1.4	0.2 0.0	43.2 11.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.54 220.25	299.67 270.49	300.61 292.60	267.30 354.03	225.50 347.06	191.39 369.21
ACTUAL EVAPOTRANSPIRATION	18.73 1.97	1.10 0.77	5.90 0.24	0.03 0.59	0.37 0.81	5.97 1.00
LATERAL DRAINAGE COLLECTED FROM LAYER 3	21.098 2.646	26.891 0.010	0.064 0.005	0.008 0.004	0.005 0.003	33.787 0.984
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001 0.000	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.001 0.000	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.591 0.074	0.806 0.000	0.002 0.000	0.000 0.000	0.000 0.000	0.979 0.028
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.653 0.150	0.819 0.000	0.003 0.000	0.000 0.000	0.000 0.000	0.920 0.067
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Operational_HELP Results - Geonet Modified

ANNUAL TOTALS FOR YEAR 2012

	MM	CU. METERS	PERCENT
PRECIPITATION	132.00	5808.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3465.644	152488.344	
ACTUAL EVAPOTRANSPIRATION	37.473	1648.801	28.39
DRAINAGE COLLECTED FROM LAYER 3	85.5038	3762.166	64.78
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.003790	0.167	0.00
AVG. HEAD ON TOP OF LAYER 4	2.0668		
DRAINAGE COLLECTED FROM LAYER 6	0.0037	0.164	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	9.020	396.863	6.83
SOIL WATER AT START OF YEAR	1474.310	64869.637	
SOIL WATER AT END OF YEAR	1483.329	65266.496	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.005	0.00

MONTHLY TOTALS (MM) FOR YEAR 2013

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	48.4 0.0	67.2 0.4	0.0 0.0	5.0 1.4	28.0 0.0	118.4 0.4
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	355.54 218.62	299.43 254.64	300.51 283.27	260.76 352.51	200.61 341.10	185.66 370.61

Poor_Operational_HELP Results - Geonet Modified

ACTUAL EVAPOTRANSPIRATION	17.08	35.76	0.00	1.92	8.94	16.89
	0.00	0.40	0.00	1.02	0.38	0.23
LATERAL DRAINAGE COLLECTED FROM LAYER 3	37.327	13.116	21.308	0.015	7.812	21.138
	94.341	0.349	0.007	0.005	0.003	0.003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.002	0.001	0.001	0.000	0.000	0.001
	0.004	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.002	0.001	0.001	0.000	0.000	0.001
	0.004	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	1.046	0.407	0.597	0.000	0.219	0.612
	2.644	0.010	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.713	0.390	0.879	0.000	0.223	0.412
	1.473	0.019	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2013

	MM	CU. METERS	PERCENT
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PRECIPITATION	269.20	11844.802	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3423.241	150622.594	
ACTUAL EVAPOTRANSPIRATION	82.618	3635.196	30.69
DRAINAGE COLLECTED FROM LAYER 3	195.4235	8598.633	72.59
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.008901	0.392	0.00
AVG. HEAD ON TOP OF LAYER 4	4.6139		
DRAINAGE COLLECTED FROM LAYER 6	0.0088	0.389	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00

Poor_Operational_HELP Results - Geonet Modified

AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-8.850	-389.419	-3.29
SOIL WATER AT START OF YEAR	1483.329	65266.496	
SOIL WATER AT END OF YEAR	1474.479	64877.082	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

MONTHLY TOTALS (MM) FOR YEAR 2014

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	9.6 0.0	4.4 0.8	0.4 1.6	19.6 0.2	53.8 4.6	9.8 2.6
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	332.65 217.86	299.36 265.75	301.24 285.67	241.39 351.41	220.23 351.93	189.38 376.28
ACTUAL EVAPOTRANSPIRATION	1.43 0.91	4.94 0.45	1.92 1.95	1.39 0.20	5.70 2.50	9.28 2.54
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.109 0.418	6.126 0.000	0.023 0.000	0.167 0.000	59.858 0.000	5.528 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.003 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.003 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.003 0.012	0.190 0.000	0.001 0.000	0.005 0.000	1.678 0.000	0.160 0.000
STD. DEVIATION OF DAILY	0.012	0.195	0.000	0.020	0.751	0.204

Poor_Operational_HELP Results - Geonet Modified

HEAD ON TOP OF LAYER 4	0.024	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2014

	MM	CU. METERS	PERCENT
PRECIPITATION	107.40	4725.600	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3433.140	151058.172	
ACTUAL EVAPOTRANSPIRATION	33.210	1461.261	30.92
DRAINAGE COLLECTED FROM LAYER 3	72.2289	3178.071	67.25
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.003239	0.143	0.00
AVG. HEAD ON TOP OF LAYER 4	1.7068		
DRAINAGE COLLECTED FROM LAYER 6	0.0032	0.140	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	1.957	86.115	1.82
SOIL WATER AT START OF YEAR	1474.479	64877.082	
SOIL WATER AT END OF YEAR	1476.436	64963.195	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.011	0.00

MONTHLY TOTALS (MM) FOR YEAR 2015

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.6	153.4	150.4	49.4	9.8	13.0

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	0.0	0.4	0.0	0.0	0.0	8.2
RUNOFF	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
POTENTIAL EVAPOTRANSPIRATION	327.68	283.17	279.46	218.07	201.54	195.25
	212.80	252.67	306.14	360.41	359.22	362.97
ACTUAL EVAPOTRANSPIRATION	3.14	17.02	20.93	13.97	11.44	5.74
	4.73	0.14	0.26	0.00	0.00	1.03
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.000	12.544	188.149	90.324	9.090	1.328
	2.277	0.012	0.006	0.004	0.003	0.674
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000	0.001	0.010	0.004	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000	0.000	0.010	0.004	0.001	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.000	0.389	5.274	2.616	0.255	0.038
	0.064	0.000	0.000	0.000	0.000	0.019
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.000	0.678	1.212	0.609	0.463	0.126
	0.127	0.000	0.000	0.000	0.000	0.063
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2015

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	387.20	17036.807	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3359.374	147812.453	
ACTUAL EVAPOTRANSPIRATION	78.403	3449.722	20.25
DRAINAGE COLLECTED FROM LAYER 3	304.4098	13394.032	78.62
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.015187	0.668	0.00

Poor_Operational_HELP Results - Geonet Modified

AVG. HEAD ON TOP OF LAYER 4	7.2130		
DRAINAGE COLLECTED FROM LAYER 6	0.0151	0.665	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	4.372	192.377	1.13
SOIL WATER AT START OF YEAR	1476.436	64963.195	
SOIL WATER AT END OF YEAR	1480.808	65155.574	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.007	0.00

MONTHLY TOTALS (MM) FOR YEAR 2016

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.2 1.6	0.0 1.0	17.0 0.2	20.4 0.0	182.2 2.2	4.0 191.8
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	316.75 208.27	313.61 244.17	294.22 281.54	261.66 342.66	213.89 351.42	177.55 385.76
ACTUAL EVAPOTRANSPIRATION	5.43 1.60	1.96 1.00	0.51 0.04	4.88 0.16	48.38 0.90	4.00 35.84
LATERAL DRAINAGE COLLECTED FROM LAYER 3	1.283 0.593	0.011 0.001	0.151 0.000	11.658 0.000	47.579 0.000	105.877 20.608
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000	0.002 0.000	0.005 0.001
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000	0.002 0.000	0.005 0.001
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Operational_HELP Results - Geonet Modified
MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	0.036 0.017	0.000 0.000	0.004 0.000	0.338 0.000	1.334 0.000	3.067 0.578
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	0.070 0.034	0.000 0.000	0.023 0.000	0.459 0.000	0.880 0.000	1.550 0.942
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2016

	MM	CU. METERS	PERCENT
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PRECIPITATION	422.60	18594.406	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3391.501	149226.047	
ACTUAL EVAPOTRANSPIRATION	104.695	4606.585	24.77
DRAINAGE COLLECTED FROM LAYER 3	187.7609	8261.479	44.43
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.008781	0.386	0.00
AVG. HEAD ON TOP OF LAYER 4	4.4771		
DRAINAGE COLLECTED FROM LAYER 6	0.0085	0.376	0.00
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	130.135	5725.948	30.79
SOIL WATER AT START OF YEAR	1480.808	65155.574	
SOIL WATER AT END OF YEAR	1610.944	70881.516	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.014	0.00

Poor_Operational_HELP Results - Geonet Modified

MONTHLY TOTALS (MM) FOR YEAR 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	44.0 0.6	35.0 0.0	0.6 0.0	1.2 3.2	0.0 18.8	1.6 0.0
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	311.22 226.04	292.94 264.30	296.25 287.82	250.50 355.03	225.27 344.10	193.24 382.72
ACTUAL EVAPOTRANSPIRATION	18.32 0.23	8.55 0.37	0.60 0.00	0.69 3.20	0.51 2.78	1.60 3.70
LATERAL DRAINAGE COLLECTED FROM LAYER 3	145.149 0.000	39.274 0.000	4.359 0.000	0.000 0.000	0.000 10.701	0.000 1.569
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.007 0.000	0.002 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.007 0.000	0.002 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 4	4.068 0.000	1.219 0.000	0.122 0.000	0.000 0.000	0.000 0.310	0.000 0.044
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 4	1.378 0.000	0.775 0.000	0.250 0.000	0.000 0.000	0.000 0.475	0.000 0.088
AVERAGE DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 7	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2017

	MM	CU. METERS	PERCENT
PRECIPITATION	105.00	4620.000	100.00
RUNOFF	0.000	0.000	0.00
POTENTIAL EVAPOTRANSPIRATION	3429.427	150894.781	

Poor_Operational_HELP Results - Geonet Modified

ACTUAL EVAPOTRANSPIRATION	40.548	1784.098	38.62
DRAINAGE COLLECTED FROM LAYER 3	201.0517	8846.274	191.48
RECIRC. FROM LAYER 3 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 4	0.009738	0.428	0.01
AVG. HEAD ON TOP OF LAYER 4	4.8027		
DRAINAGE COLLECTED FROM LAYER 6	0.0099	0.434	0.01
RECIRC. FROM LAYER 6 INTO L. 1	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 7	0.000063	0.003	0.00
AVG. HEAD ON TOP OF LAYER 7	0.0000		
PERC./LEAKAGE THROUGH LAYER 10	0.000063	0.003	0.00
CHANGE IN WATER STORAGE	-136.610	-6010.843	-130.10
SOIL WATER AT START OF YEAR	1610.944	70881.516	
SOIL WATER AT END OF YEAR	1474.333	64870.672	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0008	0.033	0.00

FINAL WATER STORAGE AT END OF YEAR 2017

LAYER	(CM)	(VOL/VOL)
1	72.4623	0.2898
2	0.0120	0.0401
3	0.9602	0.0320
4	0.0000	0.0000
5	0.4482	0.7470
6	0.0060	0.0100
7	0.0000	0.0000
8	0.4482	0.7470
9	14.2000	0.2840
10	58.0000	0.2320
TOTAL WATER IN LAYERS	146.537	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	146.537	

Poor_Operational_HELP Results - Geonet Modified

PEAK DAILY VALUES FOR YEARS 2007 THROUGH 2017

	(MM)	(CU. METERS)
PRECIPITATION	238.40	10489.600
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 3	15.84312	697.09723
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.001169	0.05143
AVERAGE HEAD ON TOP OF LAYER 4	137.660	
MAXIMUM HEAD ON TOP OF LAYER 4	238.915	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	17.7 METERS	
DRAINAGE COLLECTED FROM LAYER 6	0.00114	0.05024
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 7	0.001	
MAXIMUM HEAD ON TOP OF LAYER 7	0.707	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00001
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.6255
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0770

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

AVERAGE MONTHLY VALUES (MM) FOR YEARS 2007 THROUGH 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	49.55 7.13	65.64 1.95	43.55 1.18	14.93 1.96	27.35 5.04	36.42 23.13
STD. DEVIATIONS	80.40 14.04	89.20 2.47	69.16 3.22	15.88 4.44	53.92 8.26	42.52 57.00
RUNOFF						

Poor_Operational_HELP Results - Geonet Modified

TOTALS	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATIONS	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
POTENTIAL EVAPOTRANSPIRATION						
TOTALS	336.567 214.599	294.789 253.434	297.861 287.047	251.911 348.445	217.929 347.715	188.011 369.800
STD. DEVIATIONS	18.055 5.639	12.875 10.687	11.732 8.015	14.823 8.872	11.107 11.030	6.249 10.759
ACTUAL EVAPOTRANSPIRATION						
TOTALS	10.713 5.693	16.978 1.549	7.416 1.123	4.789 1.175	8.547 1.586	6.517 5.347
STD. DEVIATIONS	11.778 6.352	24.609 1.689	10.058 1.641	6.121 1.551	13.867 2.289	4.155 10.826
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	23.1583 17.5647	36.9872 0.3974	50.9148 0.6474	29.9372 0.8383	14.4082 1.0296	25.1368 5.3321
STD. DEVIATIONS	42.4972 28.8111	69.1800 0.9715	76.8487 1.7635	53.5814 2.7494	20.2451 3.2126	33.5172 8.4986
LATERAL DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0011 0.0008	0.0020 0.0000	0.0026 0.0000	0.0015 0.0000	0.0006 0.0000	0.0012 0.0002
STD. DEVIATIONS	0.0021 0.0013	0.0043 0.0000	0.0041 0.0001	0.0027 0.0001	0.0009 0.0001	0.0016 0.0004
LATERAL DRAINAGE COLLECTED FROM LAYER 6						
TOTALS	0.0011 0.0008	0.0020 0.0000	0.0026 0.0000	0.0015 0.0000	0.0006 0.0000	0.0011 0.0002
STD. DEVIATIONS	0.0022 0.0014	0.0044 0.0000	0.0041 0.0001	0.0027 0.0001	0.0009 0.0001	0.0016 0.0003
LATERAL DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 7						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 10						
TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.6491 0.4923	1.1438 0.0111	1.4271 0.0187	0.8671 0.0235	0.4038 0.0298	0.7280 0.1495
STD. DEVIATIONS	1.1911 0.8075	2.1477 0.0272	2.1540 0.0511	1.5519 0.0771	0.5674 0.0930	0.9708 0.2382

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2007 THROUGH 2017

	MM	CU. METERS	PERCENT
PRECIPITATION	277.80 (187.475)	12223.2	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
POTENTIAL EVAPOTRANSPIRATION	3408.108 (52.4596)	149956.77	
ACTUAL EVAPOTRANSPIRATION	71.433 (43.3038)	3143.06	25.714
LATERAL DRAINAGE COLLECTED FROM LAYER 3	206.35176 (141.49344)	9079.478	74.28068
DRAINAGE RECIRCULATED FROM LAYER 3 INTO L. 1	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.01021 (0.00751)	0.449	0.00367
AVERAGE HEAD ON TOP OF LAYER 4	4.953 (3.432)		
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.01014 (0.00754)	0.446	0.00365
DRAINAGE RECIRCULATED FROM LAYER 6 INTO L. 1	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00006 (0.00000)	0.003	0.00002
AVERAGE HEAD ON TOP OF LAYER 7	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00006 (0.00000)	0.003	0.00002
CHANGE IN WATER STORAGE	0.005 (2.3623)	0.21	0.002



Appendix B: Capped & Restored Landfill HELP Simulations


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**
**      HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
**
**      HELP Version 3.95 D      (10 August 2012)
**      developed at
**      Institute of Soil Science, University of Hamburg, Germany
**      based on
**      US HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
**      DEVELOPED BY ENVIRONMENTAL LABORATORY
**      USAE WATERWAYS EXPERIMENT STATION
**      FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
**
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PRECIPITATION DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Precipitation\P - 2007 - 2018 (11 years).d4
TEMPERATURE DATA FILE:      \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Temperature\T- 2007 - 2018 (11 years).d7
SOLAR RADIATION DATA FILE:  \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Solar Radiation\SR - 2007 - 2018 (11 years).d13
EVAPOTRANSPIRATION DATA F. 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Evapotranspiration\Evapotranspiration - Capped.d11
SOIL AND DESIGN DATA FILE 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Layers\Layers - Excellent - Capped Geonet Modified.d10
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modified.out
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modified.DAY
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onslow HRA 2\Data\HELP Simulation\Simulation Results\Excellent Installation Capped Geonet
modified.MON
YEARLY OUTPUT DATA FILE:   \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
onslow HRA 2\Data\HELP Simulation\Simulation Results\Excellent Installation Capped Geonet
modified.YR
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1 DATE (yyyymmdd)
2 AIR TEMPERATURE (* INDICATES FREEZING TEMPERATURES)
3 FROZEN SOIL STATE (* INDICATES FROZEN SOIL)
4 PRECIPITATION (MM)
5 RUNOFF (MM)
6 POTENTIAL EVAPOTRANSPIRATION (MM)
7 ACTUAL EVAPOTRANSPIRATION (MM)
8 WATER CONTENT OF THE EVAPORATIVE ZONE (MM)
9 HEAD #1: AVERAGE HEAD ON TOP OF LAYER 3 (CM)
10 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
11 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 9 (CM)
12 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (RECIRC. + COLLECT.) (MM)
13 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
14 HEAD #3: AVERAGE HEAD ON TOP OF LAYER 12 (CM)
15 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (RECIRC. + COLLECT.) (MM)
16 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
17 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)

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1  DATE OF ULTIMO (yyyymmdd)
2  PRECIPITATION (MM)
3  RUNOFF (MM)
4  POTENTIAL EVAPOTRANSPIRATION (MM)
5  ACTUAL EVAPOTRANSPIRATION (MM)
6  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 3 (CM)
7  LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
8  HEAD #2: AVERAGE HEAD ON TOP OF LAYER 9 (CM)

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Excellent_Capped_HELP Results - Geonet Modified

9	DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (WITHOUT RECIRC.) (MM)
10	RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6 (MM)
11	LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
12	HEAD #3: AVERAGE HEAD ON TOP OF LAYER 12 (CM)
13	DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (WITHOUT RECIRC.) (MM)
14	RECIRC#3: LAT. DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6 (MM)
15	LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
16	LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)

COLUMNS OF YEARLY OUTPUT DATA FILE:

1	DATE OF ULTIMO (yyyy1231)
2	PRECIPITATION (MM)
3	RUNOFF (MM)
4	POTENTIAL EVAPOTRANSPIRATION (MM)
5	ACTUAL EVAPOTRANSPIRATION (MM)
6	LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
7	DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (WITHOUT RECIRC.) (MM)
8	RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6 (MM)
9	LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
10	DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (WITHOUT RECIRC.) (MM)
11	RECIRC#3: LAT. DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6 (MM)
12	LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
13	LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)
14	CHANGE IN TOTAL WATER STORAGE (MM)
15	CHANGE IN SOIL WATER STORAGE (MM)
16	CHANGE IN INTERCEPTION WATER STORAGE (MM)
17	CHANGE IN SNOW WATER STORAGE (MM)
18	ANNUAL WATER BUDGET BALANCE (MM)

TITLE: Onslow Landfill Excellent Capped

WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: TEMPERATURE DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: SOLAR RADIATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

LAYER DATA 1

VALID FOR 11 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 8

Excellent_Capped_HELP Results - Geonet Modified

THICKNESS = 120.00 CM
 POROSITY = 0.4630 VOL/VOL
 FIELD CAPACITY = 0.2320 VOL/VOL
 WILTING POINT = 0.1160 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2290 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC
 NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 0.60 CM
 POROSITY = 0.8500 VOL/VOL
 FIELD CAPACITY = 0.0100 VOL/VOL
 WILTING POINT = 0.0050 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.8500 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 11.60 CM/SEC

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 36

THICKNESS = 0.15 CM
 EFFECTIVE SAT. HYD. CONDUCT.= 0.4000E-12 CM/SEC
 FML PINHOLE DENSITY = 2.00 HOLES/HECTARE
 FML INSTALLATION DEFECTS = 2.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 2 - EXCELLENT

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
 POROSITY = 0.7500 VOL/VOL
 FIELD CAPACITY = 0.7470 VOL/VOL
 WILTING POINT = 0.4000 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS = 30.00 CM
 POROSITY = 0.4630 VOL/VOL
 FIELD CAPACITY = 0.2320 VOL/VOL
 WILTING POINT = 0.1160 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 18

THICKNESS = 1500.00 CM
 POROSITY = 0.6710 VOL/VOL
 FIELD CAPACITY = 0.2920 VOL/VOL
 WILTING POINT = 0.0770 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL

Excellent_Capped_HELP Results - Geonet Modified
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-02 CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 20
THICKNESS = 0.30 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 10.00 CM/SEC

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 30.00 CM
POROSITY = 0.3970 VOL/VOL
FIELD CAPACITY = 0.0320 VOL/VOL
WILTING POINT = 0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 135.0 METERS

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35
THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 2.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 2.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 2 - EXCELLENT

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17
THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 11

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 0.60 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 2.600 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 135.0 METERS

Excellent_Capped_HELP Results - Geonet Modified

LAYER 12

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 2.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 2.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 2 - EXCELLENT

LAYER 13

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 14

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 9

THICKNESS = 50.00 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1900E-03 CM/SEC

LAYER 15

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS = 250.00 CM
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 11 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 90.00
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 13.7150 HECTARES
EVAPORATIVE ZONE DEPTH = 20.0 CM
INITIAL WATER IN EVAPORATIVE ZONE = 2.320 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 9.260 CM
FIELD CAPACITY OF EVAPORATIVE ZONE = 4.640 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 2.320 CM
SOIL EVAPORATION ZONE DEPTH = 20.0 CM
INITIAL SNOW WATER = 0.000 CM

Excellent_Capped_HELP Results - Geonet Modified

INITIAL INTERCEPTION WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	547.464	CM
TOTAL INITIAL WATER	=	547.464	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION DATA 1

VALID FOR 11 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

Onslow	Western Australia
STATION LATITUDE	= -21.67 DEGREES
MAXIMUM LEAF AREA INDEX	= 1.00
START OF GROWING SEASON (JULIAN DATE)	= 335
END OF GROWING SEASON (JULIAN DATE)	= 212
EVAPORATIVE ZONE DEPTH	= 20.0 CM
AVERAGE ANNUAL WIND SPEED	= 20.32 KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 54.0 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 52.0 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 47.0 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 43.0 %

MONTHLY TOTALS (MM) FOR YEAR 2007

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.4 43.4	0.0 0.6	19.6 0.0	15.2 0.2	3.2 0.0	0.0 0.0
RUNOFF	0.00 0.05	0.00 0.00	0.00 0.00	0.03 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	354.11 208.29	311.12 255.15	306.67 289.85	267.42 338.56	230.92 363.91	192.66 357.59
ACTUAL EVAPOTRANSPIRATION	0.40 44.63	0.00 10.62	2.84 0.37	5.27 0.20	5.95 0.00	3.99 0.00
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	9.087 10.897	9.087 11.566	9.086 12.627	9.086 12.659	9.156 12.658	10.225 12.658
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.003 0.020	0.004 0.465	0.000 0.072	0.000 0.000	0.071 0.000	0.457 0.005
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2007

	MM	CU. METERS	PERCENT
PRECIPITATION	82.60	11328.589	100.00
RUNOFF	0.074	10.110	0.09
POTENTIAL EVAPOTRANSPIRATION	3476.242	476766.562	
ACTUAL EVAPOTRANSPIRATION	74.269	10185.972	89.91
PERC./LEAKAGE THROUGH LAYER 3	0.009564	1.312	0.01
AVG. HEAD ON TOP OF LAYER 3	107.3273		
DRAINAGE COLLECTED FROM LAYER 8	0.0094	1.291	0.01
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0007		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	8.248	1131.259	9.99
SOIL WATER AT START OF YEAR	5488.085	752690.875	
SOIL WATER AT END OF YEAR	5496.334	753822.188	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	

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SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0004	-0.051	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.2 1.0	65.8 7.0	201.2 0.0	21.2 15.0	0.0 23.6	47.2 3.2
RUNOFF	0.00 0.00	3.39 0.00	100.02 0.00	0.43 0.00	0.00 1.27	4.50 0.00
POTENTIAL EVAPOTRANSPIRATION	359.35 209.70	296.75 244.70	283.49 283.22	257.00 345.35	233.61 325.55	189.17 367.69
ACTUAL EVAPOTRANSPIRATION	0.20 7.26	12.31 6.32	35.44 5.52	39.86 5.24	0.07 15.03	5.76 5.53
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001 0.005	0.001 0.005	0.001 0.005	0.004 0.005	0.005 0.005	0.004 0.005
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.001 0.005	0.001 0.005	0.001 0.005	0.003 0.005	0.004 0.005	0.004 0.005
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	12.657 56.653	12.657 59.616	15.354 60.324	48.663 60.334	53.763 60.972	54.680 63.072
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.005 1.213	0.004 0.519	2.423 0.000	6.265 0.029	0.531 0.196	0.227 1.047
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	385.40	52857.629	100.00
RUNOFF	109.609	15032.842	28.44
POTENTIAL EVAPOTRANSPIRATION	3395.577	465703.344	
ACTUAL EVAPOTRANSPIRATION	138.530	18999.355	35.94
PERC./LEAKAGE THROUGH LAYER 3	0.046539	6.383	0.01
AVG. HEAD ON TOP OF LAYER 3	465.6208		
DRAINAGE COLLECTED FROM LAYER 8	0.0451	6.183	0.01
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0032		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	137.216	18819.232	35.60
SOIL WATER AT START OF YEAR	5496.334	753822.188	
SOIL WATER AT END OF YEAR	5633.550	772641.375	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.006	0.00

MONTHLY TOTALS (MM) FOR YEAR 2009

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	275.6	110.0	16.0	0.0	2.8	42.6

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	5.2	6.2	0.0	0.0	1.4	0.0
RUNOFF	207.09 0.00	29.99 0.00	0.03 0.00	0.00 0.00	0.00 0.00	0.02 0.00
POTENTIAL EVAPOTRANSPIRATION	349.46 212.63	278.58 246.06	318.14 279.87	251.97 344.95	219.54 357.01	180.40 378.63
ACTUAL EVAPOTRANSPIRATION	36.48 13.13	56.62 5.54	16.89 4.94	0.50 4.76	1.13 4.33	9.79 4.57
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.006 0.009	0.007 0.009	0.009 0.009	0.009 0.009	0.009 0.009	0.009 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.006 0.009	0.007 0.009	0.009 0.009	0.009 0.009	0.009 0.009	0.009 0.009
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	66.720 98.859	87.977 99.238	95.422 99.234	95.419 99.230	95.415 99.226	95.540 99.222
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	4.623 0.639	5.964 0.000	0.000 0.000	0.000 0.000	0.000 0.081	0.324 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2009

	MM	CU. METERS	PERCENT
PRECIPITATION	459.80	63061.570	100.00
RUNOFF	237.136	32523.240	51.57
POTENTIAL EVAPOTRANSPIRATION	3417.241	468674.562	

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ACTUAL EVAPOTRANSPIRATION	158.673	21761.955	34.51
PERC./LEAKAGE THROUGH LAYER 3	0.102361	14.039	0.02
AVG. HEAD ON TOP OF LAYER 3	942.9176		
DRAINAGE COLLECTED FROM LAYER 8	0.1011	13.872	0.02
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0072		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	63.890	8762.499	13.90
SOIL WATER AT START OF YEAR	5633.550	772641.375	
SOIL WATER AT END OF YEAR	5697.440	781403.875	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.005	0.00

MONTHLY TOTALS (MM) FOR YEAR 2010

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	13.6 0.6	0.0 3.4	0.0 10.8	0.0 0.0	3.6 4.8	9.6 37.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.68
POTENTIAL EVAPOTRANSPIRATION	352.46 215.58	296.94 234.55	310.20 291.00	258.06 357.25	218.87 335.26	193.73 349.69
ACTUAL EVAPOTRANSPIRATION	3.42 2.73	4.56 2.62	5.02 2.68	1.75 2.89	0.71 2.73	2.58 23.02
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.009 0.009	0.008 0.009	0.009 0.009	0.009 0.009	0.009 0.009	0.009 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.009 0.009	0.008 0.009	0.009 0.009	0.009 0.009	0.009 0.009	0.009 0.009
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH	0.000	0.000	0.000	0.000	0.000	0.000

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LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	99.218	99.214	99.210	99.206	99.202	99.198
	99.195	99.191	99.187	99.183	99.179	99.939
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.029	0.000	0.000	0.053	0.059	0.043
	0.000	0.000	0.030	0.029	0.043	0.918
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001	0.001	0.001	0.001	0.001	0.001
	0.001	0.001	0.001	0.001	0.001	0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2010

	MM	CU. METERS	PERCENT
PRECIPITATION	83.60	11465.738	100.00
RUNOFF	0.679	93.067	0.81
POTENTIAL EVAPOTRANSPIRATION	3413.590	468173.781	
ACTUAL EVAPOTRANSPIRATION	54.707	7503.121	65.44
PERC./LEAKAGE THROUGH LAYER 3	0.108619	14.897	0.13
AVG. HEAD ON TOP OF LAYER 3	992.6014		
DRAINAGE COLLECTED FROM LAYER 8	0.1085	14.880	0.13
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0077		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00

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AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	28.106	3854.689	33.62
SOIL WATER AT START OF YEAR	5697.440	781403.875	
SOIL WATER AT END OF YEAR	5725.546	785258.562	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0002	-0.028	0.00

MONTHLY TOTALS (MM) FOR YEAR 2011

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	81.6 24.8	285.0 0.8	68.0 0.2	32.0 0.2	17.2 0.0	111.2 0.0
RUNOFF	2.07 0.57	129.23 0.00	41.35 0.00	0.77 0.00	0.44 0.00	44.88 0.00
POTENTIAL EVAPOTRANSPIRATION	315.49 210.56	271.10 255.28	285.68 276.54	236.90 330.74	207.24 348.32	179.71 366.65
ACTUAL EVAPOTRANSPIRATION	90.27 45.27	115.72 12.64	48.22 8.78	13.71 7.47	40.02 4.89	40.69 0.00
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.010 0.011	0.009 0.010	0.011 0.010	0.010 0.010	0.011 0.009	0.010 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.010 0.011	0.009 0.010	0.011 0.010	0.010 0.010	0.011 0.009	0.010 0.009
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	101.907	106.178	112.798	111.277	111.590	111.810

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TOP OF LAYER 3	112.827	107.564	104.586	102.568	100.634	100.594
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	1.418	6.470	2.141	1.372	2.030	2.842
	2.337	0.879	0.772	0.892	0.101	0.051
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001	0.001	0.001	0.001	0.001	0.001
	0.001	0.001	0.001	0.001	0.001	0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2011

	MM	CU. METERS	PERCENT
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PRECIPITATION	621.00	85170.109	100.00
RUNOFF	219.294	30076.211	35.31
POTENTIAL EVAPOTRANSPIRATION	3284.212	450429.688	
ACTUAL EVAPOTRANSPIRATION	427.667	58654.477	68.87
PERC./LEAKAGE THROUGH LAYER 3	0.118989	16.319	0.02
AVG. HEAD ON TOP OF LAYER 3	1070.2784		
DRAINAGE COLLECTED FROM LAYER 8	0.1189	16.312	0.02
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0085		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-26.081	-3576.951	-4.20
SOIL WATER AT START OF YEAR	5725.546	785258.562	
SOIL WATER AT END OF YEAR	5699.465	781681.625	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0004	0.062	0.00

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MONTHLY TOTALS (MM) FOR YEAR 2012

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.8 1.2	1.2 0.8	5.8 0.2	0.2 1.4	0.2 0.0	43.2 11.0
RUNOFF	1.66 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	16.28 0.00
POTENTIAL EVAPOTRANSPIRATION	327.54 220.25	299.67 270.49	300.61 292.60	267.30 354.03	225.50 347.06	191.39 369.21
ACTUAL EVAPOTRANSPIRATION	3.86 12.83	4.86 9.11	4.94 7.25	4.56 6.52	4.55 3.90	40.47 0.83
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.010 0.010	0.010 0.010	0.011 0.009	0.011 0.009	0.011 0.009	0.011 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.009 0.010	0.010 0.010	0.011 0.009	0.011 0.010	0.011 0.009	0.011 0.009
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	102.116 108.463	116.503 105.784	116.041 103.717	115.512 101.495	114.360 100.597	113.857 100.593
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	4.456 1.209	0.358 0.993	0.399 0.318	0.339 0.754	0.334 0.043	2.760 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 2012

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	132.00	18103.799	100.00
RUNOFF	17.946	2461.265	13.60
POTENTIAL EVAPOTRANSPIRATION	3465.644	475313.094	
ACTUAL EVAPOTRANSPIRATION	103.680	14219.737	78.55
PERC./LEAKAGE THROUGH LAYER 3	0.120926	16.585	0.09
AVG. HEAD ON TOP OF LAYER 3	1082.5298		
DRAINAGE COLLECTED FROM LAYER 8	0.1209	16.576	0.09
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0086		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	10.253	1406.233	7.77
SOIL WATER AT START OF YEAR	5699.465	781681.625	
SOIL WATER AT END OF YEAR	5709.718	783087.812	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0002	-0.022	0.00

MONTHLY TOTALS (MM) FOR YEAR 2013

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	48.4 0.0	67.2 0.4	0.0 0.0	5.0 1.4	28.0 0.0	118.4 0.4
RUNOFF	1.72 0.00	32.47 0.00	0.00 0.00	0.00 0.00	1.79 0.00	83.72 0.00
POTENTIAL EVAPOTRANSPIRATION	355.54 218.62	299.43 254.64	300.51 283.27	260.76 352.51	200.61 341.10	185.66 370.61

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ACTUAL EVAPOTRANSPIRATION	4.86 17.18	35.39 10.21	4.53 7.80	4.18 6.88	24.29 5.28	38.56 0.10
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.010 0.010	0.010 0.010	0.011 0.009	0.010 0.010	0.011 0.009	0.010 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.009 0.000	0.001 0.000	0.000 0.000	0.000 0.002	0.000 0.006	0.000 0.008
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	107.665 110.357	115.096 106.805	113.830 104.173	113.099 102.118	114.783 100.621	113.264 100.594
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	5.516 1.419	1.786 0.656	0.257 0.452	0.265 0.841	1.752 0.030	1.967 0.042
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.001	0.000 0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2013

	MM	CU. METERS	PERCENT
PRECIPITATION	269.20	36920.785	100.00
RUNOFF	119.701	16416.928	44.47
POTENTIAL EVAPOTRANSPIRATION	3423.241	469497.438	
ACTUAL EVAPOTRANSPIRATION	159.291	21846.793	59.17
PERC./LEAKAGE THROUGH LAYER 3	0.120955	16.589	0.04
AVG. HEAD ON TOP OF LAYER 3	1085.3391		
DRAINAGE COLLECTED FROM LAYER 8	0.0268	3.680	0.01

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RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000032	0.004	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0019		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000032	0.004	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000032	0.004	0.00
CHANGE IN WATER STORAGE	-9.819	-1346.646	-3.65
SOIL WATER AT START OF YEAR	5709.718	783087.812	
SOIL WATER AT END OF YEAR	5699.900	781741.250	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.025	0.00

MONTHLY TOTALS (MM) FOR YEAR 2014

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	9.6 0.0	4.4 0.8	0.4 1.6	19.6 0.2	53.8 4.6	9.8 2.6
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.15 0.00	5.28 0.00	1.41 0.00
POTENTIAL EVAPOTRANSPIRATION	332.65 217.86	299.36 265.75	301.24 285.67	241.39 351.41	220.23 351.93	189.38 376.28
ACTUAL EVAPOTRANSPIRATION	0.92 3.80	4.07 3.59	4.37 3.35	3.97 3.35	5.41 3.14	10.53 3.45
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.009 0.011	0.008 0.011	0.009 0.011	0.009 0.011	0.011 0.011	0.011 0.011
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.009 0.011	0.008 0.011	0.009 0.011	0.009 0.011	0.009 0.011	0.010 0.011
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	100.590	100.586	100.582	100.578	116.061	117.833
	116.971	116.029	115.151	114.304	113.731	113.298
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000	0.000	0.042	0.030	5.298	0.438
	0.289	0.273	0.257	0.253	0.110	0.138
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001	0.001	0.001	0.001	0.001	0.001
	0.001	0.001	0.001	0.001	0.001	0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2014

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	107.40	14729.908	100.00
RUNOFF	6.841	938.210	6.37
POTENTIAL EVAPOTRANSPIRATION	3433.140	470855.188	
ACTUAL EVAPOTRANSPIRATION	49.944	6849.854	46.50
PERC./LEAKAGE THROUGH LAYER 3	0.123777	16.976	0.12
AVG. HEAD ON TOP OF LAYER 3	1104.7631		
DRAINAGE COLLECTED FROM LAYER 8	0.1207	16.557	0.11
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0086		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	50.494	6925.227	47.01
SOIL WATER AT START OF YEAR	5699.900	781741.250	

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SOIL WATER AT END OF YEAR	5750.394	788666.500	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0004	0.054	0.00

MONTHLY TOTALS (MM) FOR YEAR 2015

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.6 0.0	153.4 0.4	150.4 0.0	49.4 0.0	9.8 0.0	13.0 8.2
RUNOFF	0.00 0.00	108.79 0.00	88.72 0.00	14.21 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.68 212.80	283.17 252.67	279.46 306.14	218.07 360.41	201.54 359.22	195.25 362.97
ACTUAL EVAPOTRANSPIRATION	3.96 9.30	51.97 6.53	56.91 5.66	43.15 4.64	20.10 0.00	15.80 0.56
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.011 0.010	0.010 0.010	0.011 0.009	0.010 0.009	0.010 0.009	0.010 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.011 0.010	0.010 0.010	0.011 0.010	0.010 0.010	0.011 0.009	0.010 0.009
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	112.767 104.046	114.282 103.775	111.582 102.094	111.779 100.623	108.730 100.594	105.896 100.590
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.169 0.164	2.364 0.147	2.099 0.671	2.136 0.088	0.757 0.000	1.079 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001

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STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2015

	MM	CU. METERS	PERCENT
PRECIPITATION	387.20	53104.496	100.00
RUNOFF	211.711	29036.154	54.68
POTENTIAL EVAPOTRANSPIRATION	3359.374	460738.125	
ACTUAL EVAPOTRANSPIRATION	218.576	29977.633	56.45
PERC./LEAKAGE THROUGH LAYER 3	0.118061	16.192	0.03
AVG. HEAD ON TOP OF LAYER 3	1063.9650		
DRAINAGE COLLECTED FROM LAYER 8	0.1206	16.538	0.03
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0086		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-43.207	-5925.847	-11.16
SOIL WATER AT START OF YEAR	5750.394	788666.500	
SOIL WATER AT END OF YEAR	5707.187	782740.688	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.008	0.00

MONTHLY TOTALS (MM) FOR YEAR 2016

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	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	2.2 1.6	0.0 1.0	17.0 0.2	20.4 0.0	182.2 2.2	4.0 191.8
RUNOFF	0.00 0.00	0.00 0.00	0.09 0.00	0.00 0.00	80.25 0.00	0.00 102.37
POTENTIAL EVAPOTRANSPIRATION	316.75 208.27	313.61 244.17	294.22 281.54	261.66 342.66	213.89 351.42	177.55 385.76
ACTUAL EVAPOTRANSPIRATION	3.33 10.61	3.19 8.15	3.52 6.71	4.84 5.36	91.79 0.47	18.30 40.30
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.009 0.010	0.009 0.010	0.009 0.009	0.009 0.009	0.011 0.009	0.010 0.010
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.009 0.010	0.009 0.010	0.009 0.010	0.009 0.010	0.009 0.009	0.010 0.009
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	100.586 106.716	100.582 104.223	100.578 102.544	100.809 100.664	111.024 100.594	109.675 106.987
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.051 0.602	0.000 0.474	0.029 0.802	0.700 0.144	4.990 0.043	1.098 6.901
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001	0.001 0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2016

MM	CU. METERS	PERCENT
-----	-----	-----

Excellent_Capped_HELP Results - Geonet Modified

PRECIPITATION	422.60	57959.605	100.00
RUNOFF	182.700	25057.354	43.23
POTENTIAL EVAPOTRANSPIRATION	3391.501	465144.344	
ACTUAL EVAPOTRANSPIRATION	196.552	26957.064	46.51
PERC./LEAKAGE THROUGH LAYER 3	0.114925	15.762	0.03
AVG. HEAD ON TOP OF LAYER 3	1037.4852		
DRAINAGE COLLECTED FROM LAYER 8	0.1139	15.623	0.03
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0081		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	43.234	5929.515	10.23
SOIL WATER AT START OF YEAR	5707.187	782740.688	
SOIL WATER AT END OF YEAR	5750.420	788670.125	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.038	0.00

MONTHLY TOTALS (MM) FOR YEAR 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	44.0 0.6	35.0 0.0	0.6 0.0	1.2 3.2	0.0 18.8	1.6 0.0
RUNOFF	8.47 0.00	5.71 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	311.22 226.04	292.94 264.30	296.25 287.82	250.50 355.03	225.27 344.10	193.24 382.72
ACTUAL EVAPOTRANSPIRATION	41.92 5.79	27.77 5.17	12.40 0.39	9.74 1.66	9.42 2.90	6.97 4.05
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.011 0.010	0.010 0.009	0.011 0.009	0.010 0.009	0.010 0.009	0.009 0.009
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.010 0.010	0.010 0.010	0.011 0.009	0.010 0.009	0.010 0.009	0.010 0.009

Excellent_Capped_HELP Results - Geonet Modified

LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	115.747	113.394	111.408	108.391	106.049	103.870
	102.268	100.671	100.595	100.591	100.587	100.583
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	1.427	1.701	1.076	1.033	0.976	0.122
	0.672	0.156	0.000	0.029	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.001	0.001	0.001	0.001	0.001	0.001
	0.001	0.001	0.001	0.001	0.001	0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2017

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	105.00	14400.747	100.00
RUNOFF	14.180	1944.851	13.51
POTENTIAL EVAPOTRANSPIRATION	3429.427	470345.844	
ACTUAL EVAPOTRANSPIRATION	128.195	17581.906	122.09
PERC./LEAKAGE THROUGH LAYER 3	0.116671	16.001	0.11
AVG. HEAD ON TOP OF LAYER 3	1053.4618		
DRAINAGE COLLECTED FROM LAYER 8	0.1176	16.125	0.11
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0084		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00

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RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-37.492	-5142.066	-35.71
SOIL WATER AT START OF YEAR	5750.420	788670.125	
SOIL WATER AT END OF YEAR	5712.928	783528.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0006	-0.077	0.00

FINAL WATER STORAGE AT END OF YEAR 2017

LAYER	(CM)	(VOL/VOL)
1	49.9549	0.4163
2	0.5100	0.8500
3	0.0000	0.0000
4	0.4482	0.7470
5	6.9600	0.2320
6	438.0000	0.2920
7	0.0125	0.0415
8	0.9603	0.0320
9	0.0000	0.0000
10	0.4482	0.7470
11	0.0060	0.0100
12	0.0000	0.0000
13	0.4482	0.7470
14	14.2000	0.2840
15	58.0000	0.2320
TOTAL WATER IN LAYERS	569.948	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	569.948	

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PEAK DAILY VALUES FOR YEARS 2007 THROUGH 2017

	(MM)	(CU. METERS)
PRECIPITATION	238.40	32696.557
RUNOFF	203.057	27849.2598
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000374	0.05136
AVERAGE HEAD ON TOP OF LAYER 3	1199.995	
DRAINAGE COLLECTED FROM LAYER 8	0.00037	0.05081
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 9	0.010	
MAXIMUM HEAD ON TOP OF LAYER 9	0.709	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 METERS	
DRAINAGE COLLECTED FROM LAYER 11	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 12	0.000	
MAXIMUM HEAD ON TOP OF LAYER 12	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 11 (DISTANCE FROM DRAIN)	0.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000000	0.00002
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4630
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1160

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

AVERAGE MONTHLY VALUES (MM) FOR YEARS 2007 THROUGH 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	-----	-----	-----	-----	-----	-----
TOTALS	49.55 7.13	65.64 1.95	43.55 1.18	14.93 1.96	27.35 5.04	36.42 23.13
STD. DEVIATIONS	80.40 14.04	89.20 2.47	69.16 3.22	15.88 4.44	53.92 8.26	42.52 57.00

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RUNOFF

TOTALS	20.093 0.056	28.143 0.000	20.928 0.000	1.417 0.000	7.978 0.115	13.710 9.368
STD. DEVIATIONS	62.071 0.170	46.712 0.000	38.427 0.000	4.249 0.000	24.022 0.382	26.912 30.845

POTENTIAL EVAPOTRANSPIRATION

TOTALS	336.567 214.599	294.789 253.434	297.861 287.047	251.911 348.445	217.929 347.715	188.011 369.800
STD. DEVIATIONS	18.055 5.639	12.875 10.687	11.732 8.015	14.823 8.872	11.107 11.030	6.249 10.759

ACTUAL EVAPOTRANSPIRATION

TOTALS	17.240 15.686	28.769 7.317	17.734 4.858	11.957 4.451	18.493 3.880	17.584 7.492
STD. DEVIATIONS	28.366 15.082	35.269 3.112	19.773 2.852	15.064 2.245	27.265 4.148	15.081 12.717

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS	0.0079 0.0087	0.0076 0.0086	0.0084 0.0082	0.0083 0.0084	0.0089 0.0081	0.0086 0.0084
STD. DEVIATIONS	0.0037 0.0031	0.0035 0.0030	0.0038 0.0028	0.0032 0.0028	0.0033 0.0027	0.0031 0.0028

LATERAL DRAINAGE COLLECTED FROM LAYER 8

TOTALS	0.0076 0.0079	0.0066 0.0078	0.0075 0.0074	0.0074 0.0078	0.0076 0.0078	0.0076 0.0083
STD. DEVIATIONS	0.0036 0.0041	0.0038 0.0040	0.0045 0.0038	0.0041 0.0034	0.0040 0.0028	0.0040 0.0028

LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 11

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 12

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 15

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 84.4600 88.6870 89.6266 92.1655 94.5576 94.1681
93.3866 92.2239 91.2938 90.3424 89.9448 90.7390

STD. DEVIATIONS 38.5022 39.4383 38.9171 33.1614 33.3732 32.7545
31.6816 30.3544 29.4426 28.9764 28.6908 28.7696

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES 0.0006 0.0006 0.0006 0.0006 0.0006 0.0007
0.0007 0.0007 0.0006 0.0007 0.0007 0.0007

STD. DEVIATIONS 0.0003 0.0003 0.0004 0.0004 0.0003 0.0003
0.0003 0.0003 0.0003 0.0003 0.0002 0.0002

DAILY AVERAGE HEAD ON TOP OF LAYER 12

AVERAGES 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2007 THROUGH 2017

	MM	CU. METERS	PERCENT
PRECIPITATION	277.80 (187.475)	38100.3	100.00
RUNOFF	101.806 (97.6869)	13962.75	36.647
POTENTIAL EVAPOTRANSPIRATION	3408.108 (52.4596)	467422.03	
ACTUAL EVAPOTRANSPIRATION	155.462 (105.5374)	21321.63	55.962
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.10013 (0.03708)	13.732	0.03604
AVERAGE HEAD ON TOP OF LAYER 3	909.663 (321.610)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.09123 (0.04237)	12.512	0.03284
DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00006 (0.00001)	0.008	0.00002

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AVERAGE HEAD ON TOP OF LAYER 9	0.007 (0.003)		
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.00000 (0.00000)	0.000	0.00000
DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00006 (0.00001)	0.008	0.00002
AVERAGE HEAD ON TOP OF LAYER 12	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.00006 (0.00001)	0.008	0.00002
CHANGE IN WATER STORAGE	20.440 (2.0738)	2803.38	7.358

Good_Capped_HELP Results - Geonet Modified

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**
**      HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
**
**      HELP Version 3.95 D      (10 August 2012)
**              developed at
**      Institute of Soil science, University of Hamburg, Germany
**              based on
**      US HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
**              DEVELOPED BY ENVIRONMENTAL LABORATORY
**              USAE WATERWAYS EXPERIMENT STATION
**      FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
**
**
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TIME: 15.28 DATE: 25.07.2018

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Onslow HRA 2\Data\HELP Simulation\Temperature\T- 2007 - 2018 (11 years).d7
SOLAR RADIATION DATA FILE:  \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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Onslow HRA 2\Data\HELP Simulation\Simulation Results\Good Installation Capped Geonet
Modified.YR
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COLUMNS OF DAILY OUTPUT DATA FILE:

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1  DATE (yyyymmdd)
2  AIR TEMPERATURE (* INDICATES FREEZING TEMPERATURES)
3  FROZEN SOIL STATE (* INDICATES FROZEN SOIL)
4  PRECIPITATION (MM)
5  RUNOFF (MM)
6  POTENTIAL EVAPOTRANSPIRATION (MM)
7  ACTUAL EVAPOTRANSPIRATION (MM)
8  WATER CONTENT OF THE EVAPORATIVE ZONE (MM)
9  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 3 (CM)
10 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
11 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 9 (CM)
12 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (RECIRC. + COLLECT.) (MM)
13 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
14 HEAD #3: AVERAGE HEAD ON TOP OF LAYER 12 (CM)
15 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (RECIRC. + COLLECT.) (MM)
16 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
17 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)

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COLUMNS OF MONTHLY OUTPUT DATA FILE:

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1  DATE OF ULTIMO (yyyymmdd)
2  PRECIPITATION (MM)
3  RUNOFF (MM)
4  POTENTIAL EVAPOTRANSPIRATION (MM)
5  ACTUAL EVAPOTRANSPIRATION (MM)
6  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 3 (CM)
7  LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)

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8 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 9 (CM)
9 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (WITHOUT RECIRC.) (MM)
10 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6 (MM)
11 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
12 HEAD #3: AVERAGE HEAD ON TOP OF LAYER 12 (CM)
13 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (WITHOUT RECIRC.) (MM)
14 RECIRC#3: LAT. DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6 (MM)
15 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
16 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)

COLUMNS OF YEARLY OUTPUT DATA FILE:

1 DATE OF ULTIMO (yyyy1231)
2 PRECIPITATION (MM)
3 RUNOFF (MM)
4 POTENTIAL EVAPOTRANSPIRATION (MM)
5 ACTUAL EVAPOTRANSPIRATION (MM)
6 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
7 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (WITHOUT RECIRC.) (MM)
8 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6 (MM)
9 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
10 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (WITHOUT RECIRC.) (MM)
11 RECIRC#3: LAT. DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6 (MM)
12 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
13 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)
14 CHANGE IN TOTAL WATER STORAGE (MM)
15 CHANGE IN SOIL WATER STORAGE (MM)
16 CHANGE IN INTERCEPTION WATER STORAGE (MM)
17 CHANGE IN SNOW WATER STORAGE (MM)
18 ANNUAL WATER BUDGET BALANCE (MM)

TITLE: Onslow Landfill Good Capped

WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: TEMPERATURE DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: SOLAR RADIATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

LAYER DATA 1

VALID FOR 11 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

Good_Capped_HELP Results - Geonet Modified

MATERIAL TEXTURE NUMBER 8

THICKNESS	=	120.00	CM
POROSITY	=	0.4630	VOL/VOL
FIELD CAPACITY	=	0.2320	VOL/VOL
WILTING POINT	=	0.1160	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2290	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.3700E-03	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.60	CM
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.8500	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	11.60	CM/SEC

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.15	CM
EFFECTIVE SAT. HYD. CONDUCT.	=	0.4000E-12	CM/SEC
FML PINHOLE DENSITY	=	5.00	HOLES/HECTARE
FML INSTALLATION DEFECTS	=	5.00	HOLES/HECTARE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS	=	0.60	CM
POROSITY	=	0.7500	VOL/VOL
FIELD CAPACITY	=	0.7470	VOL/VOL
WILTING POINT	=	0.4000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.7470	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.3000E-08	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS	=	30.00	CM
POROSITY	=	0.4630	VOL/VOL
FIELD CAPACITY	=	0.2320	VOL/VOL
WILTING POINT	=	0.1160	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2320	VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.	=	0.3700E-03	CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 18

THICKNESS	=	1500.00	CM
POROSITY	=	0.6710	VOL/VOL
FIELD CAPACITY	=	0.2920	VOL/VOL
WILTING POINT	=	0.0770	VOL/VOL

Good_Capped_HELP Results - Geonet Modified
INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-02 CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 20
THICKNESS = 0.30 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 10.00 CM/SEC

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 30.00 CM
POROSITY = 0.3970 VOL/VOL
FIELD CAPACITY = 0.0320 VOL/VOL
WILTING POINT = 0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 135.0 METERS

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35
THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 5.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 5.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17
THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 11

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 0.60 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 2.600 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 135.0 METERS

LAYER 12

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 5.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 5.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 3 - GOOD

LAYER 13

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 14

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 9

THICKNESS = 50.00 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1900E-03 CM/SEC

LAYER 15

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS = 250.00 CM
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 11 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 90.00
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 13.7150 HECTARES
EVAPORATIVE ZONE DEPTH = 20.0 CM
INITIAL WATER IN EVAPORATIVE ZONE = 2.320 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 9.260 CM
FIELD CAPACITY OF EVAPORATIVE ZONE = 4.640 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 2.320 CM
SOIL EVAPORATION ZONE DEPTH = 20.0 CM

Good_Capped_HELP Results - Geonet Modified

INITIAL SNOW WATER	=	0.000	CM
INITIAL INTERCEPTION WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	547.464	CM
TOTAL INITIAL WATER	=	547.464	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION DATA 1

VALID FOR 11 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Onslow Western Australia

STATION LATITUDE	=	-21.67	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	335	
END OF GROWING SEASON (JULIAN DATE)	=	212	
EVAPORATIVE ZONE DEPTH	=	20.0	CM
AVERAGE ANNUAL WIND SPEED	=	20.32	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	54.0	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.0	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	47.0	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	43.0	%

MONTHLY TOTALS (MM) FOR YEAR 2007

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.4	0.0	19.6	15.2	3.2	0.0
	43.4	0.6	0.0	0.2	0.0	0.0
RUNOFF	0.00	0.00	0.00	0.03	0.00	0.00
	0.05	0.00	0.00	0.00	0.00	0.00
POTENTIAL EVAPOTRANSPIRATION	354.11	311.12	306.67	267.42	230.92	192.66
	208.29	255.15	289.85	338.56	363.91	357.59
ACTUAL EVAPOTRANSPIRATION	0.40	0.00	2.84	5.27	5.95	3.99
	44.63	10.62	0.37	0.20	0.00	0.00
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001	0.001	0.001	0.001	0.001	0.002
	0.002	0.002	0.002	0.002	0.002	0.002
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.001	0.001	0.001	0.001	0.001	0.002
	0.002	0.002	0.002	0.002	0.002	0.002
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH	0.000	0.000	0.000	0.000	0.000	0.000

LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	9.086 10.894	9.085 11.563	9.085 12.623	9.084 12.654	9.153 12.653	10.223 12.652
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000 0.020	0.006 0.465	0.000 0.072	0.000 0.004	0.071 0.004	0.457 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2007

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	82.60	11328.589	100.00
RUNOFF	0.074	10.110	0.09
POTENTIAL EVAPOTRANSPIRATION	3476.242	476766.562	
ACTUAL EVAPOTRANSPIRATION	74.269	10185.972	89.91
PERC./LEAKAGE THROUGH LAYER 3	0.020705	2.840	0.03
AVG. HEAD ON TOP OF LAYER 3	107.2969		
DRAINAGE COLLECTED FROM LAYER 8	0.0204	2.800	0.02
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0015		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	8.237	1129.717	9.97
SOIL WATER AT START OF YEAR	5488.084	752690.688	
SOIL WATER AT END OF YEAR	5496.321	753820.375	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	

Good_Capped_HELP Results - Geonet Modified

INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-0.019	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.2 1.0	65.8 7.0	201.2 0.0	21.2 15.0	0.0 23.6	47.2 3.2
RUNOFF	0.00 0.00	3.39 0.00	100.02 0.00	0.43 0.00	0.00 1.27	4.50 0.00
POTENTIAL EVAPOTRANSPIRATION	359.35 209.70	296.75 244.70	283.49 283.22	257.00 345.35	233.61 325.55	189.17 367.69
ACTUAL EVAPOTRANSPIRATION	0.20 7.26	12.31 6.32	35.44 5.52	39.86 5.24	0.07 15.03	5.76 5.53
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.002 0.018	0.002 0.020	0.003 0.019	0.014 0.020	0.017 0.020	0.017 0.021
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.002 0.000	0.002 0.000	0.002 0.000	0.010 0.000	0.015 0.007	0.003 0.017
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	12.651 56.628	12.651 59.585	15.347 60.287	48.654 60.290	53.749 60.922	54.660 63.015
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000 1.212	0.000 0.518	2.422 0.015	6.264 0.021	0.528 0.193	0.225 1.045
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000	0.001 0.001	0.000 0.001
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000

Good_Capped_HELP Results - Geonet Modified

TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
PRECIPITATION	385.40	52857.629	100.00
RUNOFF	109.609	15032.842	28.44
POTENTIAL EVAPOTRANSPIRATION	3395.577	465703.344	
ACTUAL EVAPOTRANSPIRATION	138.530	18999.355	35.94
PERC./LEAKAGE THROUGH LAYER 3	0.171427	23.511	0.04
AVG. HEAD ON TOP OF LAYER 3	465.3663		
DRAINAGE COLLECTED FROM LAYER 8	0.0587	8.056	0.02
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000050	0.007	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0042		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000049	0.007	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000049	0.007	0.00
CHANGE IN WATER STORAGE	137.203	18817.373	35.60
SOIL WATER AT START OF YEAR	5496.321	753820.375	
SOIL WATER AT END OF YEAR	5633.523	772637.688	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.004	0.00

MONTHLY TOTALS (MM) FOR YEAR 2009

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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	Good_Capped_HELP	Results	-	Geonet	Modified		
PRECIPITATION	275.6 5.2	110.0 6.2	16.0 0.0	0.0 0.0	2.8 1.4	42.6 0.0	
RUNOFF	207.09 0.00	29.99 0.00	0.03 0.00	0.00 0.00	0.00 0.00	0.02 0.00	
POTENTIAL EVAPOTRANSPIRATION	349.46 212.63	278.58 246.06	318.14 279.87	251.97 344.95	219.54 357.01	180.40 378.63	
ACTUAL EVAPOTRANSPIRATION	36.48 13.13	56.62 5.54	16.89 4.94	0.50 4.76	1.13 4.33	9.79 4.57	
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.023 0.044	0.033 0.044	0.041 0.043	0.040 0.044	0.041 0.043	0.040 0.044	
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.021 0.042	0.022 0.044	0.037 0.043	0.040 0.044	0.041 0.043	0.040 0.044	
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	66.657 98.718	87.905 99.081	95.337 99.062	95.319 99.044	95.302 99.025	95.413 99.006	
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	4.621 0.633	5.961 0.000	0.029 0.000	0.000 0.000	0.000 0.030	0.318 0.029	
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.002 0.004	0.002 0.004	0.003 0.004	0.003 0.004	0.003 0.004	0.003 0.004	
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	

ANNUAL TOTALS FOR YEAR 2009

	MM	CU. METERS	PERCENT
PRECIPITATION	459.80	63061.570	100.00
RUNOFF	237.136	32523.240	51.57

	Good_Capped_HELP	Results - Geonet	Modified
POTENTIAL EVAPOTRANSPIRATION	3417.241	468674.562	
ACTUAL EVAPOTRANSPIRATION	158.673	21761.955	34.51
PERC./LEAKAGE THROUGH LAYER 3	0.479883	65.816	0.10
AVG. HEAD ON TOP OF LAYER 3	941.5576		
DRAINAGE COLLECTED FROM LAYER 8	0.4602	63.118	0.10
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000066	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0328		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	63.531	8713.330	13.82
SOIL WATER AT START OF YEAR	5633.523	772637.688	
SOIL WATER AT END OF YEAR	5697.055	781351.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0006	-0.083	0.00

MONTHLY TOTALS (MM) FOR YEAR 2010

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	13.6 0.6	0.0 3.4	0.0 10.8	0.0 0.0	3.6 4.8	9.6 37.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.68
POTENTIAL EVAPOTRANSPIRATION	352.46 215.58	296.94 234.55	310.20 291.00	258.06 357.25	218.87 335.26	193.73 349.69
ACTUAL EVAPOTRANSPIRATION	3.42 2.73	4.56 2.62	5.02 2.68	1.75 2.89	0.71 2.73	2.58 23.02
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.044 0.044	0.040 0.044	0.044 0.042	0.043 0.044	0.044 0.042	0.042 0.044
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.044 0.044	0.040 0.044	0.044 0.042	0.043 0.044	0.044 0.042	0.042 0.044
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Good_Capped_HELP Results - Geonet Modified						
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	98.987	98.969	98.951	98.932	98.914	98.895
	98.876	98.857	98.838	98.820	98.801	99.505
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.072	0.000	0.000	0.043	0.000	0.000
	0.042	0.000	0.000	0.000	0.068	0.863
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.004	0.004	0.004	0.004	0.004	0.004
	0.004	0.004	0.004	0.004	0.004	0.004
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2010

	MM	CU. METERS	PERCENT
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PRECIPITATION	83.60	11465.738	100.00
RUNOFF	0.679	93.067	0.81
POTENTIAL EVAPOTRANSPIRATION	3413.590	468173.781	
ACTUAL EVAPOTRANSPIRATION	54.707	7503.121	65.44
PERC./LEAKAGE THROUGH LAYER 3	0.517385	70.959	0.62
AVG. HEAD ON TOP OF LAYER 3	989.4542		
DRAINAGE COLLECTED FROM LAYER 8	0.5169	70.891	0.62
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0369		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.000	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00

Good_Capped_HELP Results - Geonet Modified

AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	27.697	3798.610	33.13
SOIL WATER AT START OF YEAR	5697.055	781351.000	
SOIL WATER AT END OF YEAR	5724.751	785149.625	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.040	0.00

MONTHLY TOTALS (MM) FOR YEAR 2011

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	81.6 24.8	285.0 0.8	68.0 0.2	32.0 0.2	17.2 0.0	111.2 0.0
RUNOFF	2.03 0.56	128.28 0.00	41.31 0.00	0.77 0.00	0.43 0.00	44.68 0.00
POTENTIAL EVAPOTRANSPIRATION	315.49 210.56	271.10 255.28	285.68 276.54	236.90 330.74	207.24 348.32	179.71 366.65
ACTUAL EVAPOTRANSPIRATION	90.27 45.28	115.72 12.64	48.25 8.78	13.73 7.47	40.05 4.68	40.71 0.00
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.046 0.055	0.045 0.050	0.055 0.047	0.052 0.047	0.054 0.044	0.052 0.045
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.045 0.054	0.041 0.053	0.053 0.048	0.052 0.048	0.054 0.044	0.052 0.045
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

Good_Capped_HELP Results - Geonet Modified

AVERAGE DAILY HEAD ON TOP OF LAYER 3	101.593 112.805	106.081 107.532	112.790 104.546	111.244 102.490	111.542 100.615	111.800 100.573
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	1.355 2.339	6.443 0.877	2.143 0.748	1.366 0.901	2.034 0.081	2.848 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.004 0.005	0.004 0.004	0.004 0.004	0.004 0.004	0.005 0.004	0.004 0.004
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2011

	MM	CU. METERS	PERCENT
PRECIPITATION	621.00	85170.109	100.00
RUNOFF	218.060	29906.957	35.11
POTENTIAL EVAPOTRANSPIRATION	3284.212	450429.688	
ACTUAL EVAPOTRANSPIRATION	427.573	58641.598	68.85
PERC./LEAKAGE THROUGH LAYER 3	0.589044	80.787	0.09
AVG. HEAD ON TOP OF LAYER 3	1069.6770		
DRAINAGE COLLECTED FROM LAYER 8	0.5886	80.726	0.09
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0420		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-25.222	-3459.211	-4.06
SOIL WATER AT START OF YEAR	5724.751	785149.625	
SOIL WATER AT END OF YEAR	5699.529	781690.438	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.038	0.00

Good_Capped_HELP Results - Geonet Modified

MONTHLY TOTALS (MM) FOR YEAR 2012

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.8 1.2	1.2 0.8	5.8 0.2	0.2 1.4	0.2 0.0	43.2 11.0
RUNOFF	1.66 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	15.97 0.00
POTENTIAL EVAPOTRANSPIRATION	327.54 220.25	299.67 270.49	300.61 292.60	267.30 354.03	225.50 347.06	191.39 369.21
ACTUAL EVAPOTRANSPIRATION	3.86 12.83	4.86 9.11	4.94 7.25	4.57 6.52	4.56 3.73	40.47 0.83
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.046 0.051	0.054 0.049	0.057 0.046	0.055 0.046	0.056 0.044	0.054 0.045
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.045 0.053	0.047 0.050	0.057 0.047	0.055 0.047	0.056 0.044	0.054 0.045
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	102.069 108.447	116.451 105.748	115.968 103.688	115.417 101.439	114.255 100.586	113.829 100.566
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	4.430 1.208	0.373 1.003	0.397 0.334	0.348 0.735	0.325 0.000	2.740 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.004 0.004	0.004 0.004	0.005 0.004	0.005 0.004	0.005 0.004	0.005 0.004
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

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ANNUAL TOTALS FOR YEAR 2012

	MM	CU. METERS	PERCENT
PRECIPITATION	132.00	18103.799	100.00
RUNOFF	17.629	2417.845	13.36
POTENTIAL EVAPOTRANSPIRATION	3465.644	475313.094	
ACTUAL EVAPOTRANSPIRATION	103.528	14198.931	78.43
PERC./LEAKAGE THROUGH LAYER 3	0.601897	82.550	0.46
AVG. HEAD ON TOP OF LAYER 3	1082.0515		
DRAINAGE COLLECTED FROM LAYER 8	0.6018	82.542	0.46
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0429		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	10.241	1404.585	7.76
SOIL WATER AT START OF YEAR	5699.529	781690.438	
SOIL WATER AT END OF YEAR	5709.771	783095.000	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0008	-0.113	0.00

MONTHLY TOTALS (MM) FOR YEAR 2013

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	48.4 0.0	67.2 0.4	0.0 0.0	5.0 1.4	28.0 0.0	118.4 0.4
RUNOFF	1.72 0.00	32.32 0.00	0.00 0.00	0.00 0.00	1.66 0.00	83.68 0.00
POTENTIAL EVAPOTRANSPIRATION	355.54 218.62	299.43 254.64	300.51 283.27	260.76 352.51	200.61 341.10	185.66 370.61

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ACTUAL EVAPOTRANSPIRATION	4.86 17.18	35.39 10.21	4.53 7.80	4.18 6.88	24.29 5.11	38.56 0.10
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.051 0.053	0.051 0.050	0.055 0.046	0.053 0.046	0.056 0.044	0.053 0.045
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.046 0.055	0.048 0.051	0.056 0.048	0.053 0.047	0.055 0.044	0.054 0.045
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	107.623 110.345	115.067 106.783	113.820 104.149	113.070 102.054	114.740 100.605	113.256 100.573
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	5.512 1.425	1.801 0.666	0.258 0.441	0.267 0.845	1.759 0.043	1.970 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.004 0.005	0.004 0.004	0.005 0.004	0.005 0.004	0.005 0.004	0.005 0.004
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2013

	MM	CU. METERS	PERCENT
PRECIPITATION	269.20	36920.785	100.00
RUNOFF	119.377	16372.574	44.35
POTENTIAL EVAPOTRANSPIRATION	3423.241	469497.438	
ACTUAL EVAPOTRANSPIRATION	159.120	21823.338	59.11
PERC./LEAKAGE THROUGH LAYER 3	0.602731	82.665	0.22
AVG. HEAD ON TOP OF LAYER 3	1085.0701		

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DRAINAGE COLLECTED FROM LAYER 8	0.6027	82.655	0.22
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0431		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-9.900	-1357.808	-3.68
SOIL WATER AT START OF YEAR	5709.771	783095.000	
SOIL WATER AT END OF YEAR	5699.870	781737.125	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.015	0.00

MONTHLY TOTALS (MM) FOR YEAR 2014

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	9.6 0.0	4.4 0.8	0.4 1.6	19.6 0.2	53.8 4.6	9.8 2.6
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.15 0.00	5.28 0.00	1.11 0.00
POTENTIAL EVAPOTRANSPIRATION	332.65 217.86	299.36 265.75	301.24 285.67	241.39 351.41	220.23 351.93	189.38 376.28
ACTUAL EVAPOTRANSPIRATION	0.92 3.80	4.07 3.59	4.37 3.35	3.97 3.35	5.42 3.14	10.53 3.45
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.045 0.058	0.041 0.057	0.045 0.055	0.044 0.056	0.057 0.053	0.057 0.055
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.045 0.058	0.041 0.058	0.045 0.055	0.044 0.056	0.049 0.054	0.056 0.055
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Good_Capped_HELP Results - Geonet Modified

PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	100.554	100.535	100.517	100.497	115.961	117.756
	116.959	115.998	115.100	114.237	113.652	113.187
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000	0.000	0.042	0.075	5.293	0.457
	0.303	0.268	0.253	0.248	0.122	0.156
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.004	0.004	0.004	0.004	0.004	0.005
	0.005	0.005	0.005	0.005	0.005	0.005
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2014

	MM	CU. METERS	PERCENT
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PRECIPITATION	107.40	14729.908	100.00
RUNOFF	6.546	897.749	6.09
POTENTIAL EVAPOTRANSPIRATION	3433.140	470855.188	
ACTUAL EVAPOTRANSPIRATION	49.960	6851.972	46.52
PERC./LEAKAGE THROUGH LAYER 3	0.621955	85.301	0.58
AVG. HEAD ON TOP OF LAYER 3	1104.1274		
DRAINAGE COLLECTED FROM LAYER 8	0.6154	84.408	0.57
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0439		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	50.279	6895.725	46.81
SOIL WATER AT START OF YEAR	5699.870	781737.125	

Good_Capped_HELP Results - Geonet Modified

SOIL WATER AT END OF YEAR	5750.149	788632.875	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.046	0.00

MONTHLY TOTALS (MM) FOR YEAR 2015

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.6 0.0	153.4 0.4	150.4 0.0	49.4 0.0	9.8 0.0	13.0 8.2
RUNOFF	0.00 0.00	108.43 0.00	88.69 0.00	14.17 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.68 212.80	283.17 252.67	279.46 306.14	218.07 360.41	201.54 359.22	195.25 362.97
ACTUAL EVAPOTRANSPIRATION	3.96 9.30	51.97 6.53	56.91 5.66	43.15 4.41	20.10 0.00	15.80 0.56
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.054 0.048	0.050 0.047	0.054 0.045	0.052 0.045	0.051 0.044	0.048 0.045
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.055 0.048	0.049 0.048	0.055 0.046	0.052 0.046	0.053 0.044	0.049 0.045
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	112.637 104.011	114.211 103.738	111.579 102.007	111.759 100.604	108.710 100.573	105.866 100.553
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.174 0.147	2.418 0.161	2.101 0.673	2.124 0.000	0.757 0.000	1.095 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.005 0.004	0.005 0.004	0.005 0.004	0.005 0.004	0.004 0.004	0.004 0.004

Good_Capped_HELP Results - Geonet Modified

STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2015

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	387.20	53104.496	100.00
RUNOFF	211.287	28977.943	54.57
POTENTIAL EVAPOTRANSPIRATION	3359.374	460738.125	
ACTUAL EVAPOTRANSPIRATION	218.354	29947.188	56.39
PERC./LEAKAGE THROUGH LAYER 3	0.582910	79.946	0.15
AVG. HEAD ON TOP OF LAYER 3	1063.5402		
DRAINAGE COLLECTED FROM LAYER 8	0.5893	80.823	0.15
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0421		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-43.030	-5901.502	-11.11
SOIL WATER AT START OF YEAR	5750.149	788632.875	
SOIL WATER AT END OF YEAR	5707.120	782731.438	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0002	0.031	0.00

MONTHLY TOTALS (MM) FOR YEAR 2016

Good_Capped_HELP Results - Geonet Modified

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.2 1.6	0.0 1.0	17.0 0.2	20.4 0.0	182.2 2.2	4.0 191.8
RUNOFF	0.00 0.00	0.00 0.00	0.09 0.00	0.00 0.00	80.05 0.00	0.00 102.27
POTENTIAL EVAPOTRANSPIRATION	316.75 208.27	313.61 244.17	294.22 281.54	261.66 342.66	213.89 351.42	177.55 385.76
ACTUAL EVAPOTRANSPIRATION	3.33 10.61	3.19 8.15	3.52 6.71	4.84 5.10	91.79 0.47	18.30 40.30
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.045 0.050	0.042 0.048	0.045 0.045	0.044 0.045	0.053 0.044	0.050 0.050
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.045 0.051	0.042 0.049	0.045 0.046	0.044 0.046	0.047 0.044	0.052 0.045
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	100.534 106.670	100.515 104.186	100.496 102.446	100.712 100.636	110.960 100.574	109.635 106.963
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.066 0.625	0.032 0.446	0.029 0.808	0.698 0.121	5.043 0.043	1.109 6.912
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.004 0.004	0.004 0.004	0.004 0.004	0.004 0.004	0.004 0.004	0.005 0.004
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2016

MM

CU. METERS

PERCENT

Good_Capped_HELP Results - Geonet Modified

PRECIPITATION	422.60	57959.605	100.00
RUNOFF	182.409	25017.416	43.16
POTENTIAL EVAPOTRANSPIRATION	3391.501	465144.344	
ACTUAL EVAPOTRANSPIRATION	196.305	26923.178	46.45
PERC./LEAKAGE THROUGH LAYER 3	0.561119	76.957	0.13
AVG. HEAD ON TOP OF LAYER 3	1036.9388		
DRAINAGE COLLECTED FROM LAYER 8	0.5562	76.286	0.13
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0396		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	43.330	5942.644	10.25
SOIL WATER AT START OF YEAR	5707.120	782731.438	
SOIL WATER AT END OF YEAR	5750.449	788674.062	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0005	0.072	0.00

MONTHLY TOTALS (MM) FOR YEAR 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	44.0 0.6	35.0 0.0	0.6 0.0	1.2 3.2	0.0 18.8	1.6 0.0
RUNOFF	8.40 0.00	5.71 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	311.22 226.04	292.94 264.30	296.25 287.82	250.50 355.03	225.27 344.10	193.24 382.72
ACTUAL EVAPOTRANSPIRATION	41.92 5.80	27.77 5.17	12.40 0.17	9.74 1.66	9.42 2.90	6.97 4.05
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.057 0.046	0.050 0.045	0.053 0.044	0.049 0.045	0.049 0.044	0.046 0.045
LATERAL DRAINAGE COLLECTED	0.054	0.050	0.055	0.051	0.050	0.047

		Good_Capped_HELP Results - Geonet Modified					
FROM LAYER	8	0.047	0.046	0.044	0.045	0.044	0.045
LATERAL DRAINAGE RECIRCULATED		0.000	0.000	0.000	0.000	0.000	0.000
FROM LAYER 8 INTO L.	6	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH		0.000	0.000	0.000	0.000	0.000	0.000
LAYER	9	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED		0.000	0.000	0.000	0.000	0.000	0.000
FROM LAYER	11	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED		0.000	0.000	0.000	0.000	0.000	0.000
FROM LAYER 11 INTO L.	6	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH		0.000	0.000	0.000	0.000	0.000	0.000
LAYER	12	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH		0.000	0.000	0.000	0.000	0.000	0.000
LAYER	15	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	115.741	113.394	111.395	108.363	106.004	103.843
TOP OF LAYER 3	102.180	100.643	100.575	100.556	100.536	100.517
STD. DEVIATION OF DAILY	1.429	1.699	1.075	1.027	0.993	0.146
HEAD ON TOP OF LAYER 3	0.674	0.132	0.030	0.059	0.030	0.051
AVERAGE DAILY HEAD ON	0.005	0.005	0.005	0.004	0.004	0.004
TOP OF LAYER 9	0.004	0.004	0.004	0.004	0.004	0.004
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2017

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	105.00	14400.747	100.00
RUNOFF	14.109	1935.059	13.44
POTENTIAL EVAPOTRANSPIRATION	3429.427	470345.844	
ACTUAL EVAPOTRANSPIRATION	127.968	17550.859	121.87
PERC./LEAKAGE THROUGH LAYER 3	0.573701	78.683	0.55
AVG. HEAD ON TOP OF LAYER 3	1053.1222		
DRAINAGE COLLECTED FROM LAYER 8	0.5785	79.339	0.55
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000067	0.009	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0413		

Good_Capped_HELP Results - Geonet Modified

DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.001	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-37.655	-5164.445	-35.86
SOIL WATER AT START OF YEAR	5750.449	788674.062	
SOIL WATER AT END OF YEAR	5712.794	783509.625	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0005	-0.075	0.00

FINAL WATER STORAGE AT END OF YEAR 2017

LAYER	(CM)	(VOL/VOL)
1	49.9378	0.4161
2	0.5100	0.8500
3	0.0000	0.0000
4	0.4482	0.7470
5	6.9600	0.2320
6	438.0000	0.2920
7	0.0150	0.0499
8	0.9614	0.0320
9	0.0000	0.0000
10	0.4482	0.7470
11	0.0060	0.0100
12	0.0000	0.0000
13	0.4482	0.7470
14	14.2000	0.2840
15	58.0000	0.2320
TOTAL WATER IN LAYERS	569.935	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	569.935	

Good_Capped_HELP Results - Geonet Modified

PEAK DAILY VALUES FOR YEARS 2007 THROUGH 2017

	(MM)	(CU. METERS)
PRECIPITATION	238.40	32696.557
RUNOFF	203.057	27849.2598
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001950	0.26750
AVERAGE HEAD ON TOP OF LAYER 3	1200.392	
DRAINAGE COLLECTED FROM LAYER 8	0.00189	0.25914
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 9	0.049	
MAXIMUM HEAD ON TOP OF LAYER 9	0.707	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 METERS	
DRAINAGE COLLECTED FROM LAYER 11	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 12	0.000	
MAXIMUM HEAD ON TOP OF LAYER 12	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 11 (DISTANCE FROM DRAIN)	0.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000000	0.00002
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4630
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1160

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

AVERAGE MONTHLY VALUES (MM) FOR YEARS 2007 THROUGH 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	49.55 7.13	65.64 1.95	43.55 1.18	14.93 1.96	27.35 5.04	36.42 23.13
STD. DEVIATIONS	80.40	89.20	69.16	15.88	53.92	42.52

Good_Capped_HELP Results - Geonet Modified

14.04 2.47 3.22 4.44 8.26 57.00

RUNOFF

TOTALS	20.082 0.055	28.011 0.000	20.922 0.000	1.413 0.000	7.947 0.115	13.633 9.359
STD. DEVIATIONS	62.074 0.168	46.443 0.000	38.421 0.000	4.237 0.000	23.966 0.382	26.890 30.817

POTENTIAL EVAPOTRANSPIRATION

TOTALS	336.567 214.599	294.789 253.434	297.861 287.047	251.911 348.445	217.929 347.715	188.011 369.800
STD. DEVIATIONS	18.055 5.639	12.875 10.687	11.732 8.015	14.823 8.872	11.107 11.030	6.249 10.759

ACTUAL EVAPOTRANSPIRATION

TOTALS	17.241 15.687	28.770 7.317	17.737 4.837	11.960 4.408	18.498 3.829	17.587 7.492
STD. DEVIATIONS	28.366 15.083	35.270 3.112	19.776 2.888	15.064 2.235	27.267 4.138	15.084 12.717

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS	0.0377 0.0425	0.0371 0.0415	0.0412 0.0394	0.0405 0.0400	0.0436 0.0384	0.0418 0.0402
STD. DEVIATIONS	0.0197 0.0171	0.0185 0.0161	0.0201 0.0151	0.0172 0.0152	0.0181 0.0145	0.0173 0.0151

LATERAL DRAINAGE COLLECTED FROM LAYER 8

TOTALS	0.0367 0.0414	0.0349 0.0404	0.0410 0.0382	0.0404 0.0386	0.0424 0.0374	0.0409 0.0394
STD. DEVIATIONS	0.0193 0.0206	0.0182 0.0199	0.0203 0.0187	0.0179 0.0189	0.0177 0.0167	0.0199 0.0153

LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 11

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 12

Good_Capped_HELP Results - Geonet Modified

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 15

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	84.3755	88.6240	89.5713	92.0957	94.4809	94.1068
	93.3211	92.1558	91.2111	90.2568	89.8674	90.6465
STD. DEVIATIONS	38.4650	39.4154	38.9001	33.1388	33.3481	32.7405
	31.6679	30.3370	29.4180	28.9491	28.6670	28.7407

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0031	0.0032	0.0034	0.0035	0.0036	0.0036
	0.0035	0.0034	0.0033	0.0032	0.0032	0.0033
STD. DEVIATIONS	0.0016	0.0017	0.0017	0.0016	0.0015	0.0017
	0.0017	0.0017	0.0016	0.0016	0.0014	0.0013

DAILY AVERAGE HEAD ON TOP OF LAYER 12

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2007 THROUGH 2017

	MM	CU. METERS	PERCENT
PRECIPITATION	277.80 (187.475)	38100.3	100.00
RUNOFF	101.538 (97.5234)	13925.89	36.551
POTENTIAL EVAPOTRANSPIRATION	3408.108 (52.4596)	467422.03	
ACTUAL EVAPOTRANSPIRATION	155.362 (105.5014)	21307.95	55.926
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.48389 (0.19883)	66.365	0.17419
AVERAGE HEAD ON TOP OF LAYER 3	908.927 (321.393)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.47171 (0.21844)	64.695	0.16980
DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH	0.00007 (0.00001)	0.009	0.00002

Good_Capped_HELP Results - Geonet Modified

LAYER 9

AVERAGE HEAD ON TOP OF LAYER 9	0.034 (0.016)		
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.00000 (0.00000)	0.000	0.00000
DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00006 (0.00000)	0.008	0.00002
AVERAGE HEAD ON TOP OF LAYER 12	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.00006 (0.00000)	0.008	0.00002
CHANGE IN WATER STORAGE	20.428 (2.0691)	2801.73	7.354

Poor_Capped_HELP Results - Geonet Modified

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**
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**
**      HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
**
**      HELP Version 3.95 D      (10 August 2012)
**              developed at
**      Institute of Soil Science, University of Hamburg, Germany
**              based on
**      US HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
**      DEVELOPED BY ENVIRONMENTAL LABORATORY
**      USAE WATERWAYS EXPERIMENT STATION
**      FOR USEPA RISK REDUCTION ENGINEERING LABORATORY
**
**
*****
*****

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TIME: 15.30 DATE: 25.07.2018

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Onslow HRA 2\Data\HELP Simulation\Precipitation\P - 2007 - 2018 (11 years).d4
TEMPERATURE DATA FILE:       \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
Onslow HRA 2\Data\HELP Simulation\Temperature\T- 2007 - 2018 (11 years).d7
SOLAR RADIATION DATA FILE:   \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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EVAPOTRANSPIRATION DATA F. 1: \\server\talis\SECTIONS\waste\PROJECTS\TW2018\TW18036 -
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Onslow HRA 2\Data\HELP Simulation\Simulation Results\Poor Installation Capped Geonet
Modified.YR
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COLUMNS OF DAILY OUTPUT DATA FILE:

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1  DATE (yyyymmdd)
2  AIR TEMPERATURE (* INDICATES FREEZING TEMPERATURES)
3  FROZEN SOIL STATE (* INDICATES FROZEN SOIL)
4  PRECIPITATION (MM)
5  RUNOFF (MM)
6  POTENTIAL EVAPOTRANSPIRATION (MM)
7  ACTUAL EVAPOTRANSPIRATION (MM)
8  WATER CONTENT OF THE EVAPORATIVE ZONE (MM)
9  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 3 (CM)
10 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
11 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 9 (CM)
12 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (RECIRC. + COLLECT.) (MM)
13 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
14 HEAD #3: AVERAGE HEAD ON TOP OF LAYER 12 (CM)
15 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (RECIRC. + COLLECT.) (MM)
16 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
17 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)

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COLUMNS OF MONTHLY OUTPUT DATA FILE:

```

1  DATE OF ULTIMO (yyyymmdd)
2  PRECIPITATION (MM)
3  RUNOFF (MM)
4  POTENTIAL EVAPOTRANSPIRATION (MM)
5  ACTUAL EVAPOTRANSPIRATION (MM)
6  HEAD #1: AVERAGE HEAD ON TOP OF LAYER 3 (CM)
7  LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)

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Poor_Capped_HELP Results - Geonet Modified

8 HEAD #2: AVERAGE HEAD ON TOP OF LAYER 9 (CM)
9 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (WITHOUT RECIRC.) (MM)
10 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6 (MM)
11 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
12 HEAD #3: AVERAGE HEAD ON TOP OF LAYER 12 (CM)
13 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (WITHOUT RECIRC.) (MM)
14 RECIRC#3: LAT. DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6 (MM)
15 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
16 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)

COLUMNS OF YEARLY OUTPUT DATA FILE:

1 DATE OF ULTIMO (yyyy1231)
2 PRECIPITATION (MM)
3 RUNOFF (MM)
4 POTENTIAL EVAPOTRANSPIRATION (MM)
5 ACTUAL EVAPOTRANSPIRATION (MM)
6 LEAK #1: PERCOLATION/LEAKAGE THROUGH LAYER 3 (MM)
7 DRAIN #2: LATERAL DRAINAGE FROM LAYER 8 (WITHOUT RECIRC.) (MM)
8 RECIRC#2: LAT. DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6 (MM)
9 LEAK #2: PERCOLATION/LEAKAGE THROUGH LAYER 9 (MM)
10 DRAIN #3: LATERAL DRAINAGE FROM LAYER 11 (WITHOUT RECIRC.) (MM)
11 RECIRC#3: LAT. DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6 (MM)
12 LEAK #3: PERCOLATION/LEAKAGE THROUGH LAYER 12 (MM)
13 LEAK #4: PERCOLATION/LEAKAGE THROUGH LAYER 15 (MM)
14 CHANGE IN TOTAL WATER STORAGE (MM)
15 CHANGE IN SOIL WATER STORAGE (MM)
16 CHANGE IN INTERCEPTION WATER STORAGE (MM)
17 CHANGE IN SNOW WATER STORAGE (MM)
18 ANNUAL WATER BUDGET BALANCE (MM)

TITLE: Onslow Landfill Poor Capped

WEATHER DATA SOURCES

NOTE: PRECIPITATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: TEMPERATURE DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

NOTE: SOLAR RADIATION DATA FOR Onslow Western Australia
WAS ENTERED FROM A TEXT FILE.

LAYER DATA 1

VALID FOR 11 YEARS

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

Poor_Capped_HELP Results - Geonet Modified

MATERIAL TEXTURE NUMBER 8
 THICKNESS = 120.00 CM
 POROSITY = 0.4630 VOL/VOL
 FIELD CAPACITY = 0.2320 VOL/VOL
 WILTING POINT = 0.1160 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2290 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC
 NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
 MATERIAL TEXTURE NUMBER 0
 THICKNESS = 0.60 CM
 POROSITY = 0.8500 VOL/VOL
 FIELD CAPACITY = 0.0100 VOL/VOL
 WILTING POINT = 0.0050 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.8500 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 11.60 CM/SEC

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
 MATERIAL TEXTURE NUMBER 36
 THICKNESS = 0.15 CM
 EFFECTIVE SAT. HYD. CONDUCT.= 0.4000E-12 CM/SEC
 FML PINHOLE DENSITY = 25.00 HOLES/HECTARE
 FML INSTALLATION DEFECTS = 25.00 HOLES/HECTARE
 FML PLACEMENT QUALITY = 4 - POOR

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
 MATERIAL TEXTURE NUMBER 17
 THICKNESS = 0.60 CM
 POROSITY = 0.7500 VOL/VOL
 FIELD CAPACITY = 0.7470 VOL/VOL
 WILTING POINT = 0.4000 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
 MATERIAL TEXTURE NUMBER 8
 THICKNESS = 30.00 CM
 POROSITY = 0.4630 VOL/VOL
 FIELD CAPACITY = 0.2320 VOL/VOL
 WILTING POINT = 0.1160 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
 EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
 MATERIAL TEXTURE NUMBER 18
 THICKNESS = 1500.00 CM
 POROSITY = 0.6710 VOL/VOL
 FIELD CAPACITY = 0.2920 VOL/VOL
 WILTING POINT = 0.0770 VOL/VOL

Poor_Capped_HELP Results - Geonet Modified
INITIAL SOIL WATER CONTENT = 0.2920 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000E-02 CM/SEC

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 20
THICKNESS = 0.30 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0107 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 10.00 CM/SEC

LAYER 8

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 30.00 CM
POROSITY = 0.3970 VOL/VOL
FIELD CAPACITY = 0.0320 VOL/VOL
WILTING POINT = 0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1000 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 135.0 METERS

LAYER 9

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35
THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 25.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 25.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 4 - POOR

LAYER 10

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 17
THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 11

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0
THICKNESS = 0.60 CM
POROSITY = 0.8500 VOL/VOL
FIELD CAPACITY = 0.0100 VOL/VOL
WILTING POINT = 0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 2.600 CM/SEC
SLOPE = 3.00 PERCENT
DRAINAGE LENGTH = 135.0 METERS

Poor_Capped_HELP Results - Geonet Modified

LAYER 12

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.20 CM
EFFECTIVE SAT. HYD. CONDUCT.= 0.2000E-12 CM/SEC
FML PINHOLE DENSITY = 25.00 HOLES/HECTARE
FML INSTALLATION DEFECTS = 25.00 HOLES/HECTARE
FML PLACEMENT QUALITY = 4 - POOR

LAYER 13

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 17

THICKNESS = 0.60 CM
POROSITY = 0.7500 VOL/VOL
FIELD CAPACITY = 0.7470 VOL/VOL
WILTING POINT = 0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.7470 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3000E-08 CM/SEC

LAYER 14

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 9

THICKNESS = 50.00 CM
POROSITY = 0.5010 VOL/VOL
FIELD CAPACITY = 0.2840 VOL/VOL
WILTING POINT = 0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.1900E-03 CM/SEC

LAYER 15

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS = 250.00 CM
POROSITY = 0.4630 VOL/VOL
FIELD CAPACITY = 0.2320 VOL/VOL
WILTING POINT = 0.1160 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.2320 VOL/VOL
EFFECTIVE SAT. HYD. CONDUCT.= 0.3700E-03 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA 1

VALID FOR 11 YEARS

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 90.00
FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE = 13.7150 HECTARES
EVAPORATIVE ZONE DEPTH = 20.0 CM
INITIAL WATER IN EVAPORATIVE ZONE = 2.320 CM
UPPER LIMIT OF EVAPORATIVE STORAGE = 9.260 CM
FIELD CAPACITY OF EVAPORATIVE ZONE = 4.640 CM
LOWER LIMIT OF EVAPORATIVE STORAGE = 2.320 CM
SOIL EVAPORATION ZONE DEPTH = 20.0 CM

Poor_Capped_HELP Results - Geonet Modified

INITIAL SNOW WATER	=	0.000	CM
INITIAL INTERCEPTION WATER	=	0.000	CM
INITIAL WATER IN LAYER MATERIALS	=	547.459	CM
TOTAL INITIAL WATER	=	547.459	CM
TOTAL SUBSURFACE INFLOW	=	0.00	MM/YR

EVAPOTRANSPIRATION DATA 1

VALID FOR 11 YEARS

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Onslow Western Australia

STATION LATITUDE	=	-21.67	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	335	
END OF GROWING SEASON (JULIAN DATE)	=	212	
EVAPORATIVE ZONE DEPTH	=	20.0	CM
AVERAGE ANNUAL WIND SPEED	=	20.32	KPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	54.0	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	52.0	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	47.0	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	43.0	%

MONTHLY TOTALS (MM) FOR YEAR 2007

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.4 43.4	0.0 0.6	19.6 0.0	15.2 0.2	3.2 0.0	0.0 0.0
RUNOFF	0.00 0.05	0.00 0.00	0.00 0.00	0.03 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	354.11 208.29	311.12 255.15	306.67 289.85	267.42 338.56	230.92 363.91	192.66 357.59
ACTUAL EVAPOTRANSPIRATION	0.40 44.63	0.00 10.62	2.84 0.37	5.27 0.20	5.95 0.00	3.99 0.00
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.020 0.026	0.018 0.028	0.020 0.031	0.020 0.032	0.020 0.031	0.023 0.032
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.004 0.022	0.000 0.026	0.000 0.028	0.000 0.032	0.000 0.031	0.010 0.032
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH	0.000	0.000	0.000	0.000	0.000	0.000

LAYER 15 0.000 0.000 0.000 0.000 0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	9.058 10.816	9.050 11.474	9.041 12.522	9.033 12.540	9.094 12.527	10.155 12.513
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000 0.017	0.000 0.461	0.005 0.070	0.000 0.005	0.069 0.000	0.454 0.004
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.000 0.002	0.000 0.002	0.000 0.002	0.000 0.003	0.000 0.003	0.001 0.003
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2007

	MM	CU. METERS	PERCENT
	-----	-----	-----
PRECIPITATION	82.60	11328.589	100.00
RUNOFF	0.074	10.110	0.09
POTENTIAL EVAPOTRANSPIRATION	3476.242	476766.562	
ACTUAL EVAPOTRANSPIRATION	74.269	10185.972	89.91
PERC./LEAKAGE THROUGH LAYER 3	0.302926	41.546	0.37
AVG. HEAD ON TOP OF LAYER 3	106.5205		
DRAINAGE COLLECTED FROM LAYER 8	0.1858	25.477	0.22
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000089	0.012	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0132		
DRAINAGE COLLECTED FROM LAYER 11	0.0000	0.005	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000051	0.007	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000051	0.007	0.00
CHANGE IN WATER STORAGE	8.072	1107.020	9.77
SOIL WATER AT START OF YEAR	5488.036	752684.062	
SOIL WATER AT END OF YEAR	5496.107	753791.062	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	

Poor_Capped_HELP Results - Geonet Modified

INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.002	0.00

MONTHLY TOTALS (MM) FOR YEAR 2008

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
	-----	-----	-----	-----	-----	-----
PRECIPITATION	0.2 1.0	65.8 7.0	201.2 0.0	21.2 15.0	0.0 23.6	47.2 3.2
RUNOFF	0.00 0.00	3.39 0.00	100.02 0.00	0.43 0.00	0.00 1.27	4.50 0.00
POTENTIAL EVAPOTRANSPIRATION	359.35 209.70	296.75 244.70	283.49 283.22	257.00 345.35	233.61 325.55	189.17 367.69
ACTUAL EVAPOTRANSPIRATION	0.20 7.26	12.31 6.32	35.44 5.52	39.86 5.24	0.07 15.03	5.76 5.53
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.032 0.080	0.030 0.080	0.043 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.032 0.078	0.030 0.079	0.032 0.077	0.054 0.080	0.074 0.077	0.074 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	12.499 56.344	12.486 59.275	15.169 59.951	48.452 59.929	53.520 60.535	54.404 62.603
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000 1.203	0.008 0.510	2.418 0.015	6.258 0.042	0.520 0.188	0.222 1.037
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.003 0.007	0.003 0.007	0.003 0.007	0.005 0.007	0.006 0.007	0.006 0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.001 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000

Poor_Capped_HELP Results - Geonet Modified

TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2008

	MM	CU. METERS	PERCENT
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PRECIPITATION	385.40	52857.629	100.00
RUNOFF	109.609	15032.842	28.44
POTENTIAL EVAPOTRANSPIRATION	3395.577	465703.344	
ACTUAL EVAPOTRANSPIRATION	138.530	18999.355	35.94
PERC./LEAKAGE THROUGH LAYER 3	0.817583	112.132	0.21
AVG. HEAD ON TOP OF LAYER 3	462.6384		
DRAINAGE COLLECTED FROM LAYER 8	0.7687	105.423	0.20
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000204	0.028	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0547		
DRAINAGE COLLECTED FROM LAYER 11	0.0001	0.019	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	136.493	18719.990	35.42
SOIL WATER AT START OF YEAR	5496.107	753791.062	
SOIL WATER AT END OF YEAR	5632.600	772511.062	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-0.012	0.00

MONTHLY TOTALS (MM) FOR YEAR 2009

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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	Poor_Capped_HELP	Results	-	Geonet	Modified		
PRECIPITATION	275.6 5.2	110.0 6.2		16.0 0.0	0.0 0.0	2.8 1.4	42.6 0.0
RUNOFF	207.09 0.00	29.99 0.00		0.03 0.00	0.00 0.00	0.00 0.00	0.02 0.00
POTENTIAL EVAPOTRANSPIRATION	349.46 212.63	278.58 246.06		318.14 279.87	251.97 344.95	219.54 357.01	180.40 378.63
ACTUAL EVAPOTRANSPIRATION	36.48 13.13	56.62 5.54		16.89 4.94	0.50 4.76	1.13 4.33	9.79 4.57
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080		0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.073 0.080		0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000		0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000		0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000		0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000		0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000		0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000		0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	66.123 98.176	87.303 98.524	94.861 98.490	94.827 98.455	94.793 98.421	94.887 98.387
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	4.456 0.633	5.975 0.000	0.000 0.000	0.000 0.029	0.000 0.000	0.315 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2009

	MM	CU. METERS	PERCENT
PRECIPITATION	459.80	63061.570	100.00
RUNOFF	237.136	32523.240	51.57

POTENTIAL EVAPOTRANSPIRATION	Poor_Capped_HELP Results - Geonet Modified 3417.241 468674.562	
ACTUAL EVAPOTRANSPIRATION	158.673	21761.955 34.51
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756 0.21
AVG. HEAD ON TOP OF LAYER 3	936.0392	
DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721 0.21
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000 0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032 0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675	
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023 0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000 0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009 0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000	
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009 0.00
CHANGE IN WATER STORAGE	63.045	8646.619 13.71
SOIL WATER AT START OF YEAR	5632.600	772511.062
SOIL WATER AT END OF YEAR	5695.645	781157.688
INTERCEPTION WATER AT START OF YEAR	0.000	0.000
INTERCEPTION WATER AT END OF YEAR	0.000	0.000
SNOW WATER AT START OF YEAR	0.000	0.000 0.00
SNOW WATER AT END OF YEAR	0.000	0.000 0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.002 0.00

MONTHLY TOTALS (MM) FOR YEAR 2010

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	13.6 0.6	0.0 3.4	0.0 10.8	0.0 0.0	3.6 4.8	9.6 37.2
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.68
POTENTIAL EVAPOTRANSPIRATION	352.46 215.58	296.94 234.55	310.20 291.00	258.06 357.25	218.87 335.26	193.73 349.69
ACTUAL EVAPOTRANSPIRATION	3.42 2.73	4.56 2.62	5.02 2.68	1.75 2.89	0.71 2.73	2.58 23.02
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Capped_HELP Results - Geonet Modified						
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	98.352	98.319	98.286	98.252	98.217	98.183
	98.149	98.114	98.080	98.046	98.012	98.668
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000	0.000	0.042	0.000	0.042	0.000
	0.000	0.051	0.000	0.000	0.030	0.804
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007	0.007	0.007	0.007	0.007	0.007
	0.007	0.007	0.007	0.007	0.007	0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2010

	MM	CU. METERS	PERCENT
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PRECIPITATION	83.60	11465.738	100.00
RUNOFF	0.679	93.067	0.81
POTENTIAL EVAPOTRANSPIRATION	3413.590	468173.781	
ACTUAL EVAPOTRANSPIRATION	54.707	7503.121	65.44
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756	1.13
AVG. HEAD ON TOP OF LAYER 3	982.2311		
DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721	1.13
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00

Poor_Capped_HELP Results - Geonet Modified

AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	27.268	3739.873	32.62
SOIL WATER AT START OF YEAR	5695.645	781157.688	
SOIL WATER AT END OF YEAR	5722.914	784897.562	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0006	-0.076	0.00

MONTHLY TOTALS (MM) FOR YEAR 2011

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	81.6 24.8	285.0 0.8	68.0 0.2	32.0 0.2	17.2 0.0	111.2 0.0
RUNOFF	1.97 0.56	126.52 0.00	41.30 0.00	0.76 0.00	0.43 0.00	44.61 0.00
POTENTIAL EVAPOTRANSPIRATION	315.49 210.56	271.10 255.28	285.68 276.54	236.90 330.74	207.24 348.32	179.71 366.65
ACTUAL EVAPOTRANSPIRATION	90.16 45.28	115.72 12.64	48.25 8.78	13.73 7.47	40.05 4.54	40.71 0.00
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

Poor_Capped_HELP Results - Geonet Modified

AVERAGE DAILY HEAD ON TOP OF LAYER 3	101.093 112.797	105.899 107.516	112.787 104.524	111.230 102.441	111.521 100.602	111.796 100.552
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	1.176 2.338	6.414 0.876	2.145 0.742	1.365 0.912	2.037 0.061	2.850 0.042
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2011

	MM	CU. METERS	PERCENT
PRECIPITATION	621.00	85170.109	100.00
RUNOFF	216.149	29644.789	34.81
POTENTIAL EVAPOTRANSPIRATION	3284.212	450429.688	
ACTUAL EVAPOTRANSPIRATION	427.316	58606.352	68.81
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756	0.15
AVG. HEAD ON TOP OF LAYER 3	1068.9647		
DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721	0.15
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-23.411	-3210.868	-3.77
SOIL WATER AT START OF YEAR	5722.914	784897.562	
SOIL WATER AT END OF YEAR	5699.502	781686.688	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0007	0.093	0.00

Poor_Capped_HELP Results - Geonet Modified

MONTHLY TOTALS (MM) FOR YEAR 2012

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	66.8 1.2	1.2 0.8	5.8 0.2	0.2 1.4	0.2 0.0	43.2 11.0
RUNOFF	1.65 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	15.76 0.00
POTENTIAL EVAPOTRANSPIRATION	327.54 220.25	299.67 270.49	300.61 292.60	267.30 354.03	225.50 347.06	191.39 369.21
ACTUAL EVAPOTRANSPIRATION	3.86 12.83	4.86 9.11	4.95 7.25	4.58 6.52	4.56 3.59	40.47 0.83
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.075 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.075 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	102.033 108.439	116.404 105.723	115.911 103.667	115.348 101.398	114.184 100.574	113.790 100.540
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	4.429 1.207	0.366 1.008	0.393 0.350	0.340 0.727	0.320 0.030	2.690 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Capped_HELP Results - Geonet Modified

ANNUAL TOTALS FOR YEAR 2012

	MM	CU. METERS	PERCENT
PRECIPITATION	132.00	18103.799	100.00
RUNOFF	17.410	2387.826	13.19
POTENTIAL EVAPOTRANSPIRATION	3465.644	475313.094	
ACTUAL EVAPOTRANSPIRATION	103.413	14183.098	78.34
PERC./LEAKAGE THROUGH LAYER 3	0.948680	130.111	0.72
AVG. HEAD ON TOP OF LAYER 3	1081.6748		
DRAINAGE COLLECTED FROM LAYER 8	0.9484	130.077	0.72
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000235	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.024	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	10.228	1402.725	7.75
SOIL WATER AT START OF YEAR	5699.502	781686.688	
SOIL WATER AT END OF YEAR	5709.729	783089.375	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.041	0.00

MONTHLY TOTALS (MM) FOR YEAR 2013

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	48.4 0.0	67.2 0.4	0.0 0.0	5.0 1.4	28.0 0.0	118.4 0.4
RUNOFF	1.72 0.00	32.20 0.00	0.00 0.00	0.00 0.00	1.58 0.00	83.66 0.00
POTENTIAL EVAPOTRANSPIRATION	355.54 218.62	299.43 254.64	300.51 283.27	260.76 352.51	200.61 341.10	185.66 370.61

Poor_Capped_HELP Results - Geonet Modified

ACTUAL EVAPOTRANSPIRATION	4.86 17.18	35.39 10.21	4.53 7.80	4.18 6.88	24.29 4.98	38.56 0.10
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	107.579 110.336	115.042 106.769	113.814 104.130	113.052 102.005	114.716 100.592	113.247 100.552
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	5.507 1.429	1.818 0.673	0.263 0.433	0.274 0.850	1.762 0.000	1.978 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2013

	MM	CU. METERS	PERCENT
PRECIPITATION	269.20	36920.785	100.00
RUNOFF	119.154	16342.012	44.26
POTENTIAL EVAPOTRANSPIRATION	3423.241	469497.438	
ACTUAL EVAPOTRANSPIRATION	158.988	21805.271	59.06
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756	0.35
AVG. HEAD ON TOP OF LAYER 3	1084.8621		

Poor_Capped_HELP Results - Geonet Modified

DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721	0.35
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-9.888	-1356.161	-3.67
SOIL WATER AT START OF YEAR	5709.729	783089.375	
SOIL WATER AT END OF YEAR	5699.841	781733.188	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0007	-0.093	0.00

MONTHLY TOTALS (MM) FOR YEAR 2014

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	9.6 0.0	4.4 0.8	0.4 1.6	19.6 0.2	53.8 4.6	9.8 2.6
RUNOFF	0.00 0.00	0.00 0.00	0.00 0.00	0.15 0.00	5.28 0.00	0.86 0.00
POTENTIAL EVAPOTRANSPIRATION	332.65 217.86	299.36 265.75	301.24 285.67	241.39 351.41	220.23 351.93	189.38 376.28
ACTUAL EVAPOTRANSPIRATION	0.92 3.80	4.07 3.59	4.37 3.35	3.97 3.35	5.43 3.14	10.54 3.45
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

Poor_Capped_HELP Results - Geonet Modified

PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	100.517	100.484	100.451	100.416	115.860	117.678
	116.952	115.981	115.074	114.204	113.611	113.129
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.042	0.000	0.000	0.053	5.289	0.465
	0.302	0.271	0.267	0.248	0.091	0.156
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007	0.007	0.007	0.007	0.007	0.007
	0.007	0.007	0.007	0.007	0.007	0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2014

	MM	CU. METERS	PERCENT
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PRECIPITATION	107.40	14729.908	100.00
RUNOFF	6.289	862.501	5.86
POTENTIAL EVAPOTRANSPIRATION	3433.140	470855.188	
ACTUAL EVAPOTRANSPIRATION	49.977	6854.349	46.53
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756	0.88
AVG. HEAD ON TOP OF LAYER 3	1103.6318		
DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721	0.88
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	50.188	6883.287	46.73
SOIL WATER AT START OF YEAR	5699.841	781733.188	

Poor_Capped_HELP Results - Geonet Modified

SOIL WATER AT END OF YEAR	5750.029	788616.500	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0001	0.020	0.00

MONTHLY TOTALS (MM) FOR YEAR 2015

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.6 0.0	153.4 0.4	150.4 0.0	49.4 0.0	9.8 0.0	13.0 8.2
RUNOFF	0.00 0.00	108.23 0.00	88.68 0.00	14.14 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	327.68 212.80	283.17 252.67	279.46 306.14	218.07 360.41	201.54 359.22	195.25 362.97
ACTUAL EVAPOTRANSPIRATION	3.96 9.30	51.97 6.53	56.91 5.66	43.15 4.24	20.10 0.00	15.80 0.56
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	112.568 103.988	114.173 103.708	111.573 101.938	111.741 100.591	108.696 100.551	105.843 100.516
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.167 0.135	2.447 0.184	2.102 0.679	2.115 0.029	0.763 0.043	1.106 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007

Poor_Capped_HELP Results - Geonet Modified

STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2015

	MM	CU. METERS	PERCENT
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PRECIPITATION	387.20	53104.496	100.00
RUNOFF	211.052	28945.717	54.51
POTENTIAL EVAPOTRANSPIRATION	3359.374	460738.125	
ACTUAL EVAPOTRANSPIRATION	218.177	29923.018	56.35
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756	0.24
AVG. HEAD ON TOP OF LAYER 3	1063.2386		
DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721	0.24
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-42.975	-5893.953	-11.10
SOIL WATER AT START OF YEAR	5750.029	788616.500	
SOIL WATER AT END OF YEAR	5707.055	782722.500	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0003	-0.040	0.00

MONTHLY TOTALS (MM) FOR YEAR 2016

Poor_Capped_HELP Results - Geonet Modified

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.2 1.6	0.0 1.0	17.0 0.2	20.4 0.0	182.2 2.2	4.0 191.8
RUNOFF	0.00 0.00	0.00 0.00	0.09 0.00	0.00 0.00	79.86 0.00	0.00 102.18
POTENTIAL EVAPOTRANSPIRATION	316.75 208.27	313.61 244.17	294.22 281.54	261.66 342.66	213.89 351.42	177.55 385.76
ACTUAL EVAPOTRANSPIRATION	3.33 10.61	3.19 8.15	3.52 6.71	4.84 4.89	91.79 0.47	18.30 40.30
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.075 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.080 0.080	0.075 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	100.482 106.632	100.448 104.156	100.414 102.363	100.615 100.615	110.894 100.553	109.603 106.931
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.000 0.643	0.000 0.424	0.000 0.813	0.696 0.083	5.092 0.000	1.119 6.927
AVERAGE DAILY HEAD ON TOP OF LAYER 9	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007	0.007 0.007
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 9	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
AVERAGE DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 12	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000

ANNUAL TOTALS FOR YEAR 2016

MM

CU. METERS

PERCENT

Poor_Capped_HELP Results - Geonet Modified

PRECIPITATION	422.60	57959.605	100.00
RUNOFF	182.130	24979.125	43.10
POTENTIAL EVAPOTRANSPIRATION	3391.501	465144.344	
ACTUAL EVAPOTRANSPIRATION	196.098	26894.871	46.40
PERC./LEAKAGE THROUGH LAYER 3	0.948680	130.111	0.22
AVG. HEAD ON TOP OF LAYER 3	1036.4209		
DRAINAGE COLLECTED FROM LAYER 8	0.9484	130.077	0.22
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000235	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		
DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.024	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	43.423	5955.455	10.28
SOIL WATER AT START OF YEAR	5707.055	782722.500	
SOIL WATER AT END OF YEAR	5750.478	788677.938	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0003	0.045	0.00

MONTHLY TOTALS (MM) FOR YEAR 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
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PRECIPITATION	44.0 0.6	35.0 0.0	0.6 0.0	1.2 3.2	0.0 18.8	1.6 0.0
RUNOFF	8.37 0.00	5.71 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
POTENTIAL EVAPOTRANSPIRATION	311.22 226.04	292.94 264.30	296.25 287.82	250.50 355.03	225.27 344.10	193.24 382.72
ACTUAL EVAPOTRANSPIRATION	41.92 5.80	27.77 5.16	12.40 0.00	9.74 1.66	9.42 2.90	6.97 4.05
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.080 0.080	0.073 0.080	0.080 0.078	0.078 0.080	0.080 0.078	0.078 0.080
LATERAL DRAINAGE COLLECTED	0.080	0.073	0.080	0.078	0.080	0.078

		Poor_Capped_HELP	Results	-	Geonet	Modified	
FROM LAYER	8	0.080	0.080	0.078	0.080	0.078	0.080
LATERAL DRAINAGE RECIRCULATED		0.000	0.000	0.000	0.000	0.000	0.000
FROM LAYER	8 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH		0.000	0.000	0.000	0.000	0.000	0.000
LAYER	9	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE COLLECTED		0.000	0.000	0.000	0.000	0.000	0.000
FROM LAYER	11	0.000	0.000	0.000	0.000	0.000	0.000
LATERAL DRAINAGE RECIRCULATED		0.000	0.000	0.000	0.000	0.000	0.000
FROM LAYER	11 INTO L. 6	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH		0.000	0.000	0.000	0.000	0.000	0.000
LAYER	12	0.000	0.000	0.000	0.000	0.000	0.000
PERCOLATION/LEAKAGE THROUGH		0.000	0.000	0.000	0.000	0.000	0.000
LAYER	15	0.000	0.000	0.000	0.000	0.000	0.000

MONTHLY SUMMARIES FOR DAILY HEADS (CM)

AVERAGE DAILY HEAD ON	115.737	113.393	111.388	108.346	105.973	103.821
TOP OF LAYER 3	102.115	100.623	100.554	100.520	100.486	100.452
STD. DEVIATION OF DAILY	1.427	1.697	1.075	1.024	1.003	0.167
HEAD ON TOP OF LAYER 3	0.679	0.093	0.000	0.029	0.030	0.029
AVERAGE DAILY HEAD ON	0.007	0.007	0.007	0.007	0.007	0.007
TOP OF LAYER 9	0.007	0.007	0.007	0.007	0.007	0.007
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 9	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 12	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 2017

	MM	CU. METERS	PERCENT
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PRECIPITATION	105.00	14400.747	100.00
RUNOFF	14.072	1930.034	13.40
POTENTIAL EVAPOTRANSPIRATION	3429.427	470345.844	
ACTUAL EVAPOTRANSPIRATION	127.797	17527.400	121.71
PERC./LEAKAGE THROUGH LAYER 3	0.946088	129.756	0.90
AVG. HEAD ON TOP OF LAYER 3	1052.8398		
DRAINAGE COLLECTED FROM LAYER 8	0.9458	129.721	0.90
RECIRC. FROM LAYER 8 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 9	0.000234	0.032	0.00
AVG. HEAD ON TOP OF LAYER 9	0.0675		

Poor_Capped_HELP Results - Geonet Modified

DRAINAGE COLLECTED FROM LAYER 11	0.0002	0.023	0.00
RECIRC. FROM LAYER 11 INTO L. 6	0.000000	0.000	0.00
PERC./LEAKAGE THROUGH LAYER 12	0.000063	0.009	0.00
AVG. HEAD ON TOP OF LAYER 12	0.0000		
PERC./LEAKAGE THROUGH LAYER 15	0.000063	0.009	0.00
CHANGE IN WATER STORAGE	-37.816	-5186.398	-36.01
SOIL WATER AT START OF YEAR	5750.478	788677.938	
SOIL WATER AT END OF YEAR	5712.662	783491.562	
INTERCEPTION WATER AT START OF YEAR	0.000	0.000	
INTERCEPTION WATER AT END OF YEAR	0.000	0.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0003	-0.043	0.00

FINAL WATER STORAGE AT END OF YEAR 2017

LAYER	(CM)	(VOL/VOL)
1	49.9207	0.4160
2	0.5100	0.8500
3	0.0000	0.0000
4	0.4500	0.7499
5	6.9600	0.2320
6	438.0000	0.2920
7	0.0160	0.0535
8	0.9625	0.0321
9	0.0000	0.0000
10	0.4482	0.7470
11	0.0060	0.0100
12	0.0000	0.0000
13	0.4482	0.7470
14	14.2000	0.2840
15	58.0000	0.2320
TOTAL WATER IN LAYERS	569.922	
SNOW WATER	0.000	
INTERCEPTION WATER	0.000	
TOTAL FINAL WATER	569.922	

Poor_Capped_HELP Results - Geonet Modified

PEAK DAILY VALUES FOR YEARS 2007 THROUGH 2017

	(MM)	(CU. METERS)
PRECIPITATION	238.40	32696.557
RUNOFF	203.057	27849.2598
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.002592	0.35550
AVERAGE HEAD ON TOP OF LAYER 3	1200.707	
DRAINAGE COLLECTED FROM LAYER 8	0.00259	0.35540
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000001	0.00009
AVERAGE HEAD ON TOP OF LAYER 9	0.068	
MAXIMUM HEAD ON TOP OF LAYER 9	0.700	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 METERS	
DRAINAGE COLLECTED FROM LAYER 11	0.00000	0.00006
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 12	0.000	
MAXIMUM HEAD ON TOP OF LAYER 12	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 11 (DISTANCE FROM DRAIN)	0.0 METERS	
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.000000	0.00002
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.4630
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.1160

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

AVERAGE MONTHLY VALUES (MM) FOR YEARS 2007 THROUGH 2017

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	49.55 7.13	65.64 1.95	43.55 1.18	14.93 1.96	27.35 5.04	36.42 23.13
STD. DEVIATIONS	80.40	89.20	69.16	15.88	53.92	42.52

Poor_Capped_HELP Results - Geonet Modified

14.04 2.47 3.22 4.44 8.26 57.00

RUNOFF

TOTALS	20.073 0.055	27.822 0.000	20.920 0.000	1.410 0.000	7.922 0.115	13.581 9.351
STD. DEVIATIONS	62.076 0.167	46.029 0.000	38.418 0.000	4.230 0.000	23.912 0.382	26.886 30.789

POTENTIAL EVAPOTRANSPIRATION

TOTALS	336.567 214.599	294.789 253.434	297.861 287.047	251.911 348.445	217.929 347.715	188.011 369.800
STD. DEVIATIONS	18.055 5.639	12.875 10.687	11.732 8.015	14.823 8.872	11.107 11.030	6.249 10.759

ACTUAL EVAPOTRANSPIRATION

TOTALS	17.230 15.687	28.770 7.316	17.737 4.822	11.961 4.373	18.500 3.792	17.588 7.492
STD. DEVIATIONS	28.336 15.083	35.270 3.112	19.776 2.915	15.064 2.230	27.267 4.132	15.084 12.717

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS	0.0705 0.0754	0.0642 0.0756	0.0715 0.0735	0.0725 0.0760	0.0749 0.0735	0.0728 0.0760
STD. DEVIATIONS	0.0221 0.0164	0.0200 0.0157	0.0204 0.0141	0.0175 0.0145	0.0181 0.0141	0.0165 0.0146

LATERAL DRAINAGE COLLECTED FROM LAYER 8

TOTALS	0.0690 0.0749	0.0626 0.0753	0.0687 0.0732	0.0685 0.0759	0.0724 0.0735	0.0712 0.0759
STD. DEVIATIONS	0.0259 0.0174	0.0244 0.0164	0.0269 0.0149	0.0238 0.0146	0.0240 0.0141	0.0204 0.0145

LATERAL DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 11

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

LATERAL DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6

TOTALS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000
STD. DEVIATIONS	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000	0.0000 0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 12

Poor_Capped_HELP Results - Geonet Modified

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 15						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (CM)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	84.1856	88.4546	89.4268	91.9374	94.3152	93.9462
	93.1586	91.9875	91.0267	90.0676	89.6784	90.4403
STD. DEVIATIONS	38.4643	39.4199	38.9113	33.1467	33.3633	32.7655
	31.6939	30.3591	29.4352	28.9665	28.6893	28.7635

DAILY AVERAGE HEAD ON TOP OF LAYER 9

AVERAGES	0.0058	0.0058	0.0058	0.0060	0.0061	0.0062
	0.0063	0.0063	0.0064	0.0064	0.0064	0.0064
STD. DEVIATIONS	0.0022	0.0023	0.0023	0.0021	0.0020	0.0018
	0.0015	0.0014	0.0013	0.0012	0.0012	0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 12

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 2007 THROUGH 2017

	MM		CU. METERS	PERCENT
	-----	-----	-----	-----
PRECIPITATION	277.80	(187.475)	38100.3	100.00
RUNOFF	101.250	(97.2898)	13886.48	36.447
POTENTIAL EVAPOTRANSPIRATION	3408.108	(52.4596)	467422.03	
ACTUAL EVAPOTRANSPIRATION	155.268	(105.4245)	21294.98	55.892
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.87641	(0.19411)	120.199	0.31548
AVERAGE HEAD ON TOP OF LAYER 3	907.188	(321.590)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.86110	(0.23025)	118.100	0.30997
DRAINAGE RECIRCULATED FROM LAYER 8 INTO L. 6	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH	0.00022	(0.00004)	0.030	0.00008

Poor_Capped_HELP Results - Geonet Modified

LAYER 9

AVERAGE HEAD ON TOP OF LAYER 9	0.061 (0.016)		
LATERAL DRAINAGE COLLECTED FROM LAYER 11	0.00016 (0.00004)	0.021	0.00006
DRAINAGE RECIRCULATED FROM LAYER 11 INTO L. 6	0.00000 (0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00006 (0.00000)	0.009	0.00002
AVERAGE HEAD ON TOP OF LAYER 12	0.000 (0.000)		
PERCOLATION/LEAKAGE THROUGH LAYER 15	0.00006 (0.00000)	0.009	0.00002
CHANGE IN WATER STORAGE	20.421 (2.0555)	2800.69	7.351

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Appendix C: Model Parameterisation

Calculation Settings

Number of iterations: 1001

Results calculated using sampled PDFs

Full Calculation

Clay Liner:

Retarded values used for simulation

Biodegradation

Unsaturated Pathway:

Retarded values used for simulation

Biodegradation

Saturated Vertical Pathway:

No Vertical Pathway

Aquifer Pathway:

Retarded values used for simulation

Biodegradation

Timeslices at: 30, 100, 300, 1000

Decline in Contaminant Concentration in Leachate

Mercury

c (kg/l): 0.1643

Non-Volatile

m (kg/l): 0.0767

Nickel

c (kg/l): -0.1479

Non-Volatile

m (kg/l): 0.0987

Nitrite

c (kg/l): 0

Non-Volatile

m (kg/l): 0

Potassium

c (kg/l): 0

Non-Volatile

m (kg/l): 0

Toluene

Half life (years): 10

Volatile

Zinc

c (kg/l): 0.0561

Non-Volatile

m (kg/l): 0.0403

Contaminant Half-lives (years)

Unsaturated Pathway:

Nickel	SINGLE(1e+009)
Nitrite	SINGLE(1e+009)
Potassium	SINGLE(1e+009)
Toluene	SINGLE(1e+009)
Zinc	SINGLE(1e+009)

Aquifer Pathway:

Nickel	SINGLE(1e+009)
Nitrite	SINGLE(1e+009)
Potassium	SINGLE(1e+009)
Toluene	SINGLE(1e+009)
Zinc	SINGLE(1e+009)

Background Concentrations of Contaminants

Justification for Contaminant Properties
Unjustified value

All units in milligrams per litre

Ammoniacal_N	LOGTRIANGULAR(0.02,0.048,0.18)
Arsenic	LOGTRIANGULAR(0.002,0.0025,0.005)
Chloride	LOGTRIANGULAR(479,796,1060)
Copper	LOGTRIANGULAR(0.001,0.017,0.048)
Lead	TRIANGULAR(0.001,0.0015,0.002)
Nickel	LOGTRIANGULAR(0.001,0.0045,0.01)
Nitrite	LOGTRIANGULAR(0.01,0.12,0.48)
Potassium	LOGTRIANGULAR(35,57,81)
Zinc	LOGTRIANGULAR(0.015,0.048,0.08)

Phase: PRWMF HRA 2**Infiltration Information**

Cap design infiltration (mm/year):	NORMAL(31.5,10.5)
Infiltration to waste (mm/year):	NORMAL(314.4,104.8)
Infiltration to grassland (mm/year):	NORMAL(104.8,34.9)
End of filling (years from start of waste deposit):	30
Start of cap degradation (years from end of waste deposit):	250
End of cap degradation (years from end of waste deposit):	1000

Justification for Specified Infiltration

Annual Rainfall-Mean from BoM Onslow airport 1940-2018. SD 1/3 mean rainfall. Infiltration through cap assumed at least 1×10^{-9} m/s converted to mm/year. Infiltration to grassland is 1/3 annual rainfall as evaporation far greater than rainfall (effective rainfall).

Duration of management control (years from the start of waste disposal): 60

Cell dimensions

Cell width (m):	90
Cell length (m):	110
Cell top area (ha):	1.1814
Cell base area (ha):	0.99
Number of cells:	8
Total base area (ha):	7.92
Total top area (ha):	9.4512
Head of Leachate when surface water breakout occurs (m)	UNIFORM(3,10)
Waste porosity (fraction)	UNIFORM(0.1,0.4)
Final waste thickness (m):	LOGTRIANGULAR(7,15,22)
Field capacity (fraction):	TRIANGULAR(0.2,0.25,0.35)
Waste dry density (kg/l)	TRIANGULAR(0.9,1,1.3)

Justification for Landfill Geometry

Landfill design separated into 8 cells, base size from engineering design (best fit). Waste characteristics from literature review as no site specific data

Source concentrations of contaminants*All units in milligrams per litre*

Declining source term

Ammoniacal_N	LOGTRIANGULAR(4.37,723,3640)
Arsenic	LOGTRIANGULAR(0.000673,0.00484,1.31)
Benzene	LOGTRIANGULAR(0.0005,0.00582,0.0116) <i>Substance to be treated as List 1</i>
Cadmium	TRIANGULAR(0.0019,0.0101,0.105) <i>Substance to be treated as List 1</i>
Chloride	LOGTRIANGULAR(36.6,2270,7760)
Chromium	LOGTRIANGULAR(0.00855,0.0647,1.75)
Copper	LOGTRIANGULAR(0.00489,0.0243,1.13)
Lead	LOGTRIANGULAR(0.00957,0.13,1.02)
Mercury	LOGTRIANGULAR(4e-005,9e-005,0.00195) <i>Substance to be treated as List 1</i>
Nickel	LOGTRIANGULAR(0.00883,0.12,2.21)
Nitrite	LOGTRIANGULAR(0.01,0.27,6.01)
Potassium	LOGTRIANGULAR(7.55,929,3120)
Toluene	SINGLE(0.021) <i>Substance to be treated as List 1</i>
Zinc	LOGTRIANGULAR(0.00225,0.165,208) <i>Data are spot measurements of Leachate Quality</i>

Justification for Species Concentration in Leachate

Leachate default data from LandSim. As class IV no data exists for WA landfill. Organics taken from 'LFDGN01' and 'Attenuation of organic contaminants in leachate by mineral landfill liners' and 'Implications of Time/Space Variable Leachate Head on Liner Leakage'

Drainage Information

Fixed Head.

Head on EBS is given as (m): UNIFORM(0.3,1)

Justification for Specified Head

BEMP Default Values and Engineering information

Barrier Information

There is a double composite barrier

Justification for Engineered Barrier Type

Engineering Design

Liner installed under CQA

Upper Layer:

Design thickness of liner (m): SINGLE(0.06)

Density of clay (kg/l): UNIFORM(1.6,2)

Pathway moisture content (fraction): UNIFORM(0.07,0.095)

Pathway longitudinal dispersivity (m): SINGLE(0.006)

Lower Layer:

Design thickness of liner (m): SINGLE(0.06)

Onset of FML degradation (years since filling commenced) 150

Time for area of defects to double (years) 100

Justification for Dbl Composite: Clay or BES Substrate Properties

Engineering design and Site data (OMC)

Upper Layer:

Hydraulic conductivity of mineral liner (m/s): LOGTRIANGULAR(1.9e-011,2.5e-011,5e-010)

Membrane defects (number per hectare):

Pin holes: Minimum 0, Maximum 25

Holes: Minimum 0, Maximum 5

Tears: Minimum 0, Most Likely 0.1, Maximum 2

The most likely value for the PDFs representing the density of pinholes and holes will move from the minimum value selected above to the maximum value selected above over the time period before FML degradation commences

Lower Layer:

Membrane defects (number per hectare):

Pin holes: Minimum 0, Maximum 25

Holes: Minimum 0, Maximum 5

Tears: Minimum 0, Most Likely 0.1, Maximum 2

Justification for Dbl Composite: Flexible Membrane Liner

Default values for pin holes etc, engineering design for drainage and clay performance. QCA and leak test on liner

Retardation parameters for clay liner

Uncertainty in Kd (l/kg):

Cadmium	LOGUNIFORM(1.6,1500)
Chloride	SINGLE(0)
Chromium	UNIFORM(0,4400)
Copper	LOGUNIFORM(40,27500)
Lead	LOGUNIFORM(27,270000)
Mercury	LOGUNIFORM(450,3835)
Nickel	LOGUNIFORM(20,800)
Nitrite	SINGLE(0)
Potassium	SINGLE(0)
Toluene	SINGLE(1.092)
Zinc	LOGUNIFORM(1,600)

Justification for Liner Kd Values by Species

Default LandSim Values and Recommended Values from PRG2002

Barrier System Internal Drainage Layer

Type of drainage: Blanket

Calculate flow from given parameters:-

Corner

Sump radius (m): 1.13

Blanket thickness(m): 0.006

Blanket drain conductivity (m/s): SINGLE(0.026)

Justification for Secondary Drainage Blanket

Unjustified value

Residual Soil pathway parameters*Modelled as unsaturated pathway*

Pathway length (m):	UNIFORM(2.9,5.3)
Flow Model:	porous medium
Pathway moisture content (fraction):	UNIFORM(0.01451,0.07917)
Pathway Density (kg/l):	UNIFORM(1.6,2)

Justification for Unsat Zone Geometry
Engineering Design

Pathway hydraulic conductivity values (m/s):	LOGUNIFORM(3.382e-009,1.6339e-007)

Justification for Unsat Zone Hydraulics Properties
Site specific permeability tests

Pathway longitudinal dispersivity (m):	UNIFORM(0.29,0.53)

Justification for Unsat Zone Dispersion Properties
10% of pathway length

*Retardation parameters for Residual Soil pathway**Modelled as unsaturated pathway*

Uncertainty in Kd (l/kg):	
Ammoniacal_N	UNIFORM(0.5,2)
Arsenic	LOGUNIFORM(25,250)
Benzene	SINGLE(0.35)
Cadmium	LOGUNIFORM(1.6,1500)
Chloride	SINGLE(0)
Chromium	UNIFORM(0,4400)
Copper	LOGUNIFORM(40,27500)
Lead	LOGUNIFORM(27,270000)
Mercury	LOGUNIFORM(450,3835)
Nickel	LOGUNIFORM(20,800)
Nitrite	SINGLE(0)
Potassium	SINGLE(0)
Toluene	SINGLE(1.092)
Zinc	LOGUNIFORM(1,600)

Justification for Kd Values by Species
LandSim Supplied Data

Aquifer Pathway Dimensions for Phase

Pathway length (m):	UNIFORM(1550,2350)
Pathway width (m):	SINGLE(268)

pathway parameters

No Vertical Pathway

Windalia Radiolarite Formation pathway parameters

Modelled as aquifer pathway.

Mixing zone (m):

Calculated. Aquifer Thickness:

UNIFORM(20,140)

Justification for Aquifer Geometry

Information presented in Phase 1, aquifer thickness from literature. Porosity default values for LandSim. Aquifer width = width of landfill perpendicular to groundwater flow.

Pathway regional gradient (-):

UNIFORM(0.00154,0.00158)

Pathway hydraulic conductivity values (m/s):

LOGUNIFORM(1.50463e-008,4.16667e-006)

Pathway porosity (fraction):

UNIFORM(0.05,0.3)

Justification for Aquifer Hydraulics Properties

Supplied in Phase 1 Hydrogeological Investigation

Pathway longitudinal dispersivity (m):

UNIFORM(155,235)

Pathway transverse dispersivity (m):

UNIFORM(15.5,23.5)

Justification for Aquifer Dispersion Details

10% pathway length and 1% pathway length for Transverse

Retardation parameters for Windalia Radiolarite Formation pathway

Modelled as aquifer pathway.

Uncertainty in Kd (l/kg):

Ammoniacal_N	UNIFORM(0.25,1)
Arsenic	UNIFORM(12.5,125)
Benzene	SINGLE(0.175)
Cadmium	LOGUNIFORM(0.8,750)
Chloride	SINGLE(0)
Chromium	UNIFORM(0,2200)
Copper	LOGUNIFORM(20,13750)
Lead	LOGUNIFORM(13.5,135000)
Mercury	LOGUNIFORM(225,1917.5)
Nickel	LOGUNIFORM(10,400)
Nitrite	SINGLE(0)
Potassium	SINGLE(0)
Toluene	SINGLE(0.547)
Zinc	LOGUNIFORM(1.5,300)

Justification for Aquifer Kd Values by Species

1/2 default and published Kd values.Sandstone density from lit review.

Pathway Density (kg/l):	UNIFORM(2.2,2.6)



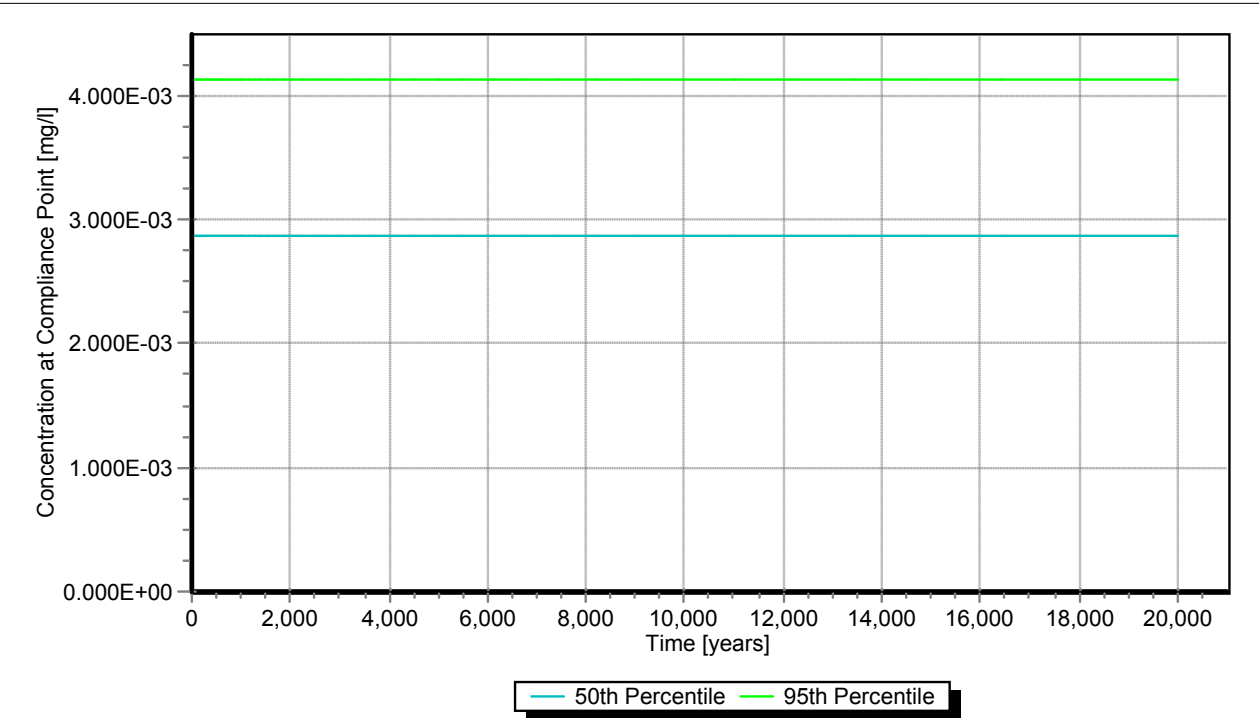
Appendix D: LandSim Results

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Arsenic Concentration at Compliance Point [mg/l]

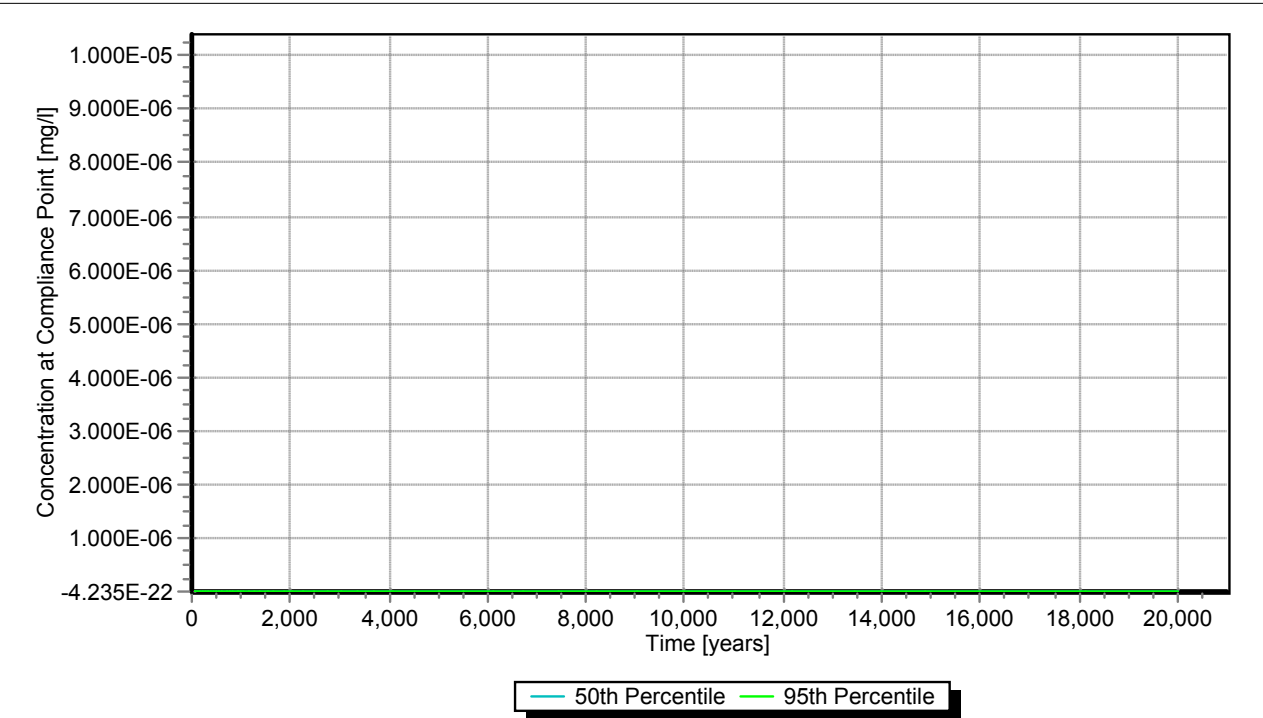


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Cadmium Concentration at Compliance Point [mg/l]

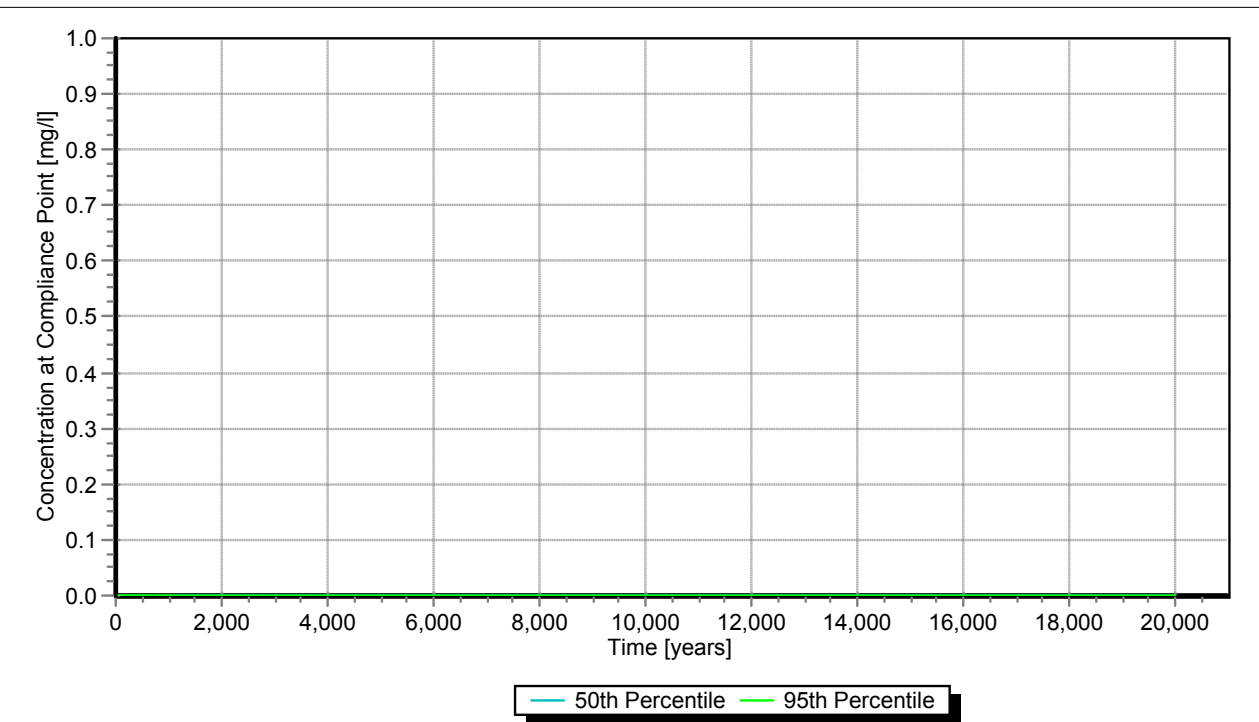


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Chromium Concentration at Compliance Point [mg/l]

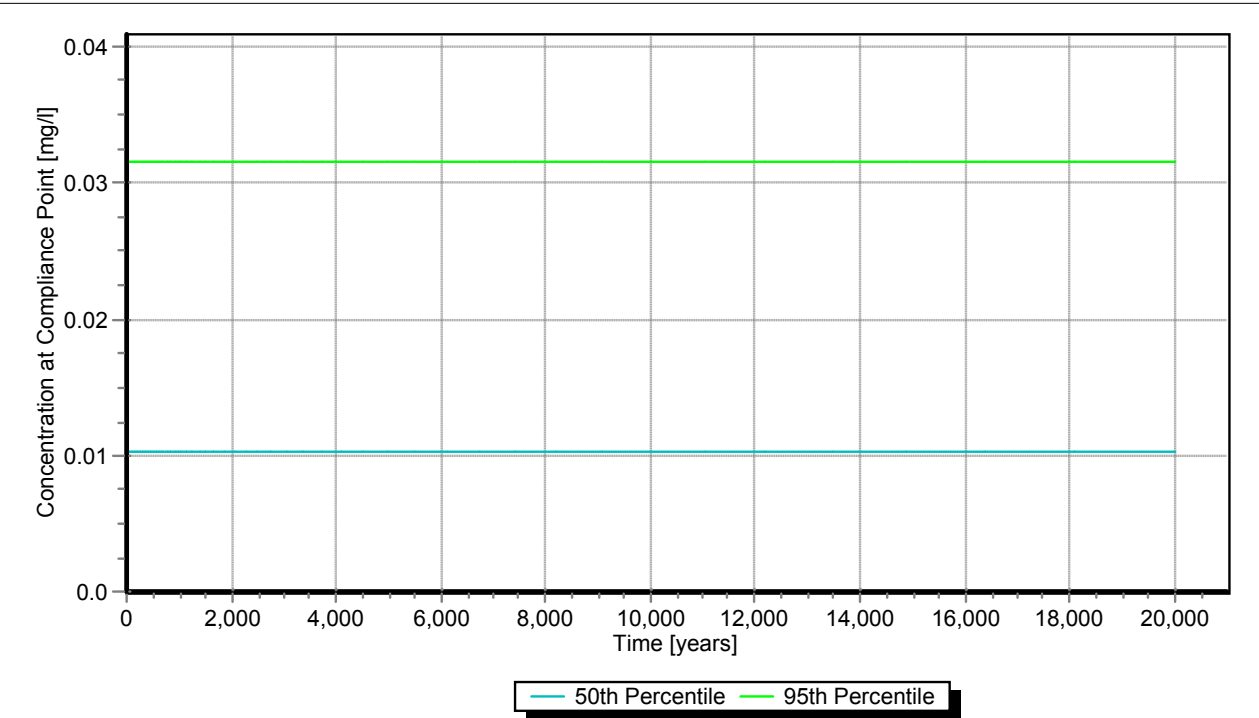


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Copper Concentration at Compliance Point [mg/l]

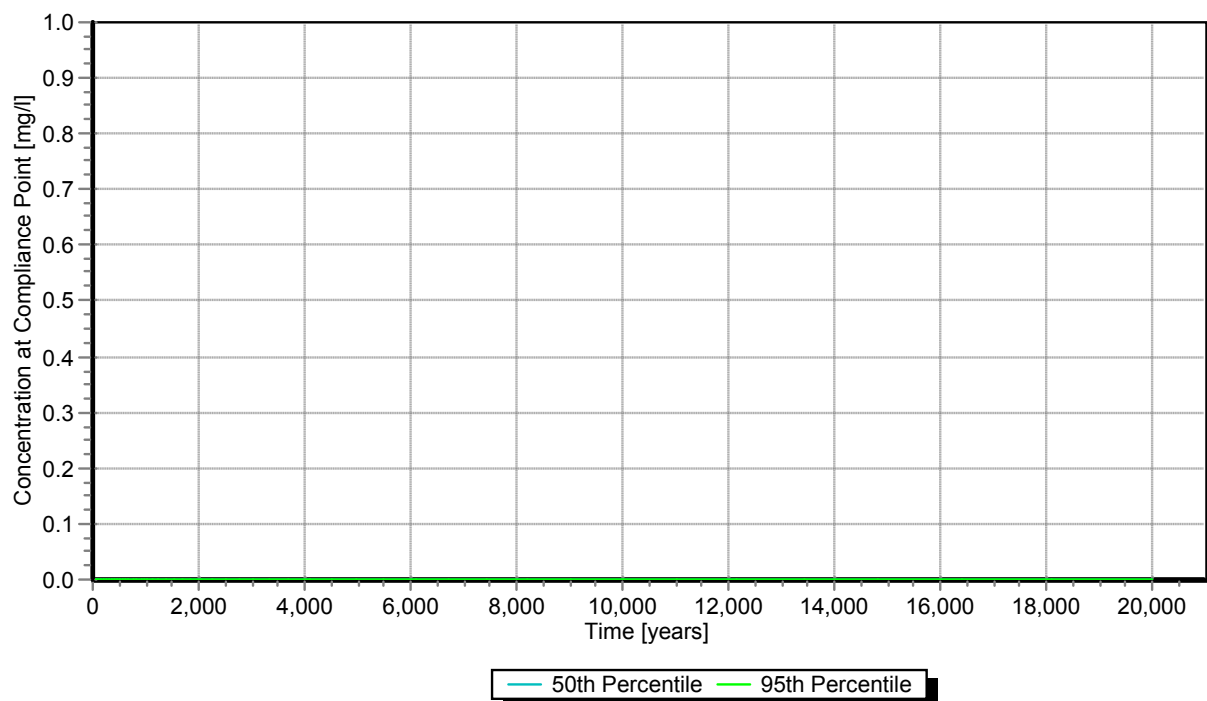


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Mercury Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

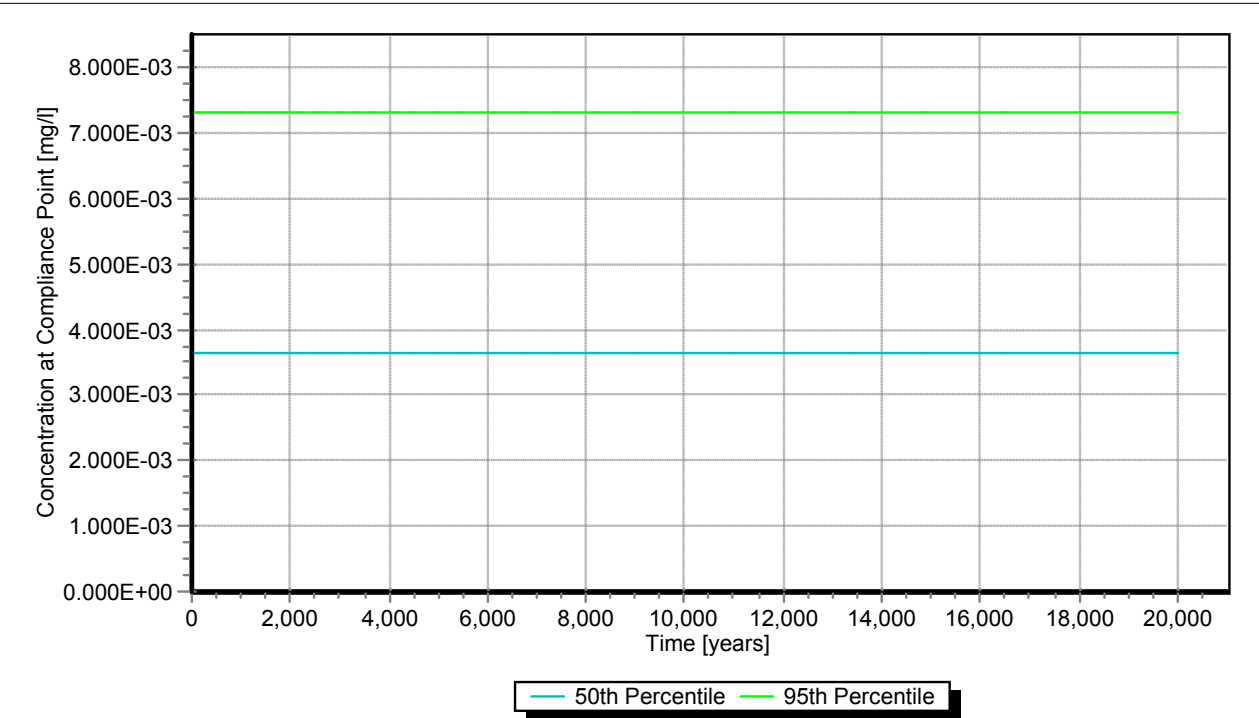
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LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Nickel Concentration at Compliance Point [mg/l]

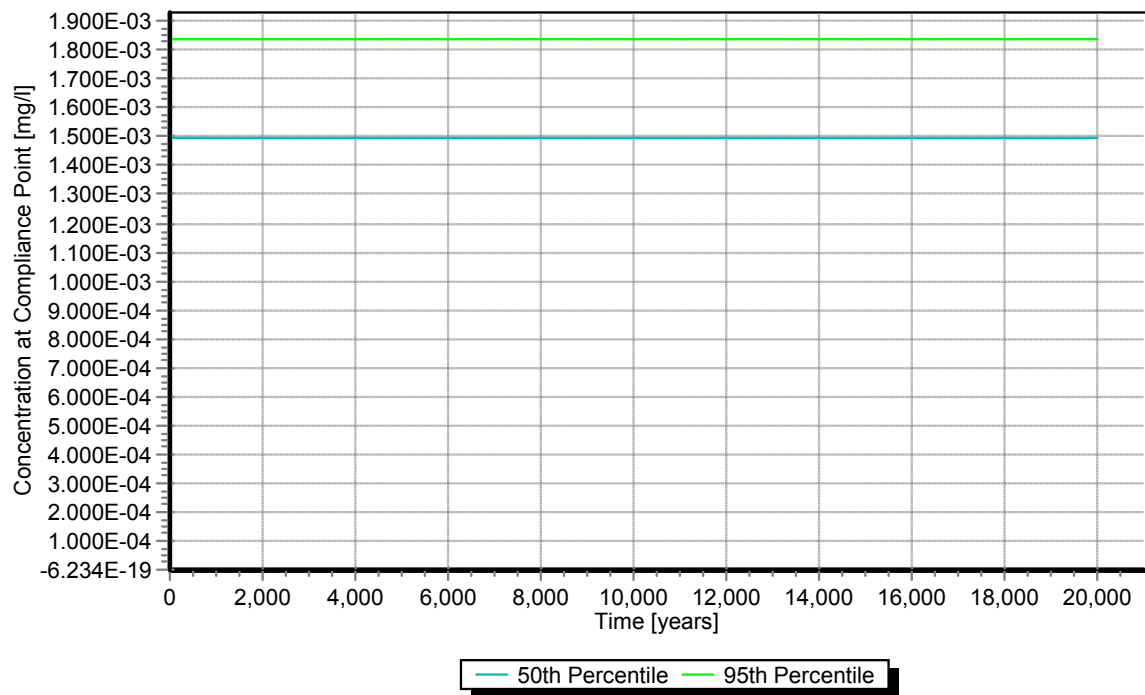


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Lead Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

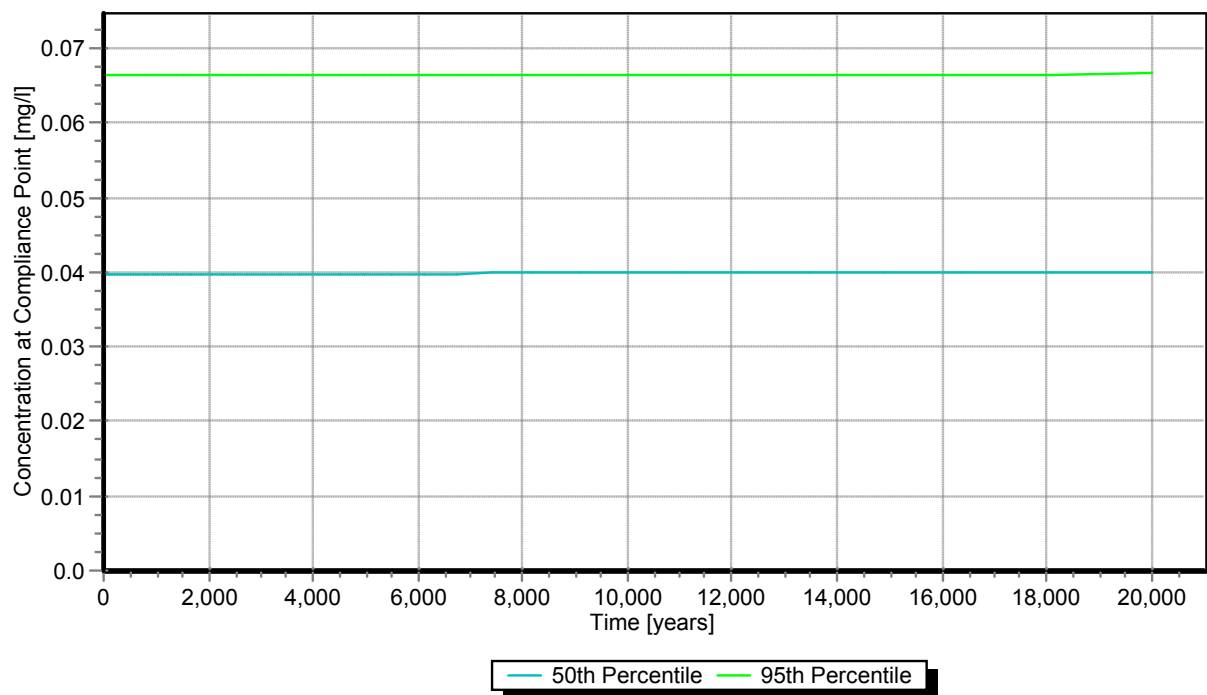
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Zinc Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

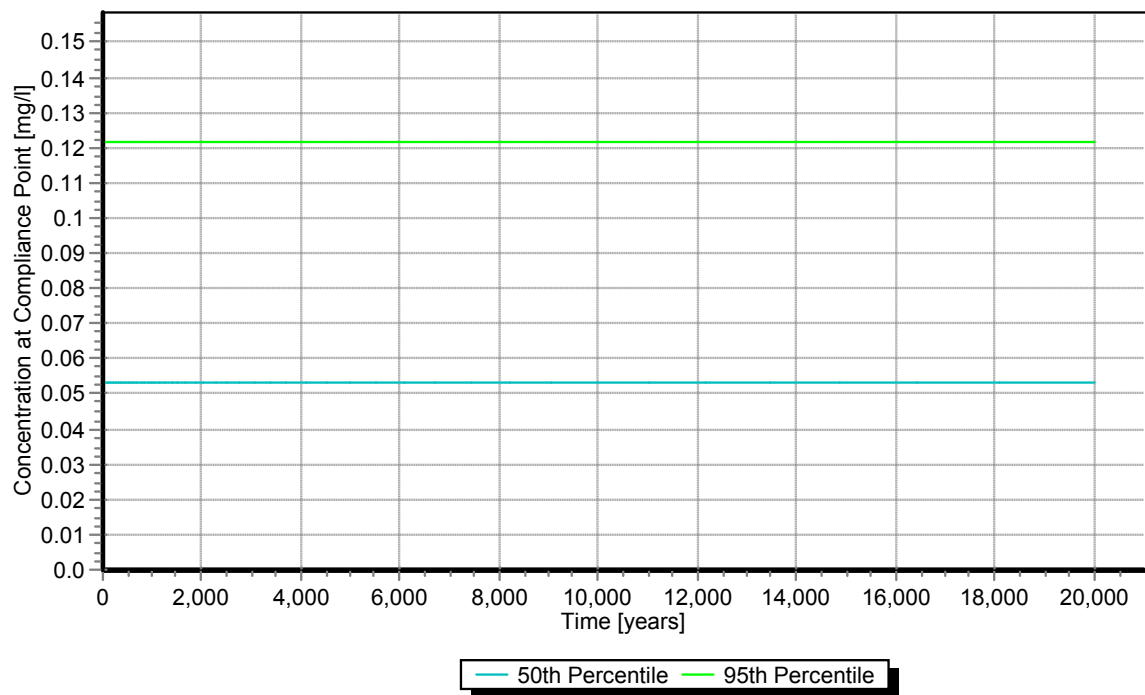
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Ammoniacal_N Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

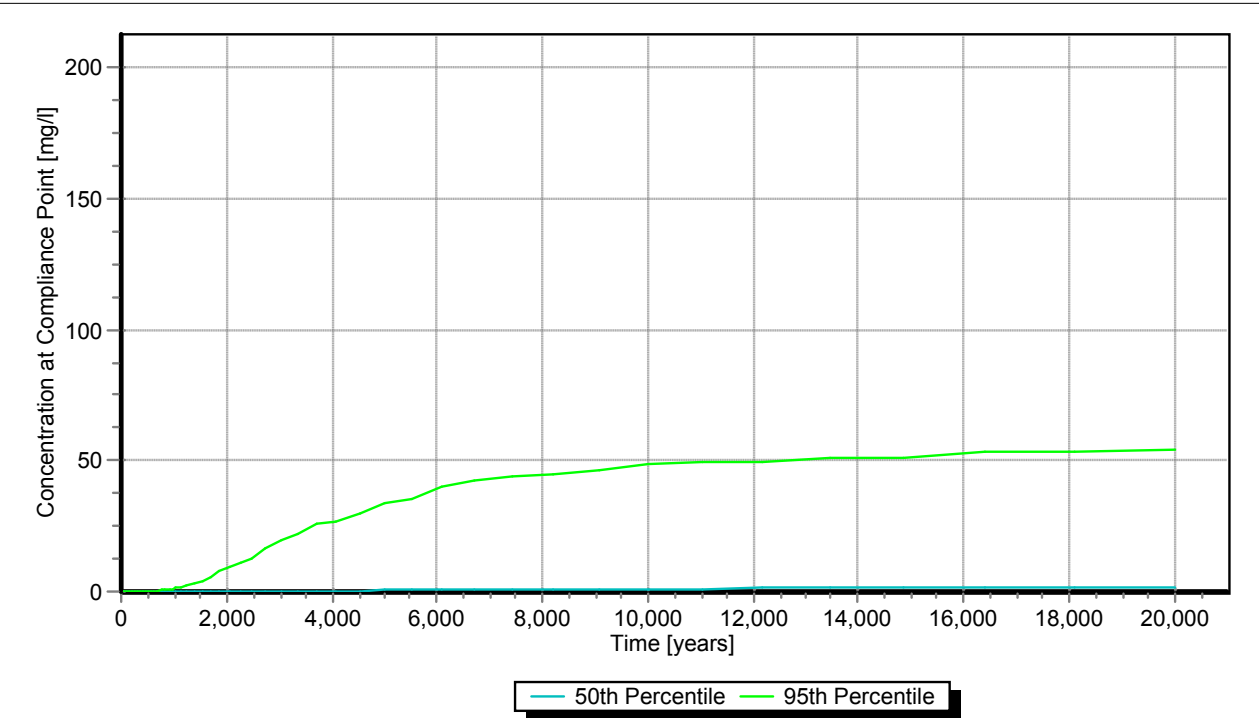
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Nitrite Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

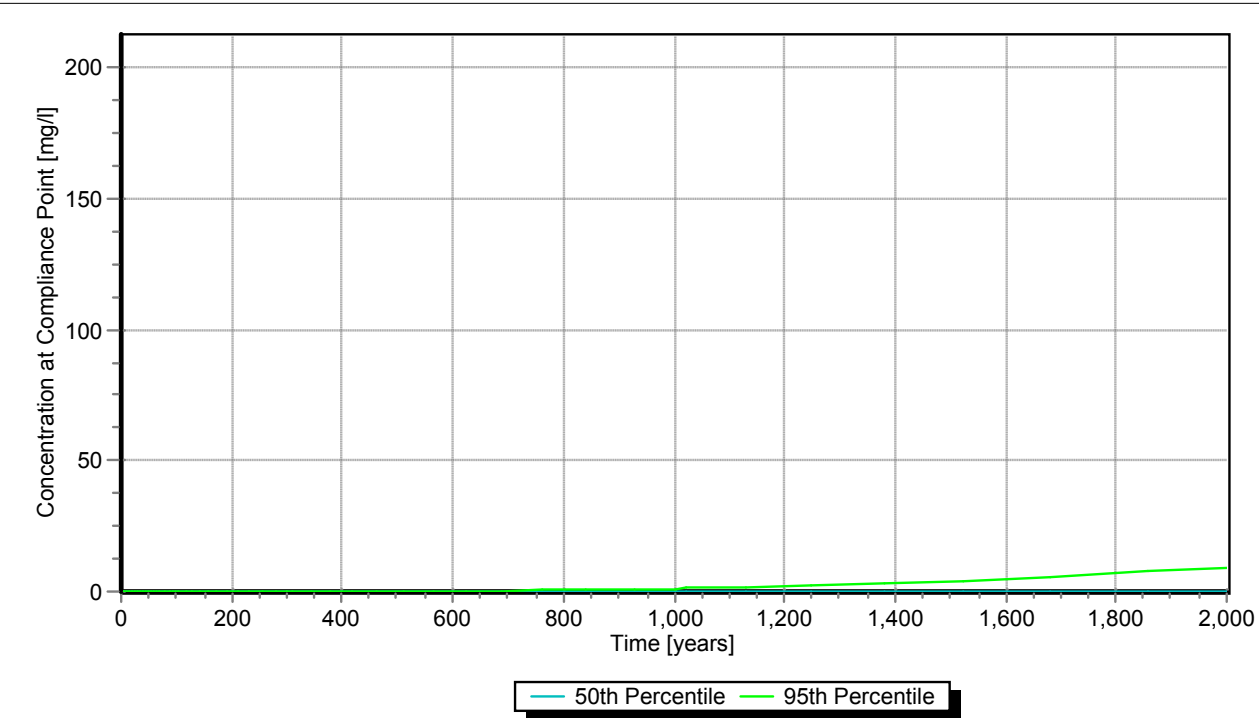
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: Nitrite Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

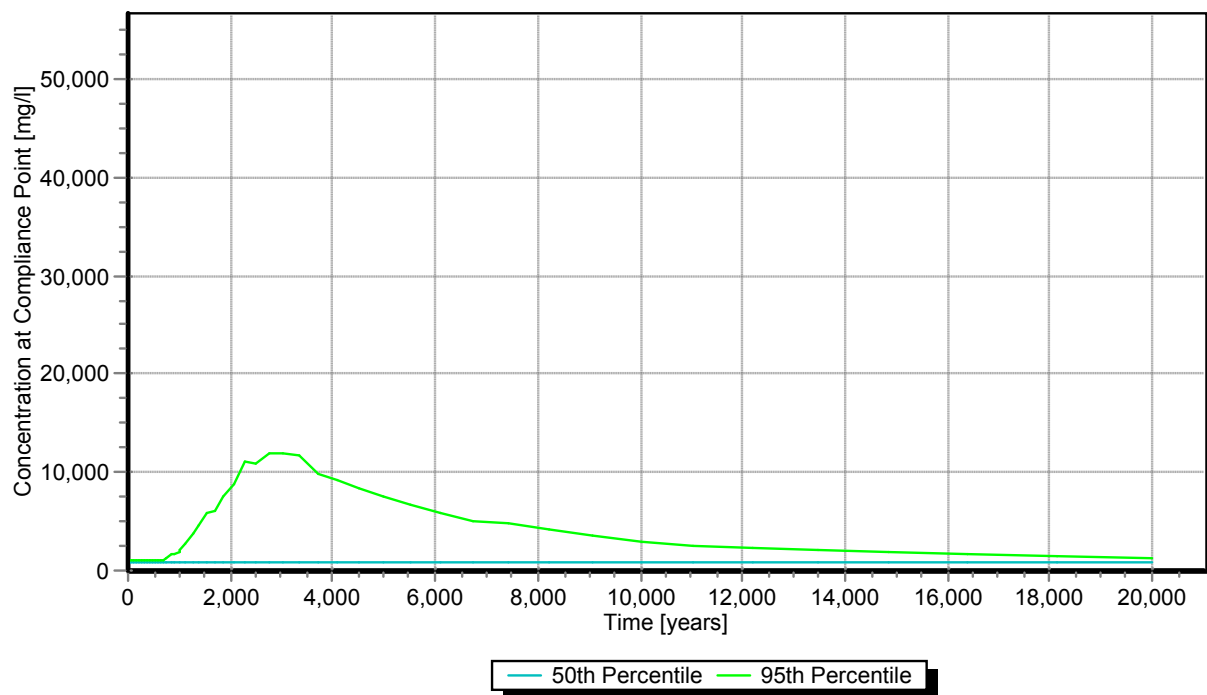
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Chloride Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

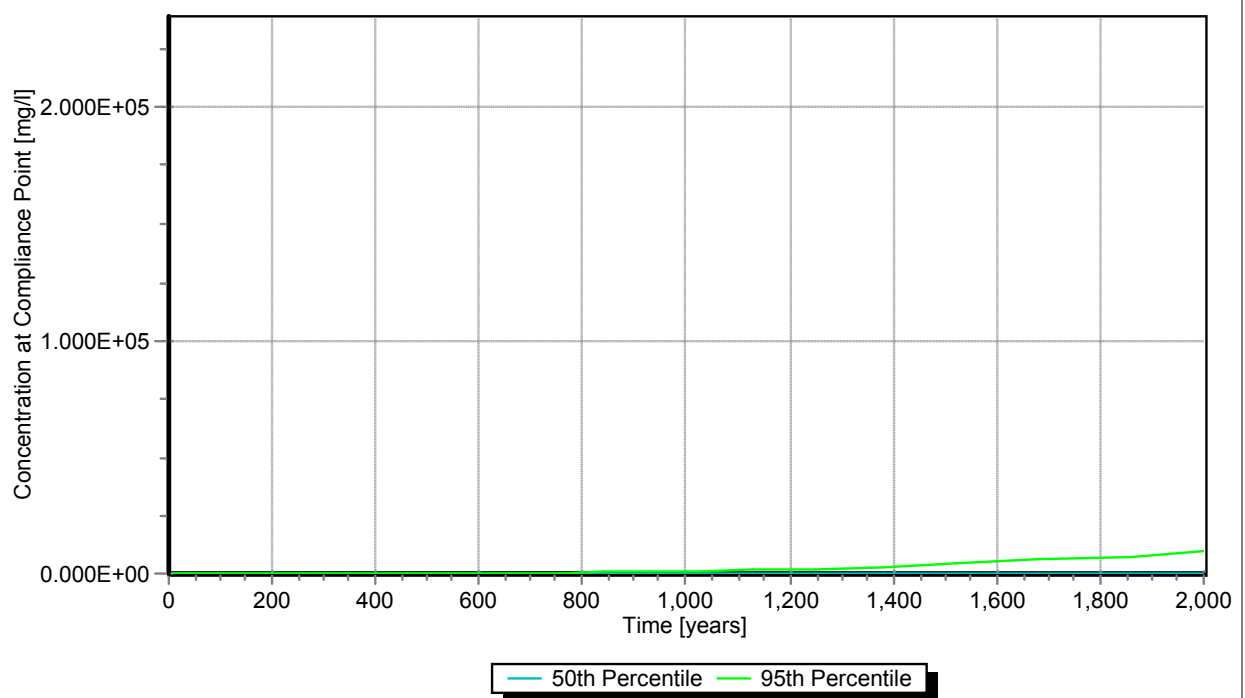
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Potassium Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

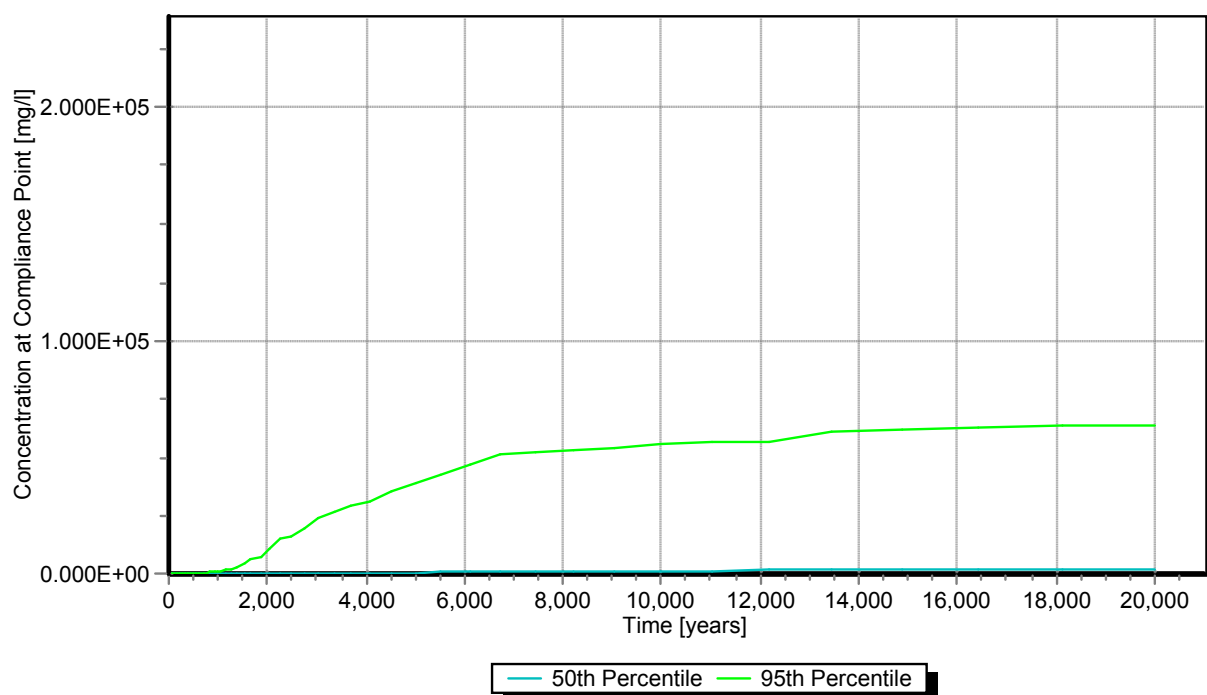
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Potassium Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

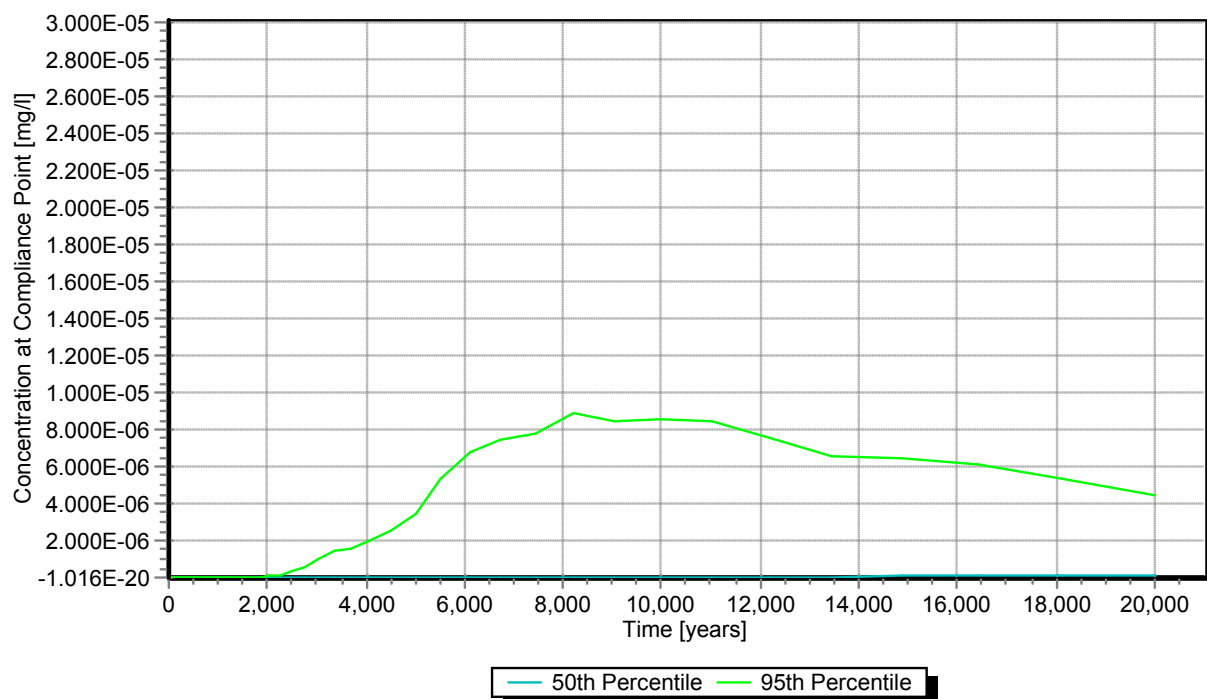
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Benzene Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

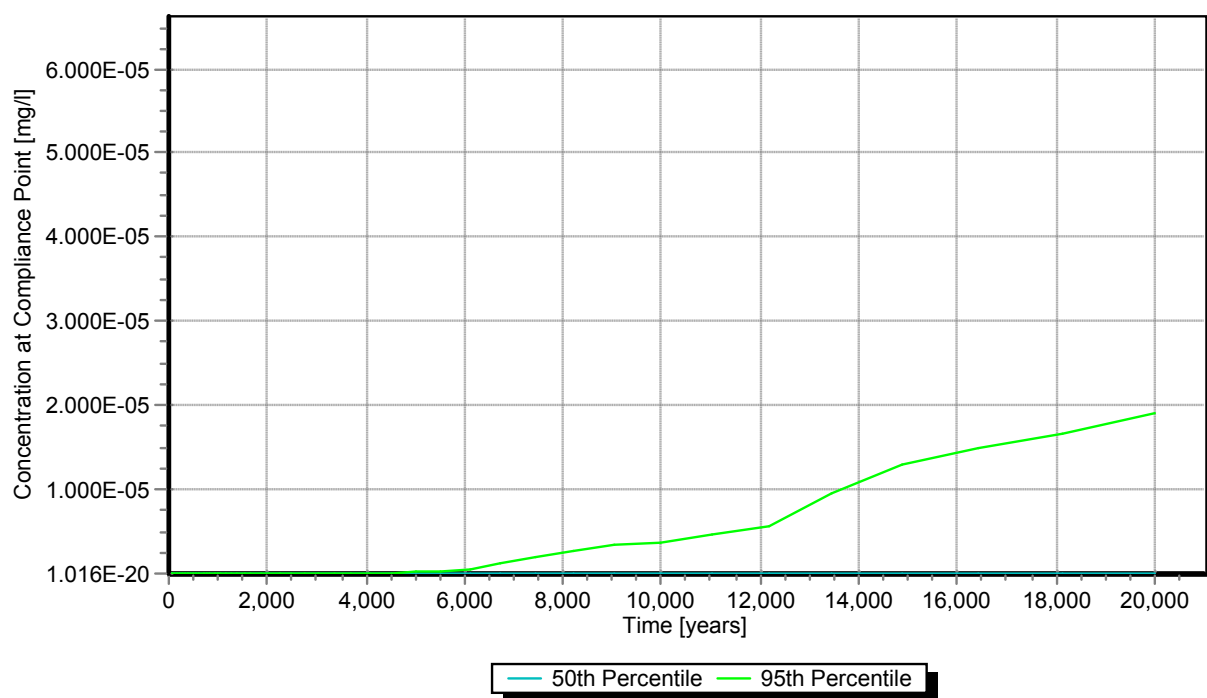
17/10/2018 07:55:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Toluene Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model.sim

17/10/2018 07:55:44

Calculation Settings

Number of iterations: 1001

Results calculated using sampled PDFs

Full Calculation

Clay Liner:

Retarded values used for simulation

Biodegradation

Unsaturated Pathway:

Retarded values used for simulation

Biodegradation

Saturated Vertical Pathway:

No Vertical Pathway

Aquifer Pathway:

Retarded values used for simulation

Biodegradation

Timeslices at: 30, 100, 300, 1000

Decline in Contaminant Concentration in Leachate

Mercury

c (kg/l): 0.1643

Non-Volatile

m (kg/l): 0.0767

Nickel

c (kg/l): -0.1479

Non-Volatile

m (kg/l): 0.0987

Nitrite

c (kg/l): 0

Non-Volatile

m (kg/l): 0

Potassium

c (kg/l): 0

Non-Volatile

m (kg/l): 0

Toluene

Half life (years): 10

Volatile

Zinc

c (kg/l): 0.0561

Non-Volatile

m (kg/l): 0.0403

Contaminant Half-lives (years)

Unsaturated Pathway:

Nickel	SINGLE(1e+009)
Nitrite	SINGLE(1e+009)
Potassium	SINGLE(1e+009)
Toluene	SINGLE(1e+009)
Zinc	SINGLE(1e+009)

Aquifer Pathway:

Nickel	SINGLE(1e+009)
Nitrite	SINGLE(1e+009)
Potassium	SINGLE(1e+009)
Toluene	SINGLE(1e+009)
Zinc	SINGLE(1e+009)

Background Concentrations of Contaminants

Justification for Contaminant Properties
Unjustified value

All units in milligrams per litre

Ammoniacal_N	LOGTRIANGULAR(0.02,0.048,0.18)
Arsenic	LOGTRIANGULAR(0.002,0.0025,0.005)
Chloride	LOGTRIANGULAR(479,796,1060)
Copper	LOGTRIANGULAR(0.001,0.017,0.048)
Lead	TRIANGULAR(0.001,0.0015,0.002)
Nickel	LOGTRIANGULAR(0.001,0.0045,0.01)
Nitrite	LOGTRIANGULAR(0.01,0.12,0.48)
Potassium	LOGTRIANGULAR(35,57,81)
Zinc	LOGTRIANGULAR(0.015,0.048,0.08)

Phase: PRWMF HRA 2**Infiltration Information**

Cap design infiltration (mm/year):	NORMAL(31.5,10.5)
Infiltration to waste (mm/year):	NORMAL(314.4,104.8)
Infiltration to grassland (mm/year):	NORMAL(104.8,34.9)
End of filling (years from start of waste deposit):	30
Start of cap degradation (years from end of waste deposit):	250
End of cap degradation (years from end of waste deposit):	1000

Justification for Specified Infiltration

Annual Rainfall-Mean from BoM Onslow airport 1940-2018. SD 1/3 mean rainfall. Infiltration through cap assumed at least 1x10⁻⁹ m/s converted to mm/year. Infiltration to grassland is 1/3 annual rainfall as evaporation far greater than rainfall (effective rainfall).

Duration of management control (years from the start of waste disposal): 60

Cell dimensions

Cell width (m):	90
Cell length (m):	110
Cell top area (ha):	1.1814
Cell base area (ha):	0.99
Number of cells:	8
Total base area (ha):	7.92
Total top area (ha):	9.4512
Head of Leachate when surface water breakout occurs (m)	UNIFORM(3,10)
Waste porosity (fraction)	UNIFORM(0.1,0.4)
Final waste thickness (m):	LOGTRIANGULAR(7,15,22)
Field capacity (fraction):	TRIANGULAR(0.2,0.25,0.35)
Waste dry density (kg/l)	TRIANGULAR(0.9,1,1.3)

Justification for Landfill Geometry

Landfill design separated into 8 cells, base size from engineering design (best fit). Waste characteristics from literature review as no site specific data

Source concentrations of contaminants*All units in milligrams per litre*

Declining source term

Ammoniacal_N	LOGTRIANGULAR(4.37,723,3640)
Arsenic	LOGTRIANGULAR(0.000673,0.00484,1.31)
Benzene	LOGTRIANGULAR(0.0005,0.00582,0.0116)
	<i>Substance to be treated as List 1</i>
Cadmium	TRIANGULAR(0.0019,0.0101,0.105)
	<i>Substance to be treated as List 1</i>
Chloride	LOGTRIANGULAR(36.6,2270,7760)
Chromium	LOGTRIANGULAR(0.00855,0.0647,1.75)
Copper	LOGTRIANGULAR(0.00489,0.0243,1.13)
Lead	LOGTRIANGULAR(0.00957,0.13,1.02)
Mercury	LOGTRIANGULAR(4e-005,9e-005,0.00195)
	<i>Substance to be treated as List 1</i>
Nickel	LOGTRIANGULAR(0.00883,0.12,2.21)
Nitrite	LOGTRIANGULAR(0.01,0.27,6.01)
Potassium	LOGTRIANGULAR(7.55,929,3120)
Toluene	SINGLE(0.021)
	<i>Substance to be treated as List 1</i>
Zinc	LOGTRIANGULAR(0.00225,0.165,208)
	<i>Data are spot measurements of Leachate Quality</i>

Justification for Species Concentration in Leachate

Leachate default data from LandSim. As class IV no data exists for WA landfill. Organics taken from 'LFDGN01' and 'Attenuation of organic contaminants in leachate by mineral landfill liners' and 'Implications of Time/Space Variable Leachate Head on Liner Leakage'

Drainage Information

Fixed Head.

Head on EBS is given as (m): UNIFORM(0.3,1)

Justification for Specified Head

BEMP Default Values and Engineering information

Barrier Information

There is a double composite barrier

Justification for Engineered Barrier Type

Engineering Design

Liner installed under CQA

Upper Layer:

Design thickness of liner (m): SINGLE(0.06)

Density of clay (kg/l): UNIFORM(1.6,2)

Pathway moisture content (fraction): UNIFORM(0.07,0.095)

Pathway longitudinal dispersivity (m): SINGLE(0.006)

Lower Layer:

Design thickness of liner (m): SINGLE(0.06)

Onset of FML degradation (years since filling commenced) 150

Time for area of defects to double (years) 100

Justification for Dbl Composite: Clay or BES Substrate Properties

Engineering design and Site data (OMC)

Upper Layer:

Hydraulic conductivity of mineral liner (m/s): LOGTRIANGULAR(1.9e-011,2.5e-011,5e-010)

Membrane defects (number per hectare):

Pin holes: Minimum 0, Maximum 25

Holes: Minimum 0, Maximum 5

Tears: Minimum 0, Most Likely 0.1, Maximum 2

The most likely value for the PDFs representing the density of pinholes and holes will move from the minimum value selected above to the maximum value selected above over the time period before FML degradation commences

Lower Layer:

Membrane defects (number per hectare):

Pin holes: Minimum 0, Maximum 25

Holes: Minimum 0, Maximum 5

Tears: Minimum 0, Most Likely 0.1, Maximum 2

Justification for Dbl Composite: Flexible Membrane Liner

Default values for pin holes etc, engineering design for drainage and clay performance. QCA and leak test on liner

Retardation parameters for clay liner

Uncertainty in Kd (l/kg):

Cadmium	LOGUNIFORM(1.6,1500)
Chloride	SINGLE(0)
Chromium	UNIFORM(0,4400)
Copper	LOGUNIFORM(40,27500)
Lead	LOGUNIFORM(27,270000)
Mercury	LOGUNIFORM(450,3835)
Nickel	LOGUNIFORM(20,800)
Nitrite	SINGLE(0)
Potassium	SINGLE(0)
Toluene	SINGLE(1.092)
Zinc	LOGUNIFORM(1,600)

Justification for Liner Kd Values by Species

Default LandSim Values and Recommended Values from PRG2002

Barrier System Internal Drainage Layer

Type of drainage: Blanket

Calculate flow from given parameters:-

Corner

Sump radius (m): 1.13

Blanket thickness(m): 0.006

Blanket drain conductivity (m/s): SINGLE(0.026)

Justification for Secondary Drainage Blanket

Unjustified value

Residual Soil pathway parameters*Modelled as unsaturated pathway*

Pathway length (m):	UNIFORM(2.9,5.3)
Flow Model:	porous medium
Pathway moisture content (fraction):	UNIFORM(0.01451,0.07917)
Pathway Density (kg/l):	UNIFORM(1.6,2)

Justification for Unsat Zone Geometry
Engineering Design

Pathway hydraulic conductivity values (m/s):	LOGUNIFORM(3.382e-009,1.6339e-007)

Justification for Unsat Zone Hydraulics Properties
Site specific permeability tests

Pathway longitudinal dispersivity (m):	UNIFORM(0.29,0.53)

Justification for Unsat Zone Dispersion Properties
10% of pathway length

*Retardation parameters for Residual Soil pathway**Modelled as unsaturated pathway*

Uncertainty in Kd (l/kg):

Ammoniacal_N	UNIFORM(0.5,2)
Arsenic	LOGUNIFORM(25,250)
Benzene	SINGLE(0.35)
Cadmium	LOGUNIFORM(1.6,1500)
Chloride	SINGLE(0)
Chromium	UNIFORM(0,4400)
Copper	LOGUNIFORM(40,27500)
Lead	LOGUNIFORM(27,270000)
Mercury	LOGUNIFORM(450,3835)
Nickel	LOGUNIFORM(20,800)
Nitrite	SINGLE(0)
Potassium	SINGLE(0)
Toluene	SINGLE(1.092)
Zinc	LOGUNIFORM(1,600)

Justification for Kd Values by Species
LandSim Supplied Data

Aquifer Pathway Dimensions for Phase

Pathway length (m):	UNIFORM(1550,2350)
Pathway width (m):	SINGLE(268)

pathway parameters

No Vertical Pathway

Windalia Radiolarite Formation pathway parameters

Modelled as aquifer pathway.

Mixing zone (m):

Calculated. Aquifer Thickness:

UNIFORM(20,140)

Justification for Aquifer Geometry

Information presented in Phase 1, aquifer thickness from literature. Porosity default values for LandSim. Aquifer width = width of landfill perpendicular to groundwater flow.

Pathway regional gradient (-):

UNIFORM(0.00154,0.00158)

Pathway hydraulic conductivity values (m/s):

LOGUNIFORM(1.50463e-008,4.16667e-006)

Pathway porosity (fraction):

UNIFORM(0.05,0.3)

Justification for Aquifer Hydraulics Properties

Supplied in Phase 1 Hydrogeological Investigation

Pathway longitudinal dispersivity (m):

UNIFORM(155,235)

Pathway transverse dispersivity (m):

UNIFORM(15.5,23.5)

Justification for Aquifer Dispersion Details

10% pathway length and 1% pathway length for Transverse

Retardation parameters for Windalia Radiolarite Formation pathway

Modelled as aquifer pathway.

Uncertainty in Kd (l/kg):

Ammoniacal_N	UNIFORM(0.25,1)
Arsenic	UNIFORM(12.5,125)
Benzene	SINGLE(0.175)
Cadmium	LOGUNIFORM(0.8,750)
Chloride	SINGLE(0)
Chromium	UNIFORM(0,2200)
Copper	LOGUNIFORM(20,13750)
Lead	LOGUNIFORM(13.5,135000)
Mercury	LOGUNIFORM(225,1917.5)
Nickel	LOGUNIFORM(10,400)
Nitrite	SINGLE(0)
Potassium	SINGLE(0)
Toluene	SINGLE(0.547)
Zinc	LOGUNIFORM(1.5,300)

Justification for Aquifer Kd Values by Species

1/2 default and published Kd values.Sandstone density from lit review.

Pathway Density (kg/l):	UNIFORM(2.2,2.6)

Concentration of Ammoniacal_N in groundwater [mg/l]

At 30 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

At 100 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

At 300 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

At 1000 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

Concentration of Ammoniacal_N in groundwater [mg/l]

At infinity

01% of values less than 0.0229722		
05% of values less than 0.0272401		
10% of values less than 0.0315712		
50% of values less than 0.0538845		
90% of values less than 0.106487		
95% of values less than 0.126147		
99% of values less than 0.155197		
Minimum 0.0204382	Maximum 0.177619	
Mean 0.0624085	Std. Dev. 0.0303217	Variance 0.000919404

Concentration of Arsenic in groundwater [mg/l]

At 30 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

At 100 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

At 300 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

At 1000 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

Concentration of Arsenic in groundwater [mg/l]

At infinity

01% of values less than 0.00208348		
05% of values less than 0.00221475		
10% of values less than 0.00231325		
50% of values less than 0.00284798		
90% of values less than 0.00384733		
95% of values less than 0.00414896		
99% of values less than 0.00459717		
Minimum 0.002	Maximum 0.00496897	
Mean 0.00298141	Std. Dev. 0.000601414	Variance 3.61698E-007

Concentration of Benzene in groundwater [mg/l]

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 3.48517E-016

95% of values less than 5.00239E-013

99% of values less than 1.20021E-009

Minimum 0

Maximum 2.03541E-008

Mean 9.25423E-011

Std. Dev. 1.0682E-009

Variance 1.14106E-018

Concentration of Benzene in groundwater [mg/l]

At infinity

01% of values less than 0		
05% of values less than 5.57541E-011		
10% of values less than 3.44161E-010		
50% of values less than 6.48372E-008		
90% of values less than 1.42329E-006		
95% of values less than 3.41964E-006		
99% of values less than 8.31658E-006		
Minimum 0	Maximum 2.73202E-005	
Mean 6.44249E-007	Std. Dev. 1.92246E-006	Variance 3.69586E-012

Concentration of Cadmium in groundwater [mg/l]

At 30 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Concentration of Cadmium in groundwater [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 7.67512E-015		
99% of values less than 8.47677E-006		
Minimum 0	Maximum 0.0191795	
Mean 2.7252E-005	Std. Dev. 0.000629729	Variance 3.96559E-007

Concentration of Chloride in groundwater [mg/l]

At 30 years

01% of values less than 514.67
 05% of values less than 556.645
 10% of values less than 586.043
 50% of values less than 755.921
 90% of values less than 915.052
 95% of values less than 955.834
 99% of values less than 1000.12
 Minimum 489.334
 Mean 752.686

Maximum 1034.41
 Std. Dev. 120.866

Variance 14608.5

At 100 years

01% of values less than 514.67
 05% of values less than 556.645
 10% of values less than 586.043
 50% of values less than 755.921
 90% of values less than 915.052
 95% of values less than 955.834
 99% of values less than 1000.12
 Minimum 489.334
 Mean 752.686

Maximum 1034.41
 Std. Dev. 120.866

Variance 14608.5

At 300 years

01% of values less than 514.67
 05% of values less than 556.645
 10% of values less than 586.043
 50% of values less than 756.4
 90% of values less than 915.594
 95% of values less than 956.188
 99% of values less than 1000.9
 Minimum 489.334
 Mean 753.232

Maximum 1119.83
 Std. Dev. 121.368

Variance 14730.1

At 1000 years

01% of values less than 524.507
 05% of values less than 565.223
 10% of values less than 602.974
 50% of values less than 788.697
 90% of values less than 1037.55
 95% of values less than 1814.52
 99% of values less than 14234.6
 Minimum 495.122
 Mean 1661.73

Maximum 197257
 Std. Dev. 9092.04

Variance 8.26651E+007

Concentration of Chloride in groundwater [mg/l]

At infinity

01% of values less than	525.98		
05% of values less than	567.01		
10% of values less than	609.367		
50% of values less than	793.012		
90% of values less than	1031.98		
95% of values less than	1312.23		
99% of values less than	2586.2		
Minimum	489.334	Maximum	7179.88
Mean	862.41	Std. Dev.	442.973
		Variance	196225

Concentration of Chromium in groundwater [mg/l]

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Concentration of Chromium in groundwater [mg/l]

At infinity

- 01% of values less than 0
- 05% of values less than 0
- 10% of values less than 0
- 50% of values less than 0
- 90% of values less than 0
- 95% of values less than 0
- 99% of values less than 0

Minimum 0	Maximum 0	
Mean 0	Std. Dev. 0	Variance 0

Concentration of Copper in groundwater [mg/l]

At 30 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

At 100 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

At 300 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

At 1000 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

Concentration of Copper in groundwater [mg/l]

At infinity

01% of values less than 0.00145815		
05% of values less than 0.00213093		
10% of values less than 0.00312604		
50% of values less than 0.0106208		
90% of values less than 0.0251063		
95% of values less than 0.030021		
99% of values less than 0.0399207		
Minimum 0.0010322	Maximum 0.0448732	
Mean 0.0126197	Std. Dev. 0.00888313	Variance 7.891E-005

Concentration of Lead in groundwater [mg/l]

At 30 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

At 100 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

At 300 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

At 1000 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

Concentration of Lead in groundwater [mg/l]

At infinity

01% of values less than 0.00105807		
05% of values less than 0.00115906		
10% of values less than 0.00122596		
50% of values less than 0.00148367		
90% of values less than 0.00175652		
95% of values less than 0.00181984		
99% of values less than 0.00191075		
Minimum 0.00101992	Maximum 0.00199323	
Mean 0.00148599	Std. Dev. 0.000201947	Variance 4.07827E-008

Concentration of Mercury in groundwater [mg/l]

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Concentration of Mercury in groundwater [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 0		
99% of values less than 0		
Minimum 0	Maximum 0	
Mean 0	Std. Dev. 0	Variance 0

Concentration of Nickel in groundwater [mg/l]

At 30 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

At 100 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

At 300 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

At 1000 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

Concentration of Nickel in groundwater [mg/l]

At infinity

01% of values less than 0.00114965		
05% of values less than 0.00148851		
10% of values less than 0.00179209		
50% of values less than 0.00380253		
90% of values less than 0.00670669		
95% of values less than 0.00733622		
99% of values less than 0.00870991		
Minimum 0.00107383	Maximum 0.00980376	
Mean 0.00401096	Std. Dev. 0.0018175	Variance 3.30329E-006

Concentration of Nitrite in groundwater [mg/l]

At 30 years

01% of values less than 0.0142484

05% of values less than 0.0195763

10% of values less than 0.0246077

50% of values less than 0.0842881

90% of values less than 0.243831

95% of values less than 0.294355

99% of values less than 0.368233

Minimum 0.0120171

Maximum 0.430283

Mean 0.110171

Std. Dev. 0.0859704

Variance 0.00739091

At 100 years

01% of values less than 0.0142484

05% of values less than 0.0195763

10% of values less than 0.0246077

50% of values less than 0.0842881

90% of values less than 0.243831

95% of values less than 0.294355

99% of values less than 0.368233

Minimum 0.0120171

Maximum 0.430283

Mean 0.110171

Std. Dev. 0.0859704

Variance 0.00739091

At 300 years

01% of values less than 0.0142484

05% of values less than 0.0195763

10% of values less than 0.0246077

50% of values less than 0.0843984

90% of values less than 0.243831

95% of values less than 0.294355

99% of values less than 0.368233

Minimum 0.0120171

Maximum 0.430283

Mean 0.110379

Std. Dev. 0.0859801

Variance 0.00739258

At 1000 years

01% of values less than 0.0154676

05% of values less than 0.0211839

10% of values less than 0.028455

50% of values less than 0.0972688

90% of values less than 0.346283

95% of values less than 0.702928

99% of values less than 12.4864

Minimum 0.0120171

Maximum 98.1859

Mean 0.561674

Std. Dev. 4.00164

Variance 16.0131

Concentration of Nitrite in groundwater [mg/l]

At infinity

01% of values less than 0.0728737		
05% of values less than 0.140604		
10% of values less than 0.202343		
50% of values less than 1.44155		
90% of values less than 25.5108		
95% of values less than 52.31		
99% of values less than 153.357		
Minimum 0.0411556	Maximum 1214.4	
Mean 12.1329	Std. Dev. 51.2616	Variance 2627.75

Concentration of Potassium in groundwater [mg/l]

At 30 years

01% of values less than 37.6094

05% of values less than 40.7675

10% of values less than 42.6771

50% of values less than 54.5882

90% of values less than 68.2587

95% of values less than 71.1038

99% of values less than 76.6726

Minimum 35.585

Maximum 80.0644

Mean 55.0534

Std. Dev. 9.35546

Variance 87.5246

At 100 years

01% of values less than 37.6094

05% of values less than 40.7675

10% of values less than 42.6771

50% of values less than 54.5882

90% of values less than 68.2587

95% of values less than 71.1038

99% of values less than 76.6726

Minimum 35.585

Maximum 80.0644

Mean 55.0534

Std. Dev. 9.35546

Variance 87.5246

At 300 years

01% of values less than 37.6094

05% of values less than 40.7741

10% of values less than 42.7774

50% of values less than 54.7253

90% of values less than 68.4379

95% of values less than 71.3812

99% of values less than 77.0138

Minimum 35.641

Maximum 824.372

Mean 55.9891

Std. Dev. 26.1526

Variance 683.961

At 1000 years

01% of values less than 38.0868

05% of values less than 41.7365

10% of values less than 43.8804

50% of values less than 58.506

90% of values less than 213.831

95% of values less than 853.518

99% of values less than 10513.7

Minimum 35.7178

Maximum 517327

Mean 1102.8

Std. Dev. 17175.1

Variance 2.94984E+008

Concentration of Potassium in groundwater [mg/l]

At infinity

01% of values less than 68.8351		
05% of values less than 109.36		
10% of values less than 158.448		
50% of values less than 1619.05		
90% of values less than 28756.6		
95% of values less than 56613.1		
99% of values less than 271061		
Minimum 53.06	Maximum 782906	
Mean 14500.2	Std. Dev. 56434.3	Variance 3.18483E+009

Concentration of Toluene in groundwater [mg/l]

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 5.57534E-016

Mean 5.56977E-019

Std. Dev. 1.76219E-017

Variance 3.10533E-034

Concentration of Toluene in groundwater [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 5.85257E-008		
90% of values less than 4.84861E-006		
95% of values less than 1.52721E-005		
99% of values less than 8.86068E-005		
Minimum 0	Maximum 0.000178841	
Mean 3.6799E-006	Std. Dev. 1.65576E-005	Variance 2.74154E-010

Concentration of Zinc in groundwater [mg/l]

At 30 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

At 100 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

At 300 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

At 1000 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

Concentration of Zinc in groundwater [mg/l]

At infinity

01% of values less than 0.0172252		
05% of values less than 0.0206871		
10% of values less than 0.0236689		
50% of values less than 0.0403978		
90% of values less than 0.0607395		
95% of values less than 0.06507		
99% of values less than 0.0733456		
Minimum 0.0155261	Maximum 0.347625	
Mean 0.0416232	Std. Dev. 0.0179361	Variance 0.000321704

Approx. time to Peak Conc. Ammoniacal_N at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Arsenic at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 20000

Mean 78.036

Std. Dev. 1233.7

Variance 1.52202E+006

Approx. time to Peak Conc. Benzene at Offsite Compliance Point [years]

01% of values less than 2499

05% of values less than 4527

10% of values less than 6094

50% of values less than 16406

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 14582.9

Std. Dev. 5870.47

Variance 3.44624E+007

Approx. time to Peak Conc. Cadmium at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 1310.06

Std. Dev. 4903.18

Variance 2.40412E+007

Approx. time to Peak Conc. Chloride at Offsite Compliance Point [years]

01% of values less than 1131

05% of values less than 1523

10% of values less than 1856

50% of values less than 4999

90% of values less than 14859

95% of values less than 18114

99% of values less than 20000

Minimum 689

Maximum 20000

Mean 6673.38

Std. Dev. 5106.22

Variance 2.60735E+007

Approx. time to Peak Conc. Chromium at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Copper at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Lead at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Mercury at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Nickel at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 20000

Mean 96.1319

Std. Dev. 1359.04

Variance 1.84698E+006

Approx. time to Peak Conc. Nitrite at Offsite Compliance Point [years]

01% of values less than 11039

05% of values less than 12189

10% of values less than 16406

50% of values less than 20000

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 2050

Maximum 20000

Mean 19042.6

Std. Dev. 2368.34

Variance 5.60902E+006

Approx. time to Peak Conc. Potassium at Offsite Compliance Point [years]

01% of values less than 11039

05% of values less than 12189

10% of values less than 14859

50% of values less than 20000

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 2050

Maximum 20000

Mean 19050.6

Std. Dev. 2315.06

Variance 5.35948E+006

Approx. time to Peak Conc. Toluene at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 20000

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 16945.5

Std. Dev. 6289.31

Variance 3.95554E+007

Approx. time to Peak Conc. Zinc at Offsite Compliance Point [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 3163.29

Std. Dev. 7069.65

Variance 4.99799E+007

Phase: PRWMF HRA 2*Source Concentration of Ammoniacal_N [mg/l]*

At 30 years

01% of values less than 5.30006

05% of values less than 9.10277

10% of values less than 17.1786

50% of values less than 172.663

90% of values less than 900.594

95% of values less than 1220.88

99% of values less than 1853.88

Minimum 2.83628

Maximum 2757.03

Mean 340.216

Std. Dev. 422.166

Variance 178224

At 100 years

01% of values less than 4.47103

05% of values less than 8.18988

10% of values less than 15.8377

50% of values less than 156.026

90% of values less than 815.654

95% of values less than 1123.9

99% of values less than 1690.04

Minimum 2.71016

Maximum 2569.36

Mean 309.114

Std. Dev. 383.995

Variance 147452

At 300 years

01% of values less than 3.27607

05% of values less than 6.12153

10% of values less than 11.4407

50% of values less than 113.525

90% of values less than 618.613

95% of values less than 832.164

99% of values less than 1294.89

Minimum 1.80356

Maximum 2087.21

Mean 230.863

Std. Dev. 292.397

Variance 85495.8

At 1000 years

01% of values less than 0.0711604

05% of values less than 0.323099

10% of values less than 0.702009

50% of values less than 10.2154

90% of values less than 79.1527

95% of values less than 138.022

99% of values less than 265.709

Minimum 0.0243486

Maximum 547.593

Mean 30.6916

Std. Dev. 55.1928

Variance 3046.25

Phase: PRWMF HRA 2

Source Concentration of Ammoniacal_N [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 5.23557E-020		
95% of values less than 1.37939E-016		
99% of values less than 6.53701E-009		
Minimum 0	Maximum 29.6196	
Mean 0.0297014	Std. Dev. 0.936186	Variance 0.876444

Phase: PRWMF HRA 2*Source Concentration of Arsenic [mg/l]*

At 30 years

01% of values less than 0.00110186

05% of values less than 0.00166612

10% of values less than 0.002218

50% of values less than 0.012431

90% of values less than 0.122366

95% of values less than 0.219775

99% of values less than 0.496398

Minimum 0.000743901

Maximum 0.879121

Mean 0.0484497

Std. Dev. 0.100295

Variance 0.010059

At 100 years

01% of values less than 0.00110186

05% of values less than 0.00166612

10% of values less than 0.002218

50% of values less than 0.0124078

90% of values less than 0.119957

95% of values less than 0.217838

99% of values less than 0.489689

Minimum 0.000743901

Maximum 0.853253

Mean 0.0474891

Std. Dev. 0.0976541

Variance 0.00953632

At 300 years

01% of values less than 0.00110186

05% of values less than 0.00166612

10% of values less than 0.002218

50% of values less than 0.0123332

90% of values less than 0.11374

95% of values less than 0.200857

99% of values less than 0.466465

Minimum 0.000743901

Maximum 0.781061

Mean 0.0446026

Std. Dev. 0.0897567

Variance 0.00805627

At 1000 years

01% of values less than 0.00110186

05% of values less than 0.00166612

10% of values less than 0.002218

50% of values less than 0.0111025

90% of values less than 0.0674768

95% of values less than 0.11321

99% of values less than 0.273081

Minimum 0.000743901

Maximum 0.418688

Mean 0.0283028

Std. Dev. 0.0484799

Variance 0.0023503

Phase: PRWMF HRA 2

Source Concentration of Arsenic [mg/l]

At infinity

01% of values less than 9.73904E-018		
05% of values less than 7.14073E-013		
10% of values less than 2.01329E-010		
50% of values less than 0.000972959		
90% of values less than 0.00594768		
95% of values less than 0.00692921		
99% of values less than 0.00788245		
Minimum 0	Maximum 0.00887019	
Mean 0.00196014	Std. Dev. 0.00235331	Variance 5.53808E-006

Phase: PRWMF HRA 2*Source Concentration of Benzene [mg/l]*

At 30 years

01% of values less than 8.71092E-005

05% of values less than 0.000126842

10% of values less than 0.000159743

50% of values less than 0.00044367

90% of values less than 0.000885678

95% of values less than 0.00097721

99% of values less than 0.00119608

Minimum 7.40451E-005

Maximum 0.00138478

Mean 0.000497832

Std. Dev. 0.000280016

Variance 7.8409E-008

At 100 years

01% of values less than 6.80541E-007

05% of values less than 9.90951E-007

10% of values less than 1.24799E-006

50% of values less than 3.46617E-006

90% of values less than 6.91936E-006

95% of values less than 7.63445E-006

99% of values less than 9.34439E-006

Minimum 5.78477E-007

Maximum 1.08186E-005

Mean 3.88931E-006

Std. Dev. 2.18763E-006

Variance 4.78571E-012

At 300 years

01% of values less than 6.49014E-013

05% of values less than 9.45044E-013

10% of values less than 1.19018E-012

50% of values less than 3.3056E-012

90% of values less than 6.59882E-012

95% of values less than 7.28078E-012

99% of values less than 8.9115E-012

Minimum 5.51679E-013

Maximum 1.03174E-011

Mean 3.70913E-012

Std. Dev. 2.08628E-012

Variance 4.35257E-024

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Source Concentration of Benzene [mg/l]

At infinity

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0
Minimum 0
Mean 0

Maximum 0
Std. Dev. 0
Variance 0

Phase: PRWMF HRA 2*Source Concentration of Cadmium [mg/l]*

At 30 years

01% of values less than 0.00354865

05% of values less than 0.0064137

10% of values less than 0.0081954

50% of values less than 0.0251431

90% of values less than 0.0520208

95% of values less than 0.0603621

99% of values less than 0.0717573

Minimum 0.00171898

Maximum 0.0812597

Mean 0.0278021

Std. Dev. 0.0167351

Variance 0.000280064

At 100 years

01% of values less than 0.00334329

05% of values less than 0.00606132

10% of values less than 0.00775666

50% of values less than 0.0231512

90% of values less than 0.0480804

95% of values less than 0.0558077

99% of values less than 0.0664292

Minimum 0.00160942

Maximum 0.0759173

Mean 0.025782

Std. Dev. 0.015489

Variance 0.00023991

At 300 years

01% of values less than 0.00275695

05% of values less than 0.00475927

10% of values less than 0.00620979

50% of values less than 0.0181338

90% of values less than 0.0378691

95% of values less than 0.044567

99% of values less than 0.0566566

Minimum 0.00132732

Maximum 0.0637402

Mean 0.0204397

Std. Dev. 0.0124304

Variance 0.000154514

At 1000 years

01% of values less than 0.000217224

05% of values less than 0.000536526

10% of values less than 0.000753942

50% of values less than 0.00294297

90% of values less than 0.00822536

95% of values less than 0.0114933

99% of values less than 0.0186529

Minimum 8.62618E-005

Maximum 0.0289083

Mean 0.00401217

Std. Dev. 0.00381944

Variance 1.45881E-005

Phase: PRWMF HRA 2

Source Concentration of Cadmium [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 2.89487E-018		
95% of values less than 1.19645E-015		
99% of values less than 4.63237E-010		
Minimum 0	Maximum 0.00960649	
Mean 9.85604E-006	Std. Dev. 0.00030368	Variance 9.22218E-008

Phase: PRWMF HRA 2*Source Concentration of Chloride [mg/l]*

At 30 years

01% of values less than 37.7172

05% of values less than 66.5399

10% of values less than 100.061

50% of values less than 670.739

90% of values less than 2209.91

95% of values less than 2717.36

99% of values less than 4097

Minimum 26.0177

Maximum 6134.57

Mean 945.251

Std. Dev. 909.273

Variance 826777

At 100 years

01% of values less than 34.285

05% of values less than 57.4883

10% of values less than 91.7819

50% of values less than 585.498

90% of values less than 1950.39

95% of values less than 2394.39

99% of values less than 3699.11

Minimum 21.6125

Maximum 5527.91

Mean 842.312

Std. Dev. 815.564

Variance 665145

At 300 years

01% of values less than 22.5521

05% of values less than 38.5473

10% of values less than 62.6218

50% of values less than 383.951

90% of values less than 1384.02

95% of values less than 1682.39

99% of values less than 2782.33

Minimum 12.6325

Maximum 3619.36

Mean 593.111

Std. Dev. 596.09

Variance 355323

At 1000 years

01% of values less than 0.166031

05% of values less than 0.931327

10% of values less than 2.27429

50% of values less than 21.3971

90% of values less than 146.6

95% of values less than 225.177

99% of values less than 499.288

Minimum 0.0388192

Maximum 819.686

Mean 55.2622

Std. Dev. 94.0201

Variance 8839.77

Phase: PRWMF HRA 2

Source Concentration of Chloride [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 2.79595E-023		
95% of values less than 3.26805E-019		
99% of values less than 1.55292E-010		
Minimum 0	Maximum 496.996	
Mean 0.496814	Std. Dev. 15.7085	Variance 246.758

Phase: PRWMF HRA 2*Source Concentration of Chromium [mg/l]*

At 30 years

01% of values less than 0.0104043

05% of values less than 0.0154026

10% of values less than 0.0197667

50% of values less than 0.0700696

90% of values less than 0.364944

95% of values less than 0.53385

99% of values less than 0.787881

Minimum 0.00841492

Maximum 1.06662

Mean 0.141465

Std. Dev. 0.169535

Variance 0.028742

At 100 years

01% of values less than 0.0102268

05% of values less than 0.014896

10% of values less than 0.0191298

50% of values less than 0.0670752

90% of values less than 0.350615

95% of values less than 0.496226

99% of values less than 0.724765

Minimum 0.00815682

Maximum 1.01928

Mean 0.134059

Std. Dev. 0.159923

Variance 0.0255752

At 300 years

01% of values less than 0.00949931

05% of values less than 0.0134323

10% of values less than 0.017519

50% of values less than 0.0584884

90% of values less than 0.295296

95% of values less than 0.414907

99% of values less than 0.588386

Minimum 0.00742343

Maximum 0.915614

Mean 0.113443

Std. Dev. 0.134379

Variance 0.0180577

At 1000 years

01% of values less than 0.00314272

05% of values less than 0.00463209

10% of values less than 0.00602693

50% of values less than 0.0185959

90% of values less than 0.0790044

95% of values less than 0.115421

99% of values less than 0.190322

Minimum 0.00190588

Maximum 0.340683

Mean 0.0334226

Std. Dev. 0.0400857

Variance 0.00160686

Phase: PRWMF HRA 2

Source Concentration of Chromium [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 1.66197E-020		
90% of values less than 1.02022E-011		
95% of values less than 1.2965E-009		
99% of values less than 1.63219E-006		
Minimum 0	Maximum 0.0436265	
Mean 5.27601E-005	Std. Dev. 0.0013956	Variance 1.9477E-006

Phase: PRWMF HRA 2*Source Concentration of Copper [mg/l]*

At 30 years

01% of values less than 0.00631101

05% of values less than 0.00942978

10% of values less than 0.0119087

50% of values less than 0.0397234

90% of values less than 0.200083

95% of values less than 0.298872

99% of values less than 0.506659

Minimum 0.00507796

Maximum 0.859365

Mean 0.0805431

Std. Dev. 0.106019

Variance 0.0112399

At 100 years

01% of values less than 0.00622543

05% of values less than 0.00915032

10% of values less than 0.0117171

50% of values less than 0.0385039

90% of values less than 0.193637

95% of values less than 0.280923

99% of values less than 0.476683

Minimum 0.00503471

Maximum 0.801741

Mean 0.0767234

Std. Dev. 0.0997079

Variance 0.00994166

At 300 years

01% of values less than 0.00601145

05% of values less than 0.0085542

10% of values less than 0.0109191

50% of values less than 0.0345998

90% of values less than 0.163015

95% of values less than 0.241209

99% of values less than 0.389124

Minimum 0.00489719

Maximum 0.703788

Mean 0.0661279

Std. Dev. 0.0831488

Variance 0.00691373

At 1000 years

01% of values less than 0.00367635

05% of values less than 0.00485209

10% of values less than 0.00564975

50% of values less than 0.014521

90% of values less than 0.0512315

95% of values less than 0.0721981

99% of values less than 0.136093

Minimum 0.00259588

Maximum 0.282563

Mean 0.0233076

Std. Dev. 0.0260367

Variance 0.000677907

Phase: PRWMF HRA 2

Source Concentration of Copper [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 3.30002E-028		
50% of values less than 8.14469E-016		
90% of values less than 1.42803E-008		
95% of values less than 1.67972E-007		
99% of values less than 3.01863E-005		
Minimum 0	Maximum 0.0662143	
Mean 7.36813E-005	Std. Dev. 0.00209705	Variance 4.3976E-006

Phase: PRWMF HRA 2*Source Concentration of Lead [mg/l]*

At 30 years

01% of values less than 0.0136291

05% of values less than 0.0189349

10% of values less than 0.026456

50% of values less than 0.100037

90% of values less than 0.318609

95% of values less than 0.424296

99% of values less than 0.580478

Minimum 0.010833

Maximum 0.786154

Mean 0.141394

Std. Dev. 0.130968

Variance 0.0171527

At 100 years

01% of values less than 0.0133605

05% of values less than 0.0184489

10% of values less than 0.0256901

50% of values less than 0.0964673

90% of values less than 0.305335

95% of values less than 0.408195

99% of values less than 0.558138

Minimum 0.0107129

Maximum 0.761153

Mean 0.135417

Std. Dev. 0.124439

Variance 0.0154851

At 300 years

01% of values less than 0.0125538

05% of values less than 0.0171432

10% of values less than 0.0234155

50% of values less than 0.0846058

90% of values less than 0.262893

95% of values less than 0.350713

99% of values less than 0.48227

Minimum 0.0102292

Maximum 0.685776

Mean 0.118448

Std. Dev. 0.106677

Variance 0.0113799

At 1000 years

01% of values less than 0.00553823

05% of values less than 0.00807283

10% of values less than 0.0102015

50% of values less than 0.0313058

90% of values less than 0.0996961

95% of values less than 0.131769

99% of values less than 0.20097

Minimum 0.00443388

Maximum 0.350032

Mean 0.0454941

Std. Dev. 0.0424226

Variance 0.00179967

Phase: PRWMF HRA 2

Source Concentration of Lead [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 7.6143E-028		
50% of values less than 1.20783E-016		
90% of values less than 6.09201E-010		
95% of values less than 2.53772E-008		
99% of values less than 8.69873E-006		
Minimum 0	Maximum 0.0611676	
Mean 7.35478E-005	Std. Dev. 0.00194871	Variance 3.79748E-006

Phase: PRWMF HRA 2*Source Concentration of Mercury [mg/l]*

At 30 years

01% of values less than 4.74196E-005

05% of values less than 6.09699E-005

10% of values less than 7.19718E-005

50% of values less than 0.000161294

90% of values less than 0.0005775

95% of values less than 0.000782353

99% of values less than 0.00111892

Minimum 4.126E-005

Maximum 0.00171164

Mean 0.000258056

Std. Dev. 0.00023948

Variance 5.73508E-008

At 100 years

01% of values less than 4.74196E-005

05% of values less than 6.09699E-005

10% of values less than 7.19718E-005

50% of values less than 0.000160892

90% of values less than 0.000570051

95% of values less than 0.000759897

99% of values less than 0.0010876

Minimum 4.126E-005

Maximum 0.00166246

Mean 0.000254147

Std. Dev. 0.000232413

Variance 5.40157E-008

At 300 years

01% of values less than 4.74196E-005

05% of values less than 6.09699E-005

10% of values less than 7.19718E-005

50% of values less than 0.000158886

90% of values less than 0.000538882

95% of values less than 0.00069373

99% of values less than 0.000999303

Minimum 4.126E-005

Maximum 0.00151302

Mean 0.000242466

Std. Dev. 0.000212023

Variance 4.49538E-008

At 1000 years

01% of values less than 4.74196E-005

05% of values less than 6.09699E-005

10% of values less than 7.19718E-005

50% of values less than 0.000139951

90% of values less than 0.000316241

95% of values less than 0.000393219

99% of values less than 0.000608467

Minimum 4.126E-005

Maximum 0.000854458

Mean 0.000175012

Std. Dev. 0.000111271

Variance 1.23813E-008

Phase: PRWMF HRA 2

Source Concentration of Mercury [mg/l]

At infinity

01% of values less than 1.21332E-020		
05% of values less than 6.28185E-016		
10% of values less than 3.13722E-013		
50% of values less than 4.58494E-006		
90% of values less than 0.000100187		
95% of values less than 0.000107582		
99% of values less than 0.000115461		
Minimum 4.94637E-029	Maximum 0.000288123	
Mean 3.41935E-005	Std. Dev. 4.17188E-005	Variance 1.74046E-009

Phase: PRWMF HRA 2*Source Concentration of Nickel [mg/l]*

At 30 years

01% of values less than 0.0127929

05% of values less than 0.0186995

10% of values less than 0.0265088

50% of values less than 0.105197

90% of values less than 0.47197

95% of values less than 0.626567

99% of values less than 1.02195

Minimum 0.00887673

Maximum 1.49634

Mean 0.184459

Std. Dev. 0.21406

Variance 0.0458217

At 100 years

01% of values less than 0.0126379

05% of values less than 0.0182228

10% of values less than 0.0258074

50% of values less than 0.0983278

90% of values less than 0.439331

95% of values less than 0.577712

99% of values less than 0.906086

Minimum 0.00873777

Maximum 1.38762

Mean 0.17147

Std. Dev. 0.195543

Variance 0.0382369

At 300 years

01% of values less than 0.0121259

05% of values less than 0.0169205

10% of values less than 0.0230404

50% of values less than 0.0819614

90% of values less than 0.346886

95% of values less than 0.451092

99% of values less than 0.690263

Minimum 0.00834122

Maximum 1.08155

Mean 0.137318

Std. Dev. 0.150025

Variance 0.0225075

At 1000 years

01% of values less than 0.00291959

05% of values less than 0.00604388

10% of values less than 0.00760496

50% of values less than 0.0199734

90% of values less than 0.0626771

95% of values less than 0.0896051

99% of values less than 0.153446

Minimum 0.00167698

Maximum 0.235353

Mean 0.0298883

Std. Dev. 0.0305478

Variance 0.000933168

Phase: PRWMF HRA 2

Source Concentration of Nickel [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 1.20692E-023		
90% of values less than 2.19634E-011		
95% of values less than 1.69267E-009		
99% of values less than 2.28167E-006		
Minimum 0	Maximum 0.0354788	
Mean 3.97807E-005	Std. Dev. 0.0011252	Variance 1.26607E-006

Phase: PRWMF HRA 2*Source Concentration of Nitrite [mg/l]*

At 30 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68814

Mean 0.536682

Std. Dev. 0.727734

Variance 0.529597

At 100 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68814

Mean 0.536682

Std. Dev. 0.727734

Variance 0.529597

At 300 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68814

Mean 0.536682

Std. Dev. 0.727734

Variance 0.529597

At 1000 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68814

Mean 0.536682

Std. Dev. 0.727734

Variance 0.529597

Phase: PRWMF HRA 2

Source Concentration of Nitrite [mg/l]

At infinity

01% of values less than 0.0191699		
05% of values less than 0.0312741		
10% of values less than 0.0426614		
50% of values less than 0.264767		
90% of values less than 1.43947		
95% of values less than 2.12126		
99% of values less than 3.64882		
Minimum 0.0115689	Maximum 5.68814	
Mean 0.536682	Std. Dev. 0.727734	Variance 0.529597

Phase: PRWMF HRA 2*Source Concentration of Potassium [mg/l]*

At 30 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41348

Maximum 2852.77

Mean 534.242

Std. Dev. 543.155

Variance 295017

At 100 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41348

Maximum 2852.77

Mean 534.242

Std. Dev. 543.155

Variance 295017

At 300 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41348

Maximum 2852.77

Mean 534.242

Std. Dev. 543.155

Variance 295017

At 1000 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41348

Maximum 2852.77

Mean 534.242

Std. Dev. 543.155

Variance 295017

Phase: PRWMF HRA 2

Source Concentration of Potassium [mg/l]

At infinity

01% of values less than 14.2991		
05% of values less than 24.0945		
10% of values less than 40.031		
50% of values less than 364.805		
90% of values less than 1287.76		
95% of values less than 1632.69		
99% of values less than 2505.52		
Minimum 9.41348	Maximum 2852.77	
Mean 534.242	Std. Dev. 543.155	Variance 295017

Phase: PRWMF HRA 2*Source Concentration of Toluene [mg/l]*

At 30 years

01% of values less than 0.002625

05% of values less than 0.002625

10% of values less than 0.002625

50% of values less than 0.002625

90% of values less than 0.002625

95% of values less than 0.002625

99% of values less than 0.002625

Minimum 0.002625

Maximum 0.002625

Mean 0.002625

Std. Dev. 4.23359E-010

Variance 1.79233E-019

At 100 years

01% of values less than 2.05078E-005

05% of values less than 2.05078E-005

10% of values less than 2.05078E-005

50% of values less than 2.05078E-005

90% of values less than 2.05078E-005

95% of values less than 2.05078E-005

99% of values less than 2.05078E-005

Minimum 2.05078E-005

Maximum 2.05078E-005

Mean 2.05078E-005

Std. Dev. 2.26822E-012

Variance 5.14482E-024

At 300 years

01% of values less than 1.95578E-011

05% of values less than 1.95578E-011

10% of values less than 1.95578E-011

50% of values less than 1.95578E-011

90% of values less than 1.95578E-011

95% of values less than 1.95578E-011

99% of values less than 1.95578E-011

Minimum 1.95578E-011

Maximum 1.95578E-011

Mean 1.95578E-011

Std. Dev. 3.36579E-018

Variance -1.13285E-035

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Source Concentration of Toluene [mg/l]

At infinity

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0
Minimum 0
Mean 0

Maximum 0
Std. Dev. 0
Variance 0

Phase: PRWMF HRA 2*Source Concentration of Zinc [mg/l]*

At 30 years

01% of values less than 0.125383

05% of values less than 0.236477

10% of values less than 0.349747

50% of values less than 2.15637

90% of values less than 9.48696

95% of values less than 13.5029

99% of values less than 19.6151

Minimum 0.0382475

Maximum 35.1332

Mean 3.84326

Std. Dev. 4.56589

Variance 20.8474

At 100 years

01% of values less than 0.118087

05% of values less than 0.222862

10% of values less than 0.323442

50% of values less than 2.01883

90% of values less than 8.78837

95% of values less than 12.1541

99% of values less than 18.531

Minimum 0.0368557

Maximum 32.7569

Mean 3.58825

Std. Dev. 4.25589

Variance 18.1126

At 300 years

01% of values less than 0.0879408

05% of values less than 0.193197

10% of values less than 0.271245

50% of values less than 1.65642

90% of values less than 6.85783

95% of values less than 9.78995

99% of values less than 14.6442

Minimum 0.0327003

Maximum 30.6353

Mean 2.90581

Std. Dev. 3.46211

Variance 11.9862

At 1000 years

01% of values less than 0.0226155

05% of values less than 0.0442022

10% of values less than 0.0658548

50% of values less than 0.324486

90% of values less than 1.58922

95% of values less than 2.31545

99% of values less than 3.97472

Minimum 0.00752083

Maximum 8.74939

Mean 0.648597

Std. Dev. 0.8923

Variance 0.796199

Phase: PRWMF HRA 2

Source Concentration of Zinc [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 2.90807E-025		
90% of values less than 8.62457E-014		
95% of values less than 4.44446E-011		
99% of values less than 9.18367E-007		
Minimum 0	Maximum 0.1739	
Mean 0.000277248	Std. Dev. 0.00616343	Variance 3.79879E-005

Phase: PRWMF HRA 2*Concentration of Ammoniacal_N at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0
 05% of values less than 0
 10% of values less than 0
 50% of values less than 0
 90% of values less than 0
 95% of values less than 0
 99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0.00481399
 05% of values less than 0.174412
 10% of values less than 1.18393
 50% of values less than 62.3696
 90% of values less than 590.003
 95% of values less than 841.618
 99% of values less than 1481.32

Minimum 3.84954E-005

Maximum 2242.81

Mean 195.1

Std. Dev. 313.993

Variance 98591.4

At 300 years

01% of values less than 3.57301
 05% of values less than 6.53099
 10% of values less than 12.2999
 50% of values less than 126.536
 90% of values less than 679.518
 95% of values less than 877.266
 99% of values less than 1415.29

Minimum 1.59796

Maximum 2236.26

Mean 252.671

Std. Dev. 317.446

Variance 100772

At 1000 years

01% of values less than 0.182416
 05% of values less than 0.78678
 10% of values less than 1.35217
 50% of values less than 18.4957
 90% of values less than 124.15
 95% of values less than 208.246
 99% of values less than 364.96

Minimum 0.0555506

Maximum 684.255

Mean 48.8838

Std. Dev. 79.387

Variance 6302.3

Phase: PRWMF HRA 2

Concentration of Ammoniacal_N at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 3.18738E-014		
50% of values less than 1.21317E-006		
90% of values less than 1.6962E-005		
95% of values less than 2.783E-005		
99% of values less than 9.11958E-005		
Minimum 0	Maximum 30.1867	
Mean 0.0303646	Std. Dev. 0.954117	Variance 0.91034

Phase: PRWMF HRA 2*Concentration of Arsenic at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 6.15574E-010

95% of values less than 1.17269E-006

99% of values less than 0.00199804

Minimum 0

Maximum 0.0568628

Mean 0.00016635

Std. Dev. 0.00234851

Variance 5.51552E-006

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 7.27319E-009

90% of values less than 0.00570084

95% of values less than 0.0141149

99% of values less than 0.151474

Minimum 0

Maximum 0.619689

Mean 0.00576509

Std. Dev. 0.0383213

Variance 0.00146852

At 1000 years

01% of values less than 7.31853E-016

05% of values less than 9.58764E-013

10% of values less than 2.54497E-009

50% of values less than 0.0013382

90% of values less than 0.0424063

95% of values less than 0.0901917

99% of values less than 0.304119

Minimum 0

Maximum 0.723896

Mean 0.0181013

Std. Dev. 0.0574483

Variance 0.0033003

Phase: PRWMF HRA 2

Concentration of Arsenic at base of Clay Liner [mg/l]

At infinity

01% of values less than 2.30189E-008		
05% of values less than 1.75257E-007		
10% of values less than 2.9665E-006		
50% of values less than 0.002218		
90% of values less than 0.00718186		
95% of values less than 0.00928468		
99% of values less than 0.039446		
Minimum 7.93991E-011	Maximum 0.257315	
Mean 0.00415104	Std. Dev. 0.0128898	Variance 0.000166148

Phase: PRWMF HRA 2*Concentration of Benzene at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 1.3536E-006

05% of values less than 2.29122E-006

10% of values less than 3.17209E-006

50% of values less than 1.05637E-005

90% of values less than 3.14697E-005

95% of values less than 3.69781E-005

99% of values less than 5.29168E-005

Minimum 8.85252E-007

Maximum 7.87353E-005

Mean 1.4174E-005

Std. Dev. 1.14816E-005

Variance 1.31827E-010

At 300 years

01% of values less than 2.94212E-012

05% of values less than 4.66577E-012

10% of values less than 6.99945E-012

50% of values less than 3.45432E-011

90% of values less than 9.01198E-009

95% of values less than 3.62549E-008

99% of values less than 1.24926E-007

Minimum 2.08887E-012

Maximum 5.38837E-007

Mean 5.89424E-009

Std. Dev. 2.62663E-008

Variance 6.8992E-016

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 2.34423E-014

90% of values less than 3.17228E-013

95% of values less than 5.42858E-013

99% of values less than 9.28559E-013

Minimum 0

Maximum 2.1356E-012

Mean 1.08485E-013

Std. Dev. 2.04916E-013

Variance 4.19907E-026

Phase: PRWMF HRA 2

Concentration of Benzene at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 2.33208E-014		
90% of values less than 3.2042E-013		
95% of values less than 5.40278E-013		
99% of values less than 9.27342E-013		
Minimum 0	Maximum 2.10142E-012	
Mean 1.08597E-013	Std. Dev. 2.04949E-013	Variance 4.20041E-026

Phase: PRWMF HRA 2*Concentration of Cadmium at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0.00417941

95% of values less than 0.0132575

99% of values less than 0.0406299

Minimum 0

Maximum 0.0576627

Mean 0.00204199

Std. Dev. 0.00722585

Variance 5.22129E-005

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 1.47528E-005

90% of values less than 0.0261117

95% of values less than 0.0354874

99% of values less than 0.0511877

Minimum 0

Maximum 0.0728415

Mean 0.00714858

Std. Dev. 0.0123584

Variance 0.000152729

At 1000 years

01% of values less than 0

05% of values less than 8.72022E-016

10% of values less than 3.019E-015

50% of values less than 0.0033969

90% of values less than 0.0193226

95% of values less than 0.026057

99% of values less than 0.0441423

Minimum 0

Maximum 0.0601317

Mean 0.00687081

Std. Dev. 0.00946642

Variance 8.96132E-005

Phase: PRWMF HRA 2

Concentration of Cadmium at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 1.50066E-010		
50% of values less than 1.79999E-008		
90% of values less than 0.00423691		
95% of values less than 0.0101022		
99% of values less than 0.0216526		
Minimum 0	Maximum 0.0578795	
Mean 0.00149724	Std. Dev. 0.00462852	Variance 2.14232E-005

Phase: PRWMF HRA 2*Concentration of Chloride at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 34.4897

05% of values less than 58.3001

10% of values less than 92.6449

50% of values less than 593.638

90% of values less than 1965.34

95% of values less than 2421.92

99% of values less than 3714.98

Minimum 21.9013

Maximum 5643.87

Mean 851.135

Std. Dev. 823.761

Variance 678582

At 300 years

01% of values less than 24.0219

05% of values less than 40.0112

10% of values less than 64.0516

50% of values less than 401.479

90% of values less than 1437.68

95% of values less than 1734.88

99% of values less than 2839.69

Minimum 13.2942

Maximum 3763.44

Mean 614.156

Std. Dev. 614.589

Variance 377720

At 1000 years

01% of values less than 0.37619

05% of values less than 1.88049

10% of values less than 4.03383

50% of values less than 32.0355

90% of values less than 195.566

95% of values less than 289.59

99% of values less than 609.536

Minimum 0.104712

Maximum 864.904

Mean 74.0547

Std. Dev. 113.588

Variance 12902.3

Phase: PRWMF HRA 2

Concentration of Chloride at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 1.05948E-013		
50% of values less than 1.58179E-007		
90% of values less than 1.58616E-006		
95% of values less than 2.714E-006		
99% of values less than 6.55927E-006		
Minimum 0	Maximum 508.786	
Mean 0.5089	Std. Dev. 16.0812	Variance 258.605

Phase: PRWMF HRA 2*Concentration of Chromium at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 3.88692E-015

Minimum 0

Maximum 0.249083

Mean 0.000292157

Std. Dev. 0.00797259

Variance 6.35621E-005

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 3.05915E-015

95% of values less than 1.16015E-010

99% of values less than 0.00671996

Minimum 0

Maximum 0.313253

Mean 0.00139982

Std. Dev. 0.0179043

Variance 0.000320565

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 1.97713E-015

90% of values less than 3.61004E-006

95% of values less than 0.00272557

99% of values less than 0.0605086

Minimum 0

Maximum 0.467329

Mean 0.00269155

Std. Dev. 0.0226948

Variance 0.000515055

Phase: PRWMF HRA 2

Concentration of Chromium at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 1.41035E-013		
10% of values less than 3.79931E-010		
50% of values less than 0.000790905		
90% of values less than 0.0645651		
95% of values less than 0.122314		
99% of values less than 0.327357		
Minimum 0	Maximum 0.739452	
Mean 0.0241467	Std. Dev. 0.0681395	Variance 0.00464299

Phase: PRWMF HRA 2

Concentration of Copper at base of Clay Liner [mg/l]

At 30 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 1.77148E-016
99% of values less than 1.82324E-009

Minimum 0

Maximum 0.0253104

Mean 3.57108E-005

Std. Dev. 0.000829894

Variance 6.88724E-007

At 300 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 8.15204E-007
95% of values less than 0.000251442
99% of values less than 0.0208397

Minimum 0

Maximum 0.300298

Mean 0.00109838

Std. Dev. 0.0125537

Variance 0.000157596

At 1000 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 4.87051E-015
90% of values less than 0.00712657
95% of values less than 0.0247227
99% of values less than 0.0895491

Minimum 0

Maximum 0.289569

Mean 0.00427807

Std. Dev. 0.0187835

Variance 0.000352818

Phase: PRWMF HRA 2

Concentration of Copper at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 9.97632E-016		
50% of values less than 9.11835E-005		
90% of values less than 0.0192226		
95% of values less than 0.0403616		
99% of values less than 0.165149		
Minimum 0	Maximum 0.381731	
Mean 0.00880406	Std. Dev. 0.0297355	Variance 0.000884199

Phase: PRWMF HRA 2*Concentration of Lead at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 3.36353E-015

99% of values less than 0.000296155

Minimum 0

Maximum 0.0441342

Mean 0.000139659

Std. Dev. 0.00221671

Variance 4.91379E-006

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 2.00525E-005

95% of values less than 0.00325254

99% of values less than 0.0711541

Minimum 0

Maximum 0.642097

Mean 0.00304106

Std. Dev. 0.0260772

Variance 0.000680019

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 5.51626E-016

90% of values less than 0.025983

95% of values less than 0.0776396

99% of values less than 0.206752

Minimum 0

Maximum 0.545303

Mean 0.0108968

Std. Dev. 0.0396789

Variance 0.00157441

Phase: PRWMF HRA 2

Concentration of Lead at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 1.41587E-007		
90% of values less than 0.0359604		
95% of values less than 0.0798431		
99% of values less than 0.173032		
Minimum 0	Maximum 0.280007	
Mean 0.0121499	Std. Dev. 0.0350093	Variance 0.00122565

Phase: PRWMF HRA 2*Concentration of Mercury at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 3.94313E-016

99% of values less than 6.57624E-009

Minimum 0

Maximum 5.96963E-006

Mean 7.71258E-009

Std. Dev. 1.94549E-007

Variance 3.78494E-014

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 3.22501E-008

95% of values less than 1.35652E-006

99% of values less than 4.93502E-005

Minimum 0

Maximum 0.000444091

Mean 1.68072E-006

Std. Dev. 1.66161E-005

Variance 2.76095E-010

Phase: PRWMF HRA 2

Concentration of Mercury at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 1.44775E-011		
10% of values less than 9.26775E-010		
50% of values less than 2.6633E-005		
90% of values less than 0.000167372		
95% of values less than 0.000262556		
99% of values less than 0.000575717		
Minimum 0	Maximum 0.00235937	
Mean 6.97054E-005	Std. Dev. 0.000130831	Variance 1.71169E-008

Phase: PRWMF HRA 2*Concentration of Nickel at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 9.52952E-010

95% of values less than 9.7369E-006

99% of values less than 0.00562214

Minimum 0

Maximum 0.210421

Mean 0.00053179

Std. Dev. 0.00763583

Variance 5.83059E-005

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 3.77084E-011

90% of values less than 0.0253615

95% of values less than 0.0676277

99% of values less than 0.221929

Minimum 0

Maximum 0.512843

Mean 0.0120376

Std. Dev. 0.0467868

Variance 0.00218901

At 1000 years

01% of values less than 0

05% of values less than 3.90074E-015

10% of values less than 1.25522E-014

50% of values less than 0.00205793

90% of values less than 0.114468

95% of values less than 0.184087

99% of values less than 0.436939

Minimum 0

Maximum 0.730664

Mean 0.0380284

Std. Dev. 0.0844095

Variance 0.00712497

Phase: PRWMF HRA 2

Concentration of Nickel at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 3.3628E-009		
10% of values less than 1.17317E-008		
50% of values less than 0.000113303		
90% of values less than 0.0365842		
95% of values less than 0.0870307		
99% of values less than 0.236939		
Minimum 0	Maximum 0.399419	
Mean 0.0144282	Std. Dev. 0.0427624	Variance 0.00182863

Phase: PRWMF HRA 2*Concentration of Nitrite at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68813

Mean 0.536679

Std. Dev. 0.727732

Variance 0.529594

At 300 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68814

Mean 0.536682

Std. Dev. 0.727734

Variance 0.529597

At 1000 years

01% of values less than 0.0191699

05% of values less than 0.0312741

10% of values less than 0.0426614

50% of values less than 0.264767

90% of values less than 1.43947

95% of values less than 2.12126

99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68814

Mean 0.536682

Std. Dev. 0.727734

Variance 0.529597

Phase: PRWMF HRA 2

Concentration of Nitrite at base of Clay Liner [mg/l]

At infinity

01% of values less than 0.0191699		
05% of values less than 0.0312741		
10% of values less than 0.0426614		
50% of values less than 0.264767		
90% of values less than 1.43947		
95% of values less than 2.12126		
99% of values less than 3.64882		
Minimum 0.0115689	Maximum 5.68814	
Mean 0.536682	Std. Dev. 0.727734	Variance 0.529597

Phase: PRWMF HRA 2*Concentration of Potassium at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41331

Maximum 2852.77

Mean 534.239

Std. Dev. 543.153

Variance 295015

At 300 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41348

Maximum 2852.77

Mean 534.242

Std. Dev. 543.155

Variance 295018

At 1000 years

01% of values less than 14.2991

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 364.805

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41348

Maximum 2852.77

Mean 534.242

Std. Dev. 543.155

Variance 295017

Phase: PRWMF HRA 2

Concentration of Potassium at base of Clay Liner [mg/l]

At infinity

01% of values less than 14.2991		
05% of values less than 24.0945		
10% of values less than 40.031		
50% of values less than 364.805		
90% of values less than 1287.76		
95% of values less than 1632.69		
99% of values less than 2505.52		
Minimum 9.41348	Maximum 2852.77	
Mean 534.242	Std. Dev. 543.155	Variance 295017

Phase: PRWMF HRA 2*Concentration of Toluene at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 4.39903E-007

05% of values less than 1.55999E-006

10% of values less than 6.19013E-006

50% of values less than 7.10893E-005

90% of values less than 0.000142891

95% of values less than 0.000160418

99% of values less than 0.000188124

Minimum 1.91613E-007

Maximum 0.000196667

Mean 7.41192E-005

Std. Dev. 4.97543E-005

Variance 2.47549E-009

At 300 years

01% of values less than 6.84187E-011

05% of values less than 7.09574E-011

10% of values less than 9.74662E-011

50% of values less than 1.8659E-008

90% of values less than 9.43409E-006

95% of values less than 1.35281E-005

99% of values less than 3.66666E-005

Minimum 6.81517E-011

Maximum 6.19341E-005

Mean 2.85446E-006

Std. Dev. 7.19126E-006

Variance 5.17142E-011

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 1.69891E-015

50% of values less than 9.2394E-013

90% of values less than 2.38835E-010

95% of values less than 2.55608E-009

99% of values less than 1.7951E-008

Minimum 0

Maximum 6.53532E-008

Mean 6.9776E-010

Std. Dev. 4.19571E-009

Variance 1.7604E-017

Phase: PRWMF HRA 2

Concentration of Toluene at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 4.66212E-013		
90% of values less than 5.01486E-012		
95% of values less than 7.2017E-012		
99% of values less than 1.26401E-011		
Minimum 0	Maximum 1.58276E-011	
Mean 1.63109E-012	Std. Dev. 2.60568E-012	Variance 6.78955E-024

Phase: PRWMF HRA 2*Concentration of Zinc at base of Clay Liner [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 9.76471E-014

90% of values less than 0.889525

95% of values less than 2.13614

99% of values less than 7.93923

Minimum 0

Maximum 13.1846

Mean 0.398772

Std. Dev. 1.39825

Variance 1.95509

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 7.9299E-016

50% of values less than 0.0671879

90% of values less than 4.40849

95% of values less than 7.54518

99% of values less than 13.6529

Minimum 0

Maximum 30.2314

Mean 1.36639

Std. Dev. 3.0453

Variance 9.27384

At 1000 years

01% of values less than 2.85619E-014

05% of values less than 4.32546E-013

10% of values less than 2.02026E-009

50% of values less than 0.363769

90% of values less than 3.23464

95% of values less than 4.97318

99% of values less than 9.39255

Minimum 1.41582E-015

Maximum 22.2204

Mean 1.12023

Std. Dev. 2.05001

Variance 4.20252

Phase: PRWMF HRA 2

Concentration of Zinc at base of Clay Liner [mg/l]

At infinity

01% of values less than 0		
05% of values less than 3.51784E-015		
10% of values less than 2.64816E-009		
50% of values less than 7.42792E-007		
90% of values less than 0.194947		
95% of values less than 0.818609		
99% of values less than 2.85248		
Minimum 0	Maximum 8.43299	
Mean 0.146068	Std. Dev. 0.648438	Variance 0.420472

Phase: PRWMF HRA 2*Concentration of Ammoniacal_N at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 1.10588E+272

Minimum 0

Maximum 2.12967E+279

Mean 2.82312E+276

Std. Dev. 1.#INF

Variance 1.#INF

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0.0190969

95% of values less than 1.55281

99% of values less than 78.2016

Minimum 0

Maximum 1062.76

Mean 3.44915

Std. Dev. 38.8102

Variance 1506.23

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 5.43366E-016

50% of values less than 0.00621405

90% of values less than 47.574

95% of values less than 135.485

99% of values less than 500.137

Minimum 0

Maximum 1064.92

Mean 22.7979

Std. Dev. 82.0606

Variance 6733.94

Phase: PRWMF HRA 2

Concentration of Ammoniacal_N at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than	1.88331E-009	
05% of values less than	7.20495E-008	
10% of values less than	2.73973E-007	
50% of values less than	0.00696892	
90% of values less than	3.49711	
95% of values less than	8.56427	
99% of values less than	28.5717	
Minimum	0	Maximum 64.8696
Mean	1.53167	Std. Dev. 5.39443
		Variance 29.0999

Phase: PRWMF HRA 2*Concentration of Arsenic at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 3.13622E-005

Mean 3.13591E-008

Std. Dev. 9.91262E-007

Variance 9.82601E-013

Phase: PRWMF HRA 2

Concentration of Arsenic at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0.000105448		
95% of values less than 0.0010877		
99% of values less than 0.0091199		
Minimum 0	Maximum 0.0650886	
Mean 0.000354813	Std. Dev. 0.00261918	Variance 6.86011E-006

Phase: PRWMF HRA 2*Concentration of Benzene at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 7.16283E+272

Minimum 0

Maximum 9.06006E+276

Mean 1.57926E+274

Std. Dev. 1.#INF

Variance 1.#INF

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 1.2628E-011

90% of values less than 1.41633E-006

95% of values less than 3.26569E-006

99% of values less than 6.20775E-006

Minimum 0

Maximum 1.27316E-005

Mean 4.57175E-007

Std. Dev. 1.30599E-006

Variance 1.70562E-012

At 1000 years

01% of values less than 8.46132E-014

05% of values less than 3.26609E-011

10% of values less than 8.97502E-010

50% of values less than 2.20859E-007

90% of values less than 1.24384E-006

95% of values less than 1.61235E-006

99% of values less than 2.52459E-006

Minimum 0

Maximum 3.1271E-006

Mean 4.46236E-007

Std. Dev. 5.69929E-007

Variance 3.24819E-013

Phase: PRWMF HRA 2

Concentration of Benzene at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 4.88346E-014		
90% of values less than 4.56536E-012		
95% of values less than 2.5975E-011		
99% of values less than 1.4571E-010		
Minimum 0	Maximum 8.43389E-010	
Mean 7.18763E-012	Std. Dev. 4.52957E-011	Variance 2.0517E-021

Phase: PRWMF HRA 2*Concentration of Cadmium at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 4.68035E-011

Minimum 0

Maximum 3.77868E-006

Mean 4.01975E-009

Std. Dev. 1.19503E-007

Variance 1.42809E-014

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 9.76052E-011

99% of values less than 0.00126457

Minimum 0

Maximum 0.0141846

Mean 7.73808E-005

Std. Dev. 0.000792188

Variance 6.27562E-007

Phase: PRWMF HRA 2

Concentration of Cadmium at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 5.66046E-014		
90% of values less than 0.00108245		
95% of values less than 0.00299014		
99% of values less than 0.0117664		
Minimum 0	Maximum 0.0375555	
Mean 0.000605378	Std. Dev. 0.00257447	Variance 6.62789E-006

Phase: PRWMF HRA 2*Concentration of Chloride at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 7.0717E+275

90% of values less than 2.58361E+283

95% of values less than 3.40766E+284

99% of values less than 1.00692E+288

Minimum 0

Maximum 1.64333E+289

Mean 7.17592E+286

Std. Dev. 1.#INF

Variance 1.#INF

At 300 years

01% of values less than 16.2489

05% of values less than 37.7822

10% of values less than 55.6783

50% of values less than 423.231

90% of values less than 1579.29

95% of values less than 2007.35

99% of values less than 3198.02

Minimum 2.01987

Maximum 4965.49

Mean 648.993

Std. Dev. 690.433

Variance 476697

At 1000 years

01% of values less than 8.17032

05% of values less than 18.6671

10% of values less than 31.5504

50% of values less than 191.286

90% of values less than 743.633

95% of values less than 1017.44

99% of values less than 1618.02

Minimum 4.04186

Maximum 2064.86

Mean 314.286

Std. Dev. 342.453

Variance 117274

Phase: PRWMF HRA 2

Concentration of Chloride at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 1.07263E-011		
10% of values less than 4.81561E-010		
50% of values less than 1.78532E-007		
90% of values less than 1.86106E-006		
95% of values less than 3.18758E-006		
99% of values less than 7.15361E-005		
Minimum 0	Maximum 555.552	
Mean 0.563545	Std. Dev. 17.5601	Variance 308.358

Phase: PRWMF HRA 2*Concentration of Chromium at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 1.33519E-010

Mean 1.33386E-013

Std. Dev. 4.22014E-012

Variance 1.78096E-023

Phase: PRWMF HRA 2

Concentration of Chromium at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 0		
99% of values less than 1.55314E-006		
Minimum 0	Maximum 0.0126322	
Mean 2.57875E-005	Std. Dev. 0.000476662	Variance 2.27207E-007

Phase: PRWMF HRA 2*Concentration of Copper at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Concentration of Copper at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 3.43701E-010		
99% of values less than 0.000409453		
Minimum 0	Maximum 0.00493842	
Mean 1.61442E-005	Std. Dev. 0.000206044	Variance 4.24541E-008

Phase: PRWMF HRA 2*Concentration of Lead at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 3.25572E-010

Mean 3.25247E-013

Std. Dev. 1.02904E-011

Variance 1.05891E-022

Phase: PRWMF HRA 2

Concentration of Lead at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 1.41926E-009		
99% of values less than 0.00120958		
Minimum 0	Maximum 0.03272	
Mean 6.3585E-005	Std. Dev. 0.00108324	Variance 1.17341E-006

Phase: PRWMF HRA 2*Concentration of Mercury at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Concentration of Mercury at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 0		
99% of values less than 0		
Minimum 0	Maximum 3.32354E-006	
Mean 3.32024E-009	Std. Dev. 1.05047E-007	Variance 1.10349E-014

Phase: PRWMF HRA 2*Concentration of Nickel at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 9.58935E-006

Mean 9.58227E-009

Std. Dev. 3.0309E-007

Variance 9.18637E-014

Phase: PRWMF HRA 2

Concentration of Nickel at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 9.15041E-005		
95% of values less than 0.00143644		
99% of values less than 0.0118781		
Minimum 0	Maximum 0.14458	
Mean 0.000537152	Std. Dev. 0.00512033	Variance 2.62178E-005

Phase: PRWMF HRA 2

Concentration of Nitrite at base of Unsaturated Zone [mg/l]

At 30 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 3.66142E+272
90% of values less than 1.51622E+280
95% of values less than 3.24885E+281
99% of values less than 2.91157E+284

Minimum 0

Maximum 3.80632E+285

Mean 1.95212E+283

Std. Dev. 1.#INF

Variance 1.#INF

At 300 years

01% of values less than 0.00485231
05% of values less than 0.017605
10% of values less than 0.0315581
50% of values less than 0.195228
90% of values less than 1.20886
95% of values less than 1.88545
99% of values less than 3.30531

Minimum 0.000298652

Maximum 4.317

Mean 0.454228

Std. Dev. 0.66033

Variance 0.436036

At 1000 years

01% of values less than 0.0191699
05% of values less than 0.0310663
10% of values less than 0.0426614
50% of values less than 0.263779
90% of values less than 1.43947
95% of values less than 2.12126
99% of values less than 3.64882

Minimum 0.0115689

Maximum 5.68626

Mean 0.536268

Std. Dev. 0.727497

Variance 0.529252

Phase: PRWMF HRA 2

Concentration of Nitrite at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0.0191699		
05% of values less than 0.0312741		
10% of values less than 0.0426614		
50% of values less than 0.264767		
90% of values less than 1.43947		
95% of values less than 2.12126		
99% of values less than 3.64882		
Minimum 0.0115689	Maximum 5.68814	
Mean 0.536682	Std. Dev. 0.727734	Variance 0.529597

Phase: PRWMF HRA 2*Concentration of Potassium at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 4.92175E+275

90% of values less than 1.80872E+283

95% of values less than 2.68576E+284

99% of values less than 5.4845E+287

Minimum 0

Maximum 1.94912E+289

Mean 3.73676E+286

Std. Dev. 1.#INF

Variance 1.#INF

At 300 years

01% of values less than 4.94451

05% of values less than 16.2246

10% of values less than 26.2717

50% of values less than 263.233

90% of values less than 1150.82

95% of values less than 1508.08

99% of values less than 2250.56

Minimum 0.228947

Maximum 2769.25

Mean 447.697

Std. Dev. 500.55

Variance 250550

At 1000 years

01% of values less than 14.2975

05% of values less than 24.0945

10% of values less than 40.031

50% of values less than 363.682

90% of values less than 1287.76

95% of values less than 1632.69

99% of values less than 2505.52

Minimum 9.41346

Maximum 2852.77

Mean 533.694

Std. Dev. 542.765

Variance 294594

Phase: PRWMF HRA 2

Concentration of Potassium at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 14.2991		
05% of values less than 24.0945		
10% of values less than 40.031		
50% of values less than 364.805		
90% of values less than 1287.76		
95% of values less than 1632.69		
99% of values less than 2505.52		
Minimum 9.41348	Maximum 2852.77	
Mean 534.242	Std. Dev. 543.155	Variance 295017

Phase: PRWMF HRA 2*Concentration of Toluene at base of Unsaturated Zone [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 1.3126E+274

Mean 1.31228E+271

Std. Dev. 1.#INF

Variance 1.#INF

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 9.10962E-009

95% of values less than 6.03808E-007

99% of values less than 1.68581E-005

Minimum 0

Maximum 2.57814E-005

Mean 4.57217E-007

Std. Dev. 2.63319E-006

Variance 6.93367E-012

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 5.86975E-009

90% of values less than 4.47794E-006

95% of values less than 5.39174E-006

99% of values less than 6.62557E-006

Minimum 0

Maximum 7.68579E-006

Mean 9.99507E-007

Std. Dev. 1.84523E-006

Variance 3.40488E-012

Phase: PRWMF HRA 2

Concentration of Toluene at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 1.89858E-015		
10% of values less than 4.42581E-014		
50% of values less than 2.58638E-010		
90% of values less than 1.26532E-007		
95% of values less than 2.35395E-007		
99% of values less than 6.26823E-007		
Minimum 0	Maximum 1.53667E-006	
Mean 4.4601E-008	Std. Dev. 1.33205E-007	Variance 1.77436E-014

Phase: PRWMF HRA 2

Concentration of Zinc at base of Unsaturated Zone [mg/l]

At 30 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0
Mean 0

Maximum 0
Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0
Mean 0

Maximum 0
Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 3.70682E-008

Minimum 0
Mean 2.64749E-005

Maximum 0.0163763
Std. Dev. 0.000572166

Variance 3.27374E-007

At 1000 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 4.55326E-009
95% of values less than 9.75345E-005
99% of values less than 0.317276

Minimum 0
Mean 0.0152413

Maximum 5.82588
Std. Dev. 0.211773

Variance 0.0448479

Phase: PRWMF HRA 2

Concentration of Zinc at base of Unsaturated Zone [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 1.43614E-005		
90% of values less than 0.142154		
95% of values less than 0.322485		
99% of values less than 1.07985		
Minimum 0	Maximum 4.05089	
Mean 0.0627964	Std. Dev. 0.243777	Variance 0.0594272

Phase: PRWMF HRA 2

Approx. time to Peak Conc. Ammoniacal_N at Base of Unsaturated Zone [years]

01% of values less than 100

05% of values less than 1000

10% of values less than 1249

50% of values less than 4100

90% of values less than 11039

95% of values less than 13458

99% of values less than 20000

Minimum 100

Maximum 20000

Mean 5172.26

Std. Dev. 4039.64

Variance 1.63187E+007

Approx. time to Peak Conc. Arsenic at Base of Unsaturated Zone [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 8772.4

Std. Dev. 9903.71

Variance 9.80834E+007

Approx. time to Peak Conc. Benzene at Base of Unsaturated Zone [years]

01% of values less than 100

05% of values less than 282

10% of values less than 380

50% of values less than 1249

90% of values less than 3046

95% of values less than 3363

99% of values less than 4100

Minimum 100

Maximum 4999

Mean 1425.15

Std. Dev. 984.397

Variance 969037

Approx. time to Peak Conc. Cadmium at Base of Unsaturated Zone [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 3714

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 8932.21

Std. Dev. 9372.76

Variance 8.78486E+007

Approx. time to Peak Conc. Chloride at Base of Unsaturated Zone [years]

01% of values less than 95

05% of values less than 100

10% of values less than 100

50% of values less than 100

90% of values less than 464

95% of values less than 565

99% of values less than 761

Phase: PRWMF HRA 2

Approx. time to Peak Conc. Chloride at Base of Unsaturated Zone [years]

01% of values less than 95		
05% of values less than 100		
10% of values less than 100		
50% of values less than 100		
90% of values less than 464		
95% of values less than 565		
99% of values less than 761		
Minimum 95	Maximum 840	
Mean 174.62	Std. Dev. 155.722	Variance 24249.3

Approx. time to Peak Conc. Chromium at Base of Unsaturated Zone [years]

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 0		
99% of values less than 20000		
Minimum 0	Maximum 20000	
Mean 543.886	Std. Dev. 3229.15	Variance 1.04274E+007

Approx. time to Peak Conc. Copper at Base of Unsaturated Zone [years]

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 20000		
99% of values less than 20000		
Minimum 0	Maximum 20000	
Mean 1638.36	Std. Dev. 5487.54	Variance 3.01131E+007

Approx. time to Peak Conc. Lead at Base of Unsaturated Zone [years]

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 20000		
99% of values less than 20000		
Minimum 0	Maximum 20000	
Mean 1421.3	Std. Dev. 5122.74	Variance 2.62424E+007

Approx. time to Peak Conc. Mercury at Base of Unsaturated Zone [years]

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0

Phase: PRWMF HRA 2

Approx. time to Peak Conc. Mercury at Base of Unsaturated Zone [years]

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0	Maximum 20000	
Mean 179.82	Std. Dev. 1888.82	Variance 3.56763E+006

Approx. time to Peak Conc. Nickel at Base of Unsaturated Zone [years]

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 20000
95% of values less than 20000
99% of values less than 20000

Minimum 0	Maximum 20000	
Mean 7179.29	Std. Dev. 9531.77	Variance 9.08546E+007

Approx. time to Peak Conc. Nitrite at Base of Unsaturated Zone [years]

01% of values less than 100
05% of values less than 100
10% of values less than 100
50% of values less than 100
90% of values less than 12189
95% of values less than 13458
99% of values less than 18114

Minimum 95	Maximum 18114	
Mean 2734.17	Std. Dev. 4840.47	Variance 2.34301E+007

Approx. time to Peak Conc. Potassium at Base of Unsaturated Zone [years]

01% of values less than 95
05% of values less than 100
10% of values less than 100
50% of values less than 100
90% of values less than 11039
95% of values less than 12189
99% of values less than 18114

Minimum 95	Maximum 18114	
Mean 1852.84	Std. Dev. 4132.41	Variance 1.70768E+007

Approx. time to Peak Conc. Toluene at Base of Unsaturated Zone [years]

01% of values less than 300
05% of values less than 624
10% of values less than 928
50% of values less than 3363
90% of values less than 8202
95% of values less than 9999

Phase: PRWMF HRA 2*Approx. time to Peak Conc. Toluene at Base of Unsaturated Zone [years]*

01% of values less than 300

05% of values less than 624

10% of values less than 928

50% of values less than 3363

90% of values less than 8202

95% of values less than 9999

99% of values less than 12189

Minimum 100

Maximum 14859

Mean 4038.02

Std. Dev. 2918.33

Variance 8.51667E+006

Approx. time to Peak Conc. Zinc at Base of Unsaturated Zone [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 12189

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 10921.3

Std. Dev. 8911.2

Variance 7.94094E+007

Phase: PRWMF HRA 2*Concentration of Ammoniacal_N at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

At 100 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

At 300 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

At 1000 years

01% of values less than 0.0229722

05% of values less than 0.0272401

10% of values less than 0.0315712

50% of values less than 0.0538845

90% of values less than 0.106487

95% of values less than 0.126147

99% of values less than 0.155197

Minimum 0.0204382

Maximum 0.177619

Mean 0.0624085

Std. Dev. 0.0303217

Variance 0.000919404

Phase: PRWMF HRA 2

Concentration of Ammoniacal_N at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.0229722		
05% of values less than 0.0272401		
10% of values less than 0.0315712		
50% of values less than 0.0538845		
90% of values less than 0.106487		
95% of values less than 0.126147		
99% of values less than 0.155197		
Minimum 0.0204382	Maximum 0.177619	
Mean 0.0624085	Std. Dev. 0.0303217	Variance 0.000919404

Phase: PRWMF HRA 2*Concentration of Arsenic at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

At 100 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

At 300 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

At 1000 years

01% of values less than 0.00208348

05% of values less than 0.00221475

10% of values less than 0.00231325

50% of values less than 0.00284798

90% of values less than 0.00384733

95% of values less than 0.00414896

99% of values less than 0.00459717

Minimum 0.002

Maximum 0.00496897

Mean 0.00298141

Std. Dev. 0.000601414

Variance 3.61698E-007

Phase: PRWMF HRA 2

Concentration of Arsenic at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.0020979		
05% of values less than 0.00221542		
10% of values less than 0.00231325		
50% of values less than 0.00284798		
90% of values less than 0.00384733		
95% of values less than 0.00414896		
99% of values less than 0.00459717		
Minimum 0.002	Maximum 0.00496897	
Mean 0.00298171	Std. Dev. 0.000601051	Variance 3.61262E-007

Phase: PRWMF HRA 2*Concentration of Benzene at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 3.42184E-012

95% of values less than 3.44983E-010

99% of values less than 9.23064E-008

Minimum 0

Maximum 7.00061E-007

Mean 3.18893E-009

Std. Dev. 3.2091E-008

Variance 1.02984E-015

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 1.64701E-010

90% of values less than 2.3893E-007

95% of values less than 4.91929E-007

99% of values less than 1.00678E-006

Minimum 0

Maximum 1.35224E-006

Mean 7.65847E-008

Std. Dev. 1.93263E-007

Variance 3.73507E-014

Phase: PRWMF HRA 2

Concentration of Benzene at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0		
05% of values less than 1.58906E-013		
10% of values less than 2.39959E-012		
50% of values less than 1.5518E-009		
90% of values less than 2.41799E-008		
95% of values less than 3.77794E-008		
99% of values less than 5.97799E-008		
Minimum 0	Maximum 1.18752E-007	
Mean 7.79168E-009	Std. Dev. 1.40017E-008	Variance 1.96048E-016

Phase: PRWMF HRA 2*Concentration of Cadmium at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 1.72901E-010

Mean 1.82191E-013

Std. Dev. 5.47278E-012

Variance 2.99513E-023

Phase: PRWMF HRA 2

Concentration of Cadmium at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 8.68559E-007		
95% of values less than 4.98002E-005		
99% of values less than 0.000671658		
Minimum 0	Maximum 0.00883888	
Mean 3.67036E-005	Std. Dev. 0.000367782	Variance 1.35263E-007

Phase: PRWMF HRA 2*Concentration of Chloride at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 514.67
05% of values less than 556.645
10% of values less than 586.043
50% of values less than 755.921
90% of values less than 915.052
95% of values less than 955.834
99% of values less than 1000.12

Minimum 489.334

Maximum 1034.41

Mean 752.686

Std. Dev. 120.866

Variance 14608.5

At 100 years

01% of values less than 514.67
05% of values less than 556.645
10% of values less than 586.043
50% of values less than 755.921
90% of values less than 915.052
95% of values less than 955.834
99% of values less than 1000.12

Minimum 489.334

Maximum 1034.41

Mean 752.686

Std. Dev. 120.866

Variance 14608.5

At 300 years

01% of values less than 528.912
05% of values less than 567.57
10% of values less than 602.809
50% of values less than 783.918
90% of values less than 974.084
95% of values less than 1025.58
99% of values less than 1430.62

Minimum 495.122

Maximum 1961.21

Mean 793.604

Std. Dev. 171.703

Variance 29482

At 1000 years

01% of values less than 558.088
05% of values less than 605.786
10% of values less than 653.474
50% of values less than 858.086
90% of values less than 1199.57
95% of values less than 1412.86
99% of values less than 1882.12

Minimum 497.808

Maximum 2819.05

Mean 910.362

Std. Dev. 271.608

Variance 73771.1

Phase: PRWMF HRA 2

Concentration of Chloride at Phase Monitor Well [mg/l]

At infinity

01% of values less than	520.557		
05% of values less than	556.701		
10% of values less than	586.545		
50% of values less than	755.921		
90% of values less than	915.593		
95% of values less than	955.886		
99% of values less than	1000.86		
Minimum	489.334	Maximum	1034.41
Mean	753.082	Std. Dev.	120.886
		Variance	14613.4

Phase: PRWMF HRA 2*Concentration of Chromium at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Concentration of Chromium at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 0		
99% of values less than 0		
Minimum 0	Maximum 0	
Mean 0	Std. Dev. 0	Variance 0

Phase: PRWMF HRA 2*Concentration of Copper at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

At 100 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

At 300 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

At 1000 years

01% of values less than 0.00145815

05% of values less than 0.00213093

10% of values less than 0.00312604

50% of values less than 0.0106208

90% of values less than 0.0251063

95% of values less than 0.030021

99% of values less than 0.0399207

Minimum 0.0010322

Maximum 0.0448732

Mean 0.0126197

Std. Dev. 0.00888313

Variance 7.891E-005

Phase: PRWMF HRA 2

Concentration of Copper at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.00145815		
05% of values less than 0.00213093		
10% of values less than 0.00312604		
50% of values less than 0.0106208		
90% of values less than 0.0251063		
95% of values less than 0.030021		
99% of values less than 0.0399207		
Minimum 0.0010322	Maximum 0.0448732	
Mean 0.0126197	Std. Dev. 0.00888313	Variance 7.891E-005

Phase: PRWMF HRA 2*Concentration of Lead at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

At 100 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

At 300 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

At 1000 years

01% of values less than 0.00105807

05% of values less than 0.00115906

10% of values less than 0.00122596

50% of values less than 0.00148367

90% of values less than 0.00175652

95% of values less than 0.00181984

99% of values less than 0.00191075

Minimum 0.00101992

Maximum 0.00199323

Mean 0.00148599

Std. Dev. 0.000201947

Variance 4.07827E-008

Phase: PRWMF HRA 2

Concentration of Lead at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.00105807		
05% of values less than 0.00115906		
10% of values less than 0.00122596		
50% of values less than 0.00148367		
90% of values less than 0.00175652		
95% of values less than 0.00181984		
99% of values less than 0.00191075		
Minimum 0.00101992	Maximum 0.00199323	
Mean 0.00148599	Std. Dev. 0.000201947	Variance 4.07827E-008

Phase: PRWMF HRA 2*Concentration of Mercury at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Concentration of Mercury at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0		
05% of values less than 0		
10% of values less than 0		
50% of values less than 0		
90% of values less than 0		
95% of values less than 0		
99% of values less than 0		
Minimum 0	Maximum 0	
Mean 0	Std. Dev. 0	Variance 0

Phase: PRWMF HRA 2*Concentration of Nickel at Phase Monitor Well [mg/l]***At 30 years**

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

At 100 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

At 300 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

At 1000 years

01% of values less than 0.00114965

05% of values less than 0.00148851

10% of values less than 0.00179209

50% of values less than 0.00380253

90% of values less than 0.00670669

95% of values less than 0.00733622

99% of values less than 0.00870991

Minimum 0.00107383

Maximum 0.00980376

Mean 0.00401096

Std. Dev. 0.0018175

Variance 3.30329E-006

Phase: PRWMF HRA 2

Concentration of Nickel at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.00114965		
05% of values less than 0.00148851		
10% of values less than 0.00179209		
50% of values less than 0.00380253		
90% of values less than 0.00670669		
95% of values less than 0.00733622		
99% of values less than 0.00870991		
Minimum 0.00107383	Maximum 0.00980376	
Mean 0.00401131	Std. Dev. 0.0018177	Variance 3.30404E-006

Phase: PRWMF HRA 2*Concentration of Nitrite at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0.0142484

05% of values less than 0.0195763

10% of values less than 0.0246077

50% of values less than 0.0842881

90% of values less than 0.243831

95% of values less than 0.294355

99% of values less than 0.368233

Minimum 0.0120171

Maximum 0.430283

Mean 0.110171

Std. Dev. 0.0859704

Variance 0.00739091

At 100 years

01% of values less than 0.0142484

05% of values less than 0.0195763

10% of values less than 0.0246077

50% of values less than 0.0842881

90% of values less than 0.243831

95% of values less than 0.294355

99% of values less than 0.368233

Minimum 0.0120171

Maximum 0.430283

Mean 0.110171

Std. Dev. 0.0859704

Variance 0.00739091

At 300 years

01% of values less than 0.015341

05% of values less than 0.0222449

10% of values less than 0.0302378

50% of values less than 0.0969975

90% of values less than 0.283569

95% of values less than 0.350299

99% of values less than 0.631517

Minimum 0.0120171

Maximum 1.68411

Mean 0.136199

Std. Dev. 0.137377

Variance 0.0188724

At 1000 years

01% of values less than 0.0226929

05% of values less than 0.0372708

10% of values less than 0.0517287

50% of values less than 0.166563

90% of values less than 0.522914

95% of values less than 0.804191

99% of values less than 1.80177

Minimum 0.016895

Maximum 3.89379

Mean 0.260281

Std. Dev. 0.327969

Variance 0.107564

Phase: PRWMF HRA 2

Concentration of Nitrite at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.0406825		
05% of values less than 0.0626242		
10% of values less than 0.089809		
50% of values less than 0.27382		
90% of values less than 0.997018		
95% of values less than 1.5898		
99% of values less than 2.6748		
Minimum 0.0177414	Maximum 4.88729	
Mean 0.446642	Std. Dev. 0.531859	Variance 0.282875

Phase: PRWMF HRA 2*Concentration of Potassium at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 37.6094

05% of values less than 40.7675

10% of values less than 42.6771

50% of values less than 54.5882

90% of values less than 68.2587

95% of values less than 71.1038

99% of values less than 76.6726

Minimum 35.585

Maximum 80.0644

Mean 55.0534

Std. Dev. 9.35546

Variance 87.5246

At 100 years

01% of values less than 37.6094

05% of values less than 40.7675

10% of values less than 42.6771

50% of values less than 54.5882

90% of values less than 68.2587

95% of values less than 71.1038

99% of values less than 76.6726

Minimum 35.585

Maximum 80.0644

Mean 55.0534

Std. Dev. 9.35546

Variance 87.5246

At 300 years

01% of values less than 38.3683

05% of values less than 42.2366

10% of values less than 45.0746

50% of values less than 59.7598

90% of values less than 113.2

95% of values less than 183.681

99% of values less than 452.504

Minimum 35.7195

Maximum 2106.05

Mean 80.762

Std. Dev. 98.0302

Variance 9609.92

At 1000 years

01% of values less than 43.3546

05% of values less than 51.5138

10% of values less than 58.4625

50% of values less than 111.637

90% of values less than 422.079

95% of values less than 623.526

99% of values less than 1188.25

Minimum 40.6093

Maximum 2673.15

Mean 200.078

Std. Dev. 237.748

Variance 56524.3

Phase: PRWMF HRA 2

Concentration of Potassium at Phase Monitor Well [mg/l]

At infinity

01% of values less than 53.9727		
05% of values less than 67.314		
10% of values less than 75.2939		
50% of values less than 234.364		
90% of values less than 962.319		
95% of values less than 1210.82		
99% of values less than 1830.5		
Minimum 42.2449	Maximum 2679.4	
Mean 390.405	Std. Dev. 405.45	Variance 164389

Phase: PRWMF HRA 2

Concentration of Toluene at Phase Monitor Well [mg/l]

At 30 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 100 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 3.71108E-012

Minimum 0

Maximum 1.87963E-009

Mean 2.72277E-012

Std. Dev. 6.02236E-011

Variance 3.62688E-021

At 1000 years

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 6.11208E-009
95% of values less than 6.56302E-008
99% of values less than 1.15922E-006

Minimum 0

Maximum 2.35821E-006

Mean 3.36177E-008

Std. Dev. 1.93397E-007

Variance 3.74025E-014

Phase: PRWMF HRA 2

Concentration of Toluene at Phase Monitor Well [mg/l]

At infinity

01% of values less than 1.34911E-010		
05% of values less than 1.92917E-009		
10% of values less than 5.11009E-009		
50% of values less than 8.38322E-008		
90% of values less than 2.62418E-007		
95% of values less than 3.55909E-007		
99% of values less than 5.33743E-007		
Minimum 0	Maximum 6.58381E-007	
Mean 1.15992E-007	Std. Dev. 1.17093E-007	Variance 1.37107E-014

Phase: PRWMF HRA 2*Concentration of Zinc at Phase Monitor Well [mg/l]*

At 30 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

At 100 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

At 300 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

At 1000 years

01% of values less than 0.0172252

05% of values less than 0.0206871

10% of values less than 0.0235498

50% of values less than 0.0403239

90% of values less than 0.0605198

95% of values less than 0.0643149

99% of values less than 0.0722025

Minimum 0.0155261

Maximum 0.0791868

Mean 0.0410106

Std. Dev. 0.0135555

Variance 0.000183753

Phase: PRWMF HRA 2

Concentration of Zinc at Phase Monitor Well [mg/l]

At infinity

01% of values less than 0.0177754		
05% of values less than 0.021167		
10% of values less than 0.0238102		
50% of values less than 0.0410144		
90% of values less than 0.0627778		
95% of values less than 0.0710374		
99% of values less than 0.13587		
Minimum 0.0156245	Maximum 0.470759	
Mean 0.0449831	Std. Dev. 0.0282202	Variance 0.000796382

Phase: PRWMF HRA 2*Approx. time to Peak Conc. Ammoniacal_N at Phase Monitor Well [years]*

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 3363

95% of values less than 6094

99% of values less than 11039

Minimum 0

Maximum 20000

Mean 936.814

Std. Dev. 2332.09

Variance 5.43866E+006

Approx. time to Peak Conc. Arsenic at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 1658.34

Std. Dev. 5517.89

Variance 3.04472E+007

Approx. time to Peak Conc. Benzene at Phase Monitor Well [years]

01% of values less than 565

05% of values less than 928

10% of values less than 1249

50% of values less than 3363

90% of values less than 8202

95% of values less than 9999

99% of values less than 12189

Minimum 420

Maximum 14859

Mean 4045.18

Std. Dev. 2756

Variance 7.59554E+006

Approx. time to Peak Conc. Cadmium at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 4831.34

Std. Dev. 8495.79

Variance 7.21785E+007

Phase: PRWMF HRA 2*Approx. time to Peak Conc. Chloride at Phase Monitor Well [years]*

01% of values less than 420

05% of values less than 565

10% of values less than 689

50% of values less than 1131

90% of values less than 2263

95% of values less than 2759

99% of values less than 3363

Minimum 300

Maximum 4999

Mean 1327.99

Std. Dev. 654.97

Variance 428986

Approx. time to Peak Conc. Chromium at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Copper at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 20000

Mean 79.9201

Std. Dev. 1262.38

Variance 1.59361E+006

Approx. time to Peak Conc. Lead at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 20000

Mean 117.996

Std. Dev. 1521.24

Variance 2.31418E+006

Phase: PRWMF HRA 2*Approx. time to Peak Conc. Mercury at Phase Monitor Well [years]*

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Approx. time to Peak Conc. Nickel at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 1716.4

Std. Dev. 5601.71

Variance 3.13792E+007

Approx. time to Peak Conc. Nitrite at Phase Monitor Well [years]

01% of values less than 11039

05% of values less than 11039

10% of values less than 12189

50% of values less than 20000

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 1681

Maximum 20000

Mean 18386.4

Std. Dev. 3033.93

Variance 9.20471E+006

Approx. time to Peak Conc. Potassium at Phase Monitor Well [years]

01% of values less than 11039

05% of values less than 12189

10% of values less than 12189

50% of values less than 20000

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 1681

Maximum 20000

Mean 18385.3

Std. Dev. 2966.48

Variance 8.80003E+006

Phase: PRWMF HRA 2*Approx. time to Peak Conc. Toluene at Phase Monitor Well [years]*

01% of values less than 1249

05% of values less than 2263

10% of values less than 3046

50% of values less than 9056

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 1024

Maximum 20000

Mean 10136.8

Std. Dev. 5915.44

Variance 3.49924E+007

Approx. time to Peak Conc. Zinc at Phase Monitor Well [years]

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 20000

95% of values less than 20000

99% of values less than 20000

Minimum 0

Maximum 20000

Mean 8116.48

Std. Dev. 9668.81

Variance 9.34858E+007

Phase: PRWMF HRA 2

Flow to Leachate Treatment Plant [l/day]

At 30 years

01% of values less than 2275.47

05% of values less than 3962.33

10% of values less than 4738.45

50% of values less than 8170.68

90% of values less than 11802.6

95% of values less than 12729.5

99% of values less than 14361.3

Minimum 563.988

Maximum 16689.1

Mean 8233.84

Std. Dev. 2666.47

Variance 7.11004E+006

At 100 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 300 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

At 1000 years

01% of values less than 0

05% of values less than 0

10% of values less than 0

50% of values less than 0

90% of values less than 0

95% of values less than 0

99% of values less than 0

Minimum 0

Maximum 0

Mean 0

Std. Dev. 0

Variance 0

Phase: PRWMF HRA 2

Flow to Leachate Treatment Plant [l/day]

At infinity

01% of values less than 0
05% of values less than 0
10% of values less than 0
50% of values less than 0
90% of values less than 0
95% of values less than 0
99% of values less than 0
Minimum 0
Mean 0

Maximum 0
Std. Dev. 0
Variance 0

Phase: PRWMF HRA 2

Head on EBS [m]

At 1000 years

01% of values less than	3.06793		
05% of values less than	3.29203		
10% of values less than	3.60927		
50% of values less than	6.30015		
90% of values less than	9.01004		
95% of values less than	9.52574		
99% of values less than	9.91775		
Minimum	3.00705	Maximum	9.99509
Mean	6.33165	Std. Dev.	1.95598
		Variance	3.82587

At infinity

01% of values less than	3.06793		
05% of values less than	3.29203		
10% of values less than	3.60927		
50% of values less than	6.30015		
90% of values less than	9.01004		
95% of values less than	9.52574		
99% of values less than	9.91775		
Minimum	3.00705	Maximum	9.99509
Mean	6.33165	Std. Dev.	1.95598
		Variance	3.82587

Phase: PRWMF HRA 2

Surface Breakout [l/day]

At 300 years

01% of values less than 3127.99

05% of values less than 4589.6

10% of values less than 5575.03

50% of values less than 8880.7

90% of values less than 12348.7

95% of values less than 13317.3

99% of values less than 15150

Minimum 0

Maximum 17838.6

Mean 8914.81

Std. Dev. 2623.63

Variance 6.88341E+006

At 1000 years

01% of values less than 6614.5

05% of values less than 12126

10% of values less than 15347

50% of values less than 26493.9

90% of values less than 38222.3

95% of values less than 41907.9

99% of values less than 48231.4

Minimum 0

Maximum 58641.3

Mean 26687.4

Std. Dev. 9053.44

Variance 8.19648E+007

At infinity

01% of values less than 6614.5

05% of values less than 12126

10% of values less than 15347

50% of values less than 26493.9

90% of values less than 38222.3

95% of values less than 41907.9

99% of values less than 48231.4

Minimum 0

Maximum 58641.3

Mean 26686

Std. Dev. 9055.09

Variance 8.19947E+007

Phase: PRWMF HRA 2

Leakage through EBS [l/day]

At 100 years

01% of values less than 141.735

05% of values less than 161.612

10% of values less than 176.896

50% of values less than 397.109

90% of values less than 1247.26

95% of values less than 1646.94

99% of values less than 2479.28

Minimum 131.383

Maximum 3268.44

Mean 579.772

Std. Dev. 507.778

Variance 257839

At 300 years

01% of values less than 142.436

05% of values less than 162.148

10% of values less than 177.522

50% of values less than 402.988

90% of values less than 1277.34

95% of values less than 1708.14

99% of values less than 2479.28

Minimum 131.383

Maximum 3268.44

Mean 585.787

Std. Dev. 514.13

Variance 264330

At 1000 years

01% of values less than 141.735

05% of values less than 162.148

10% of values less than 177.003

50% of values less than 402.369

90% of values less than 1277.34

95% of values less than 1724.13

99% of values less than 2479.28

Minimum 65.7358

Maximum 3268.44

Mean 588.03

Std. Dev. 517.251

Variance 267549

At infinity

01% of values less than 141.735

05% of values less than 162.148

10% of values less than 177.003

50% of values less than 402.369

90% of values less than 1282.99

95% of values less than 1733.97

99% of values less than 2479.28

Minimum 65.7358

Maximum 3268.44

Mean 589.421

Std. Dev. 519.595

Variance 269979

Phase: PRWMF HRA 2Aquifer Flow [m³/year]

At 30 years

01% of values less than 3.83573

05% of values less than 5.02725

10% of values less than 6.47956

50% of values less than 69.7183

90% of values less than 604.345

95% of values less than 849.448

99% of values less than 1035.2

Minimum 0

Maximum 1244.29

Mean 196.952

Std. Dev. 263.968

Variance 69679

At 100 years

01% of values less than 62.0976

05% of values less than 74.8445

10% of values less than 93.1095

50% of values less than 300.282

90% of values less than 918.089

95% of values less than 1097.73

99% of values less than 1384.67

Minimum 0

Maximum 1981.03

Mean 407.37

Std. Dev. 328.304

Variance 107784

At 300 years

01% of values less than 62.0976

05% of values less than 74.8445

10% of values less than 93.1095

50% of values less than 303.502

90% of values less than 926.613

95% of values less than 1109.56

99% of values less than 1389.09

Minimum 0

Maximum 1981.03

Mean 409.654

Std. Dev. 330.789

Variance 109422

At 1000 years

01% of values less than 62.0976

05% of values less than 74.8445

10% of values less than 93.1095

50% of values less than 303.619

90% of values less than 926.613

95% of values less than 1109.56

99% of values less than 1389.09

Minimum 0

Maximum 1981.03

Mean 410.45

Std. Dev. 331.006

Variance 109565

Phase: PRWMF HRA 2

Aquifer Flow [m³/year]

At infinity

01% of values less than	62.0976		
05% of values less than	74.8445		
10% of values less than	93.1095		
50% of values less than	303.619		
90% of values less than	926.613		
95% of values less than	1109.56		
99% of values less than	1389.09		
Minimum	0	Maximum	1981.03
Mean	410.957	Std. Dev.	331.224
		Variance	109709



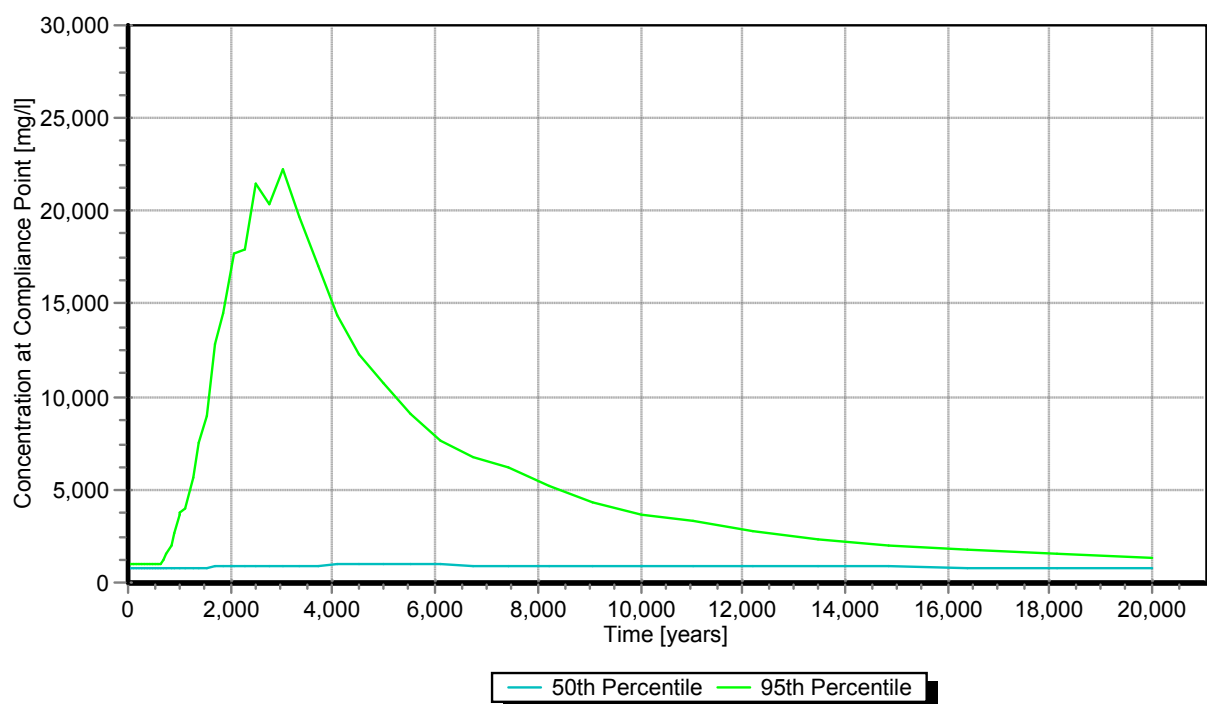
Appendix E: Sensitivity Analysis-Class IV

LandSim Version 2.5

Project Name: Phase 2

Customer: Shire of Ashburton

Results: Chloride Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model-CIV leachate data.sim

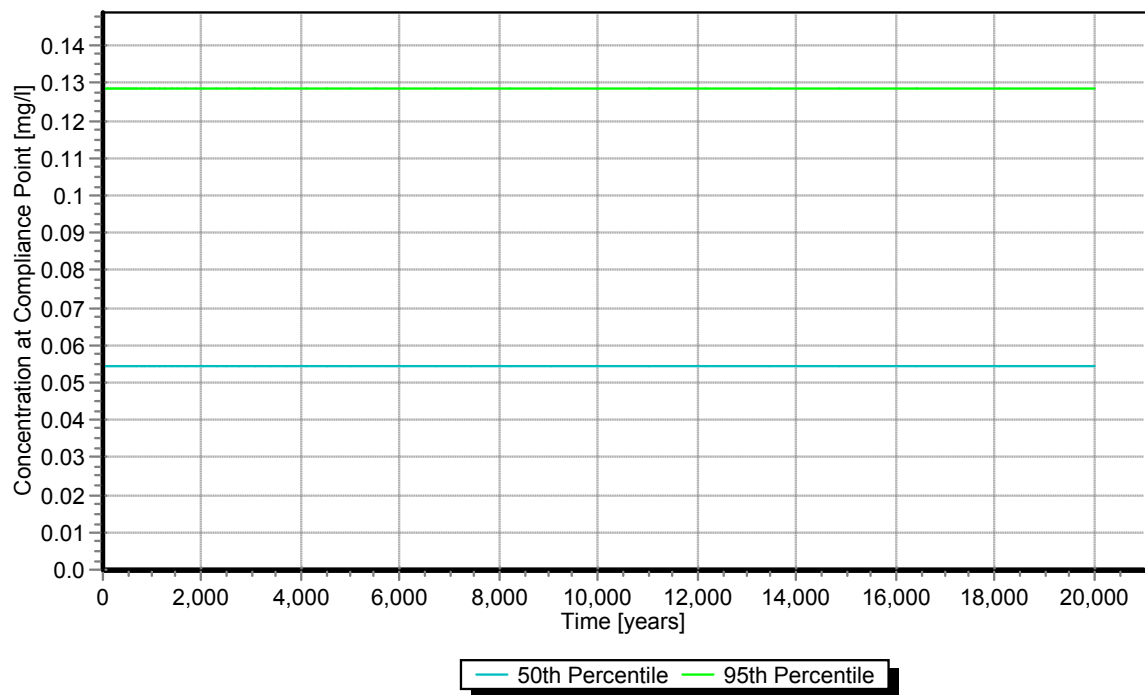
18/10/2018 03:08:30

LandSim Version 2.5

Project Name: Phase 2

Customer: Shire of Ashburton

Results: Ammoniacal_N Concentration at Compliance Point [mg/l]



\\TW18036-Onslow Main Model-CIV leachate data.sim

18/10/2018 03:08:30



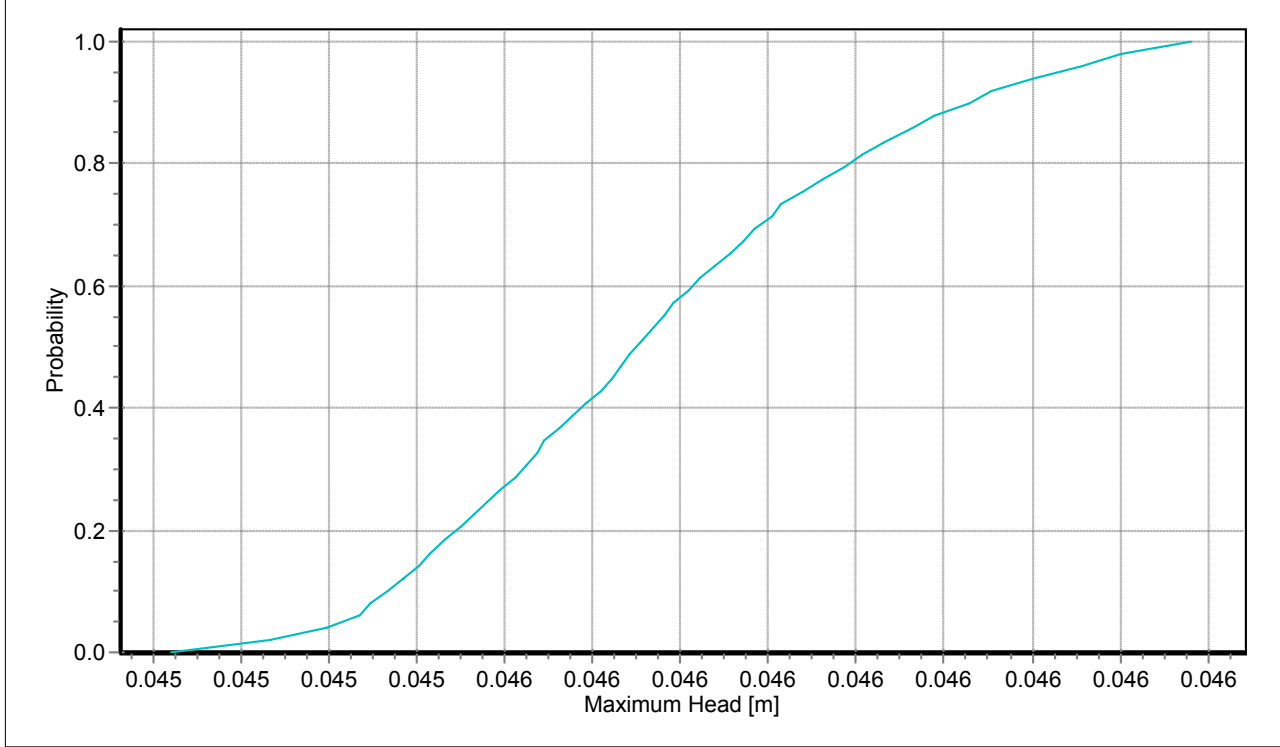
Appendix F: Sensitivity Analysis Model 1

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: PRWMF HRA 2, Maximum Head [m]



\\TW18036-Onslow higher K Model.sim	17/10/2018 09:03:59

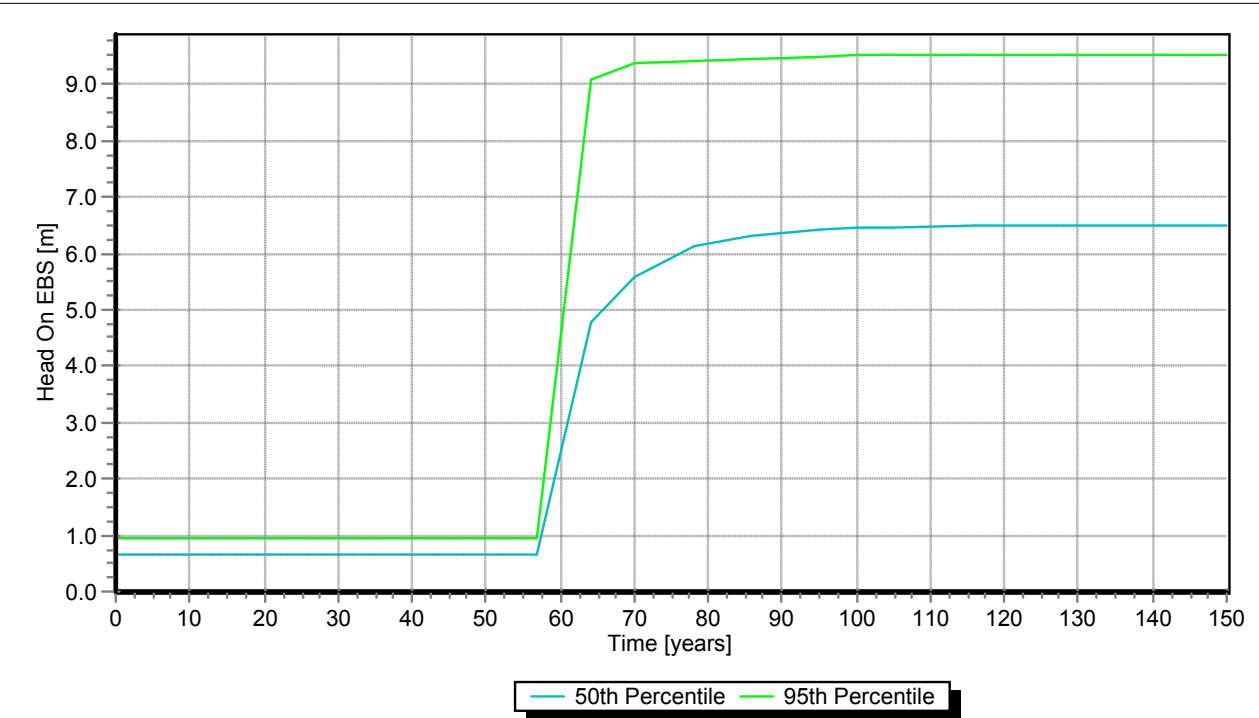
17/10/2018 09:03:59

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: PRWMF HRA 2, Head On EBS [m]



\\TW18036-Onslow higher K Model.sim

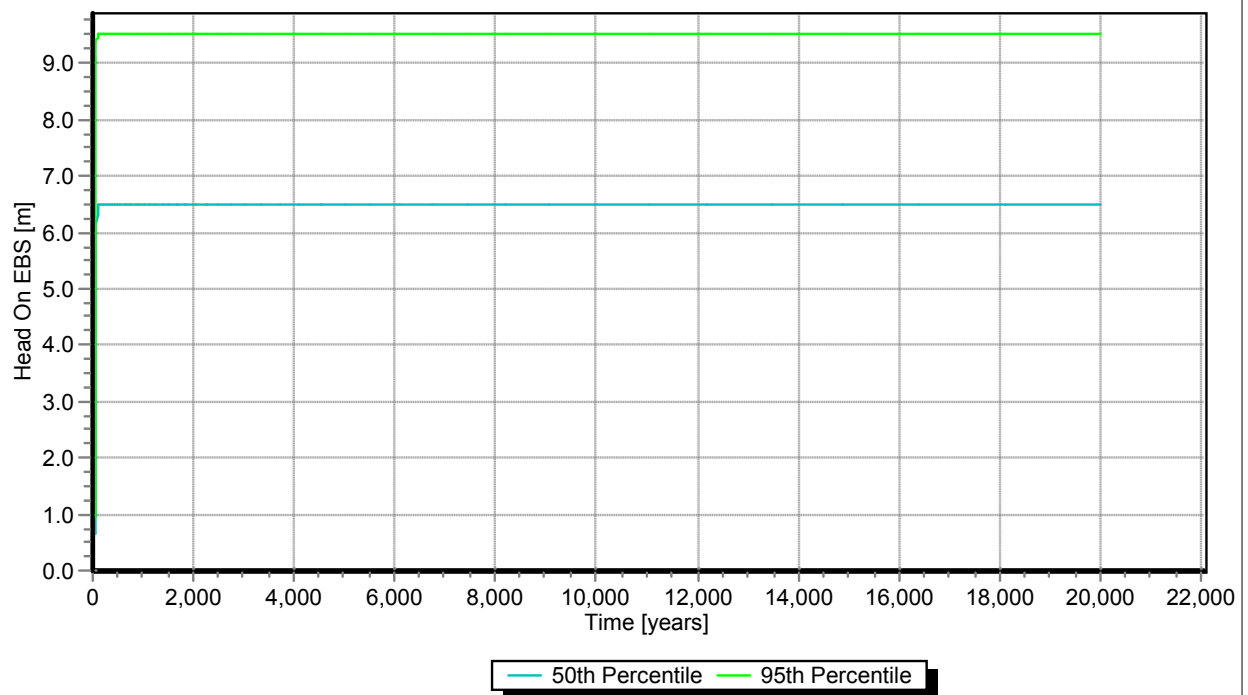
17/10/2018 08:54:09

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: PRWMF HRA 2, Head On EBS [m]



\\TW18036-Onslow higher K Model.sim

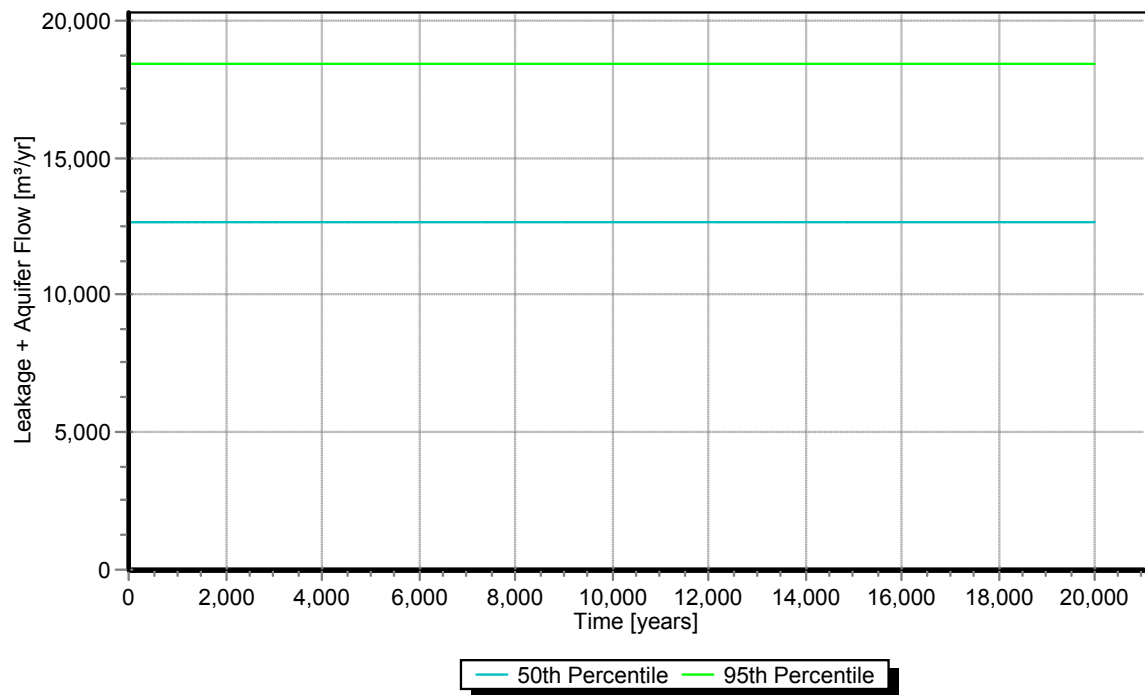
17/10/2018 08:54:09

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: PRWMF HRA 2, Leakage + Aquifer Flow [m³/yr]



\\TW18036-Onslow higher K Model.sim

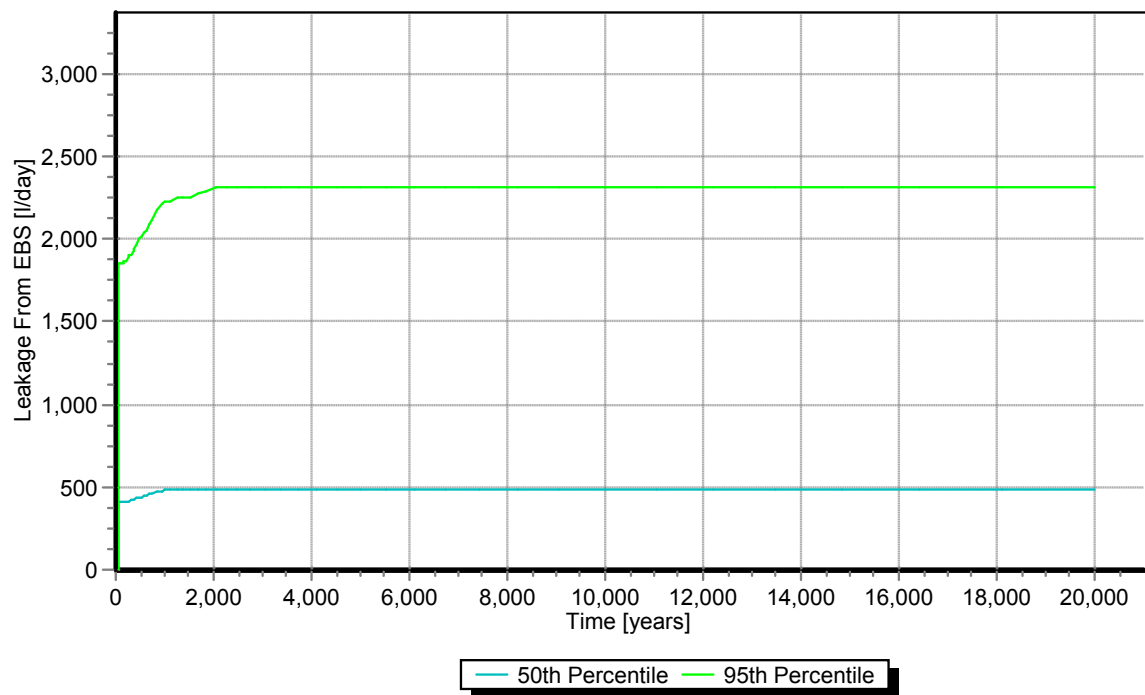
18/10/2018 03:20:01

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: PRWMF HRA 2, Leakage From EBS [l/day]



\\TW18036-Onslow higher K Model.sim

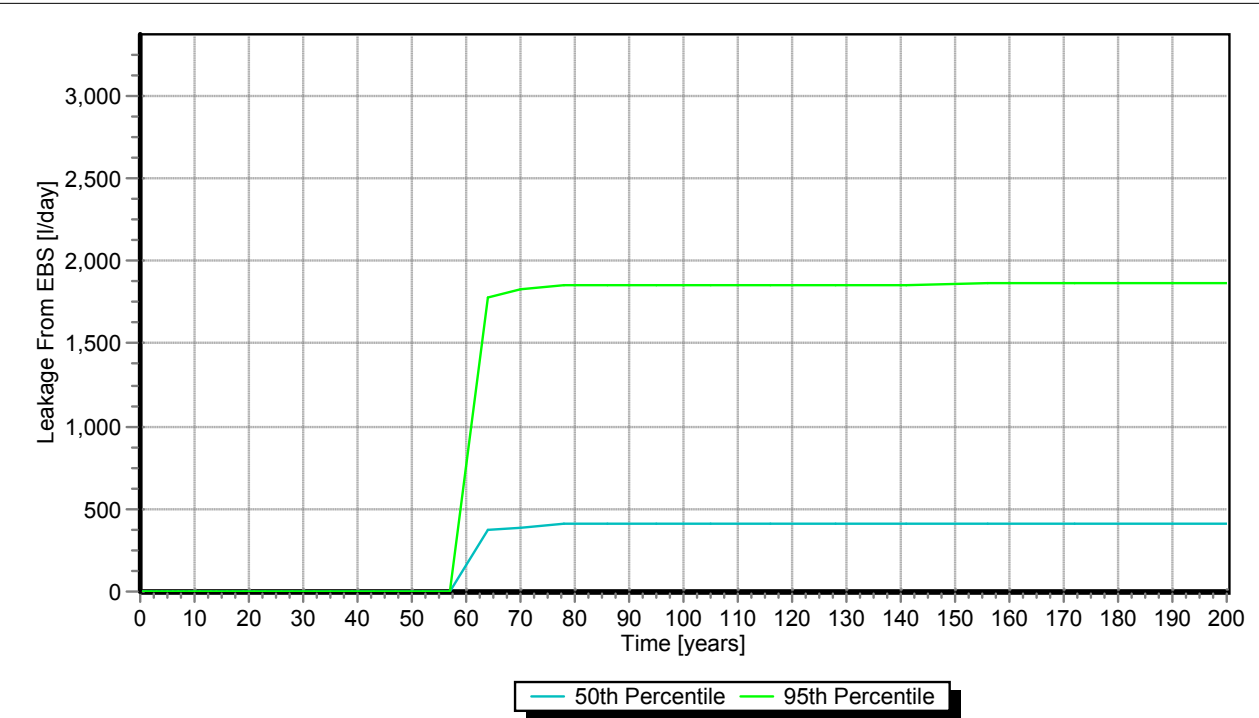
18/10/2018 03:20:01

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: PRWMF HRA 2, Leakage From EBS [l/day]

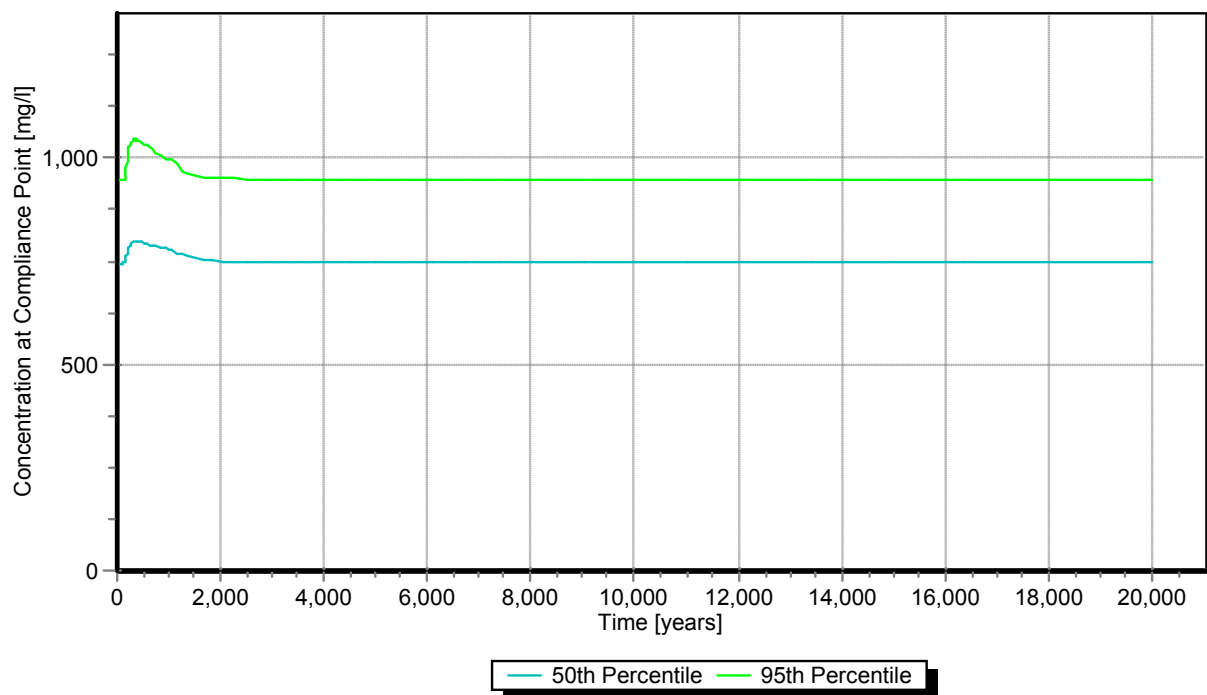


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Chloride Concentration at Compliance Point [mg/l]



\\TW18036-Onslow higher K Model.sim

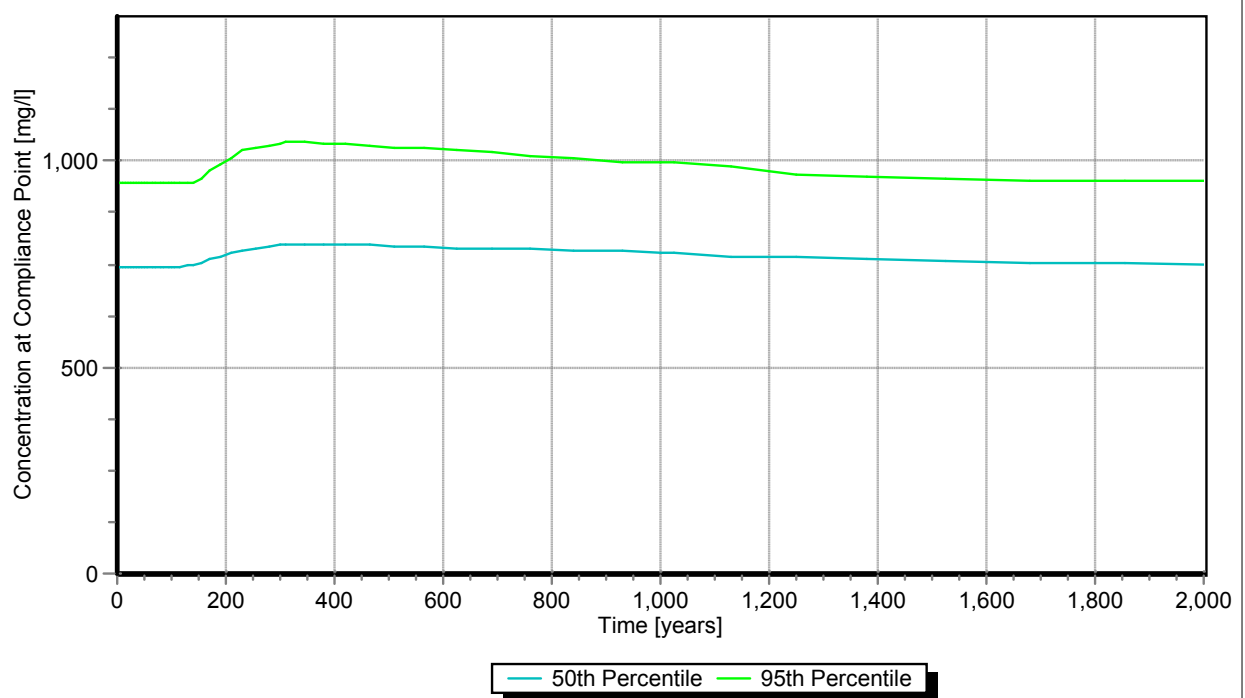
17/10/2018 09:15:20

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Chloride Concentration at Compliance Point [mg/l]



\\TW18036-Onslow higher K Model.sim

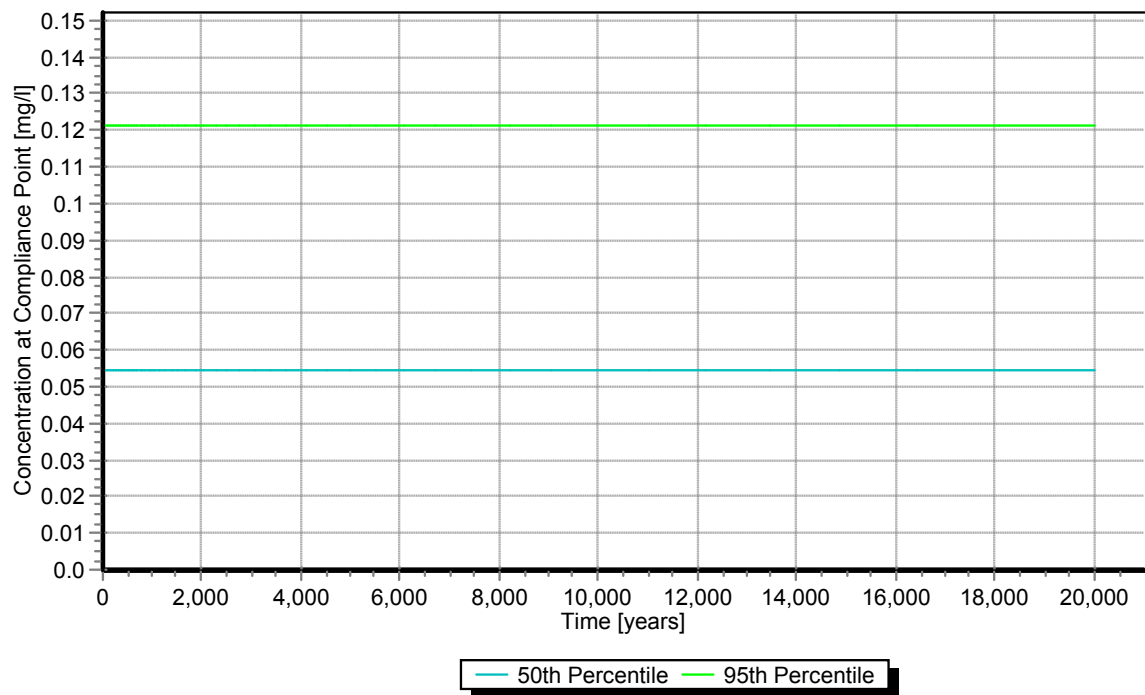
17/10/2018 09:15:20

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Ammoniacal_N Concentration at Compliance Point [mg/l]



\\TW18036-Onslow higher K Model.sim

17/10/2018 09:15:20

Concentration of Ammoniacal_N in groundwater [mg/l]

At 30 years

01% of values less than 0.0230013

05% of values less than 0.0270418

10% of values less than 0.0302387

50% of values less than 0.0548034

90% of values less than 0.10566

95% of values less than 0.125446

99% of values less than 0.158642

Minimum 0.0201538

Maximum 0.170808

Mean 0.0623921

Std. Dev. 0.0303595

Variance 0.000921701

At 100 years

01% of values less than 0.0230013

05% of values less than 0.0270418

10% of values less than 0.0302387

50% of values less than 0.0548034

90% of values less than 0.10566

95% of values less than 0.125446

99% of values less than 0.158642

Minimum 0.0201538

Maximum 0.170808

Mean 0.0623921

Std. Dev. 0.0303595

Variance 0.000921701

At 300 years

01% of values less than 0.0230013

05% of values less than 0.0270418

10% of values less than 0.0302387

50% of values less than 0.0548034

90% of values less than 0.10566

95% of values less than 0.125446

99% of values less than 0.158642

Minimum 0.0201538

Maximum 0.170808

Mean 0.0623921

Std. Dev. 0.0303595

Variance 0.000921701

At 1000 years

01% of values less than 0.0230013

05% of values less than 0.0270418

10% of values less than 0.0302387

50% of values less than 0.0548034

90% of values less than 0.10566

95% of values less than 0.125446

99% of values less than 0.158642

Minimum 0.0201538

Maximum 0.170808

Mean 0.0623921

Std. Dev. 0.0303595

Variance 0.000921701

Concentration of Ammoniacal_N in groundwater [mg/l]

At infinity

01% of values less than 0.0230013		
05% of values less than 0.0270418		
10% of values less than 0.0302387		
50% of values less than 0.0548034		
90% of values less than 0.10566		
95% of values less than 0.125446		
99% of values less than 0.158642		
Minimum 0.0201538	Maximum 0.170808	
Mean 0.0623921	Std. Dev. 0.0303595	Variance 0.000921701

Concentration of Chloride in groundwater [mg/l]

At 30 years

01% of values less than 509.322

05% of values less than 553.209

10% of values less than 578.194

50% of values less than 749.946

90% of values less than 914.084

95% of values less than 944.327

99% of values less than 1018.39

Minimum 489.191

Maximum 1044.08

Mean 748.113

Std. Dev. 123.199

Variance 15178

At 100 years

01% of values less than 509.322

05% of values less than 553.209

10% of values less than 578.194

50% of values less than 749.946

90% of values less than 914.084

95% of values less than 944.329

99% of values less than 1018.39

Minimum 489.194

Maximum 1044.08

Mean 748.118

Std. Dev. 123.199

Variance 15178

At 300 years

01% of values less than 526.506

05% of values less than 572.058

10% of values less than 602.021

50% of values less than 799.094

90% of values less than 1005.41

95% of values less than 1072.69

99% of values less than 1270.81

Minimum 494.769

Maximum 1704.82

Mean 805.565

Std. Dev. 159.565

Variance 25460.8

At 1000 years

01% of values less than 522.851

05% of values less than 570.588

10% of values less than 597.359

50% of values less than 786.267

90% of values less than 949.964

95% of values less than 1009.65

99% of values less than 1093.32

Minimum 494.333

Maximum 1410.14

Mean 782.259

Std. Dev. 135.069

Variance 18243.7

Concentration of Chloride in groundwater [mg/l]

At infinity

01% of values less than	509.322		
05% of values less than	553.209		
10% of values less than	578.194		
50% of values less than	749.946		
90% of values less than	914.084		
95% of values less than	944.327		
99% of values less than	1018.39		
Minimum	489.191	Maximum	1044.08
Mean	748.121	Std. Dev.	123.205
		Variance	15179.6

Concentration of Zinc in groundwater [mg/l]

At 30 years

01% of values less than 0.0179575

05% of values less than 0.0207233

10% of values less than 0.0239536

50% of values less than 0.0409187

90% of values less than 0.0605708

95% of values less than 0.0646663

99% of values less than 0.0710374

Minimum 0.0155894

Maximum 0.0783819

Mean 0.0413031

Std. Dev. 0.0133795

Variance 0.00017901

At 100 years

01% of values less than 0.0179575

05% of values less than 0.0207233

10% of values less than 0.0239536

50% of values less than 0.0409187

90% of values less than 0.0605708

95% of values less than 0.0646663

99% of values less than 0.0710374

Minimum 0.0155894

Maximum 0.0783819

Mean 0.0413031

Std. Dev. 0.0133795

Variance 0.00017901

At 300 years

01% of values less than 0.0179575

05% of values less than 0.0207233

10% of values less than 0.0239536

50% of values less than 0.0409187

90% of values less than 0.0605708

95% of values less than 0.0646663

99% of values less than 0.0710374

Minimum 0.0155894

Maximum 0.0783819

Mean 0.0413031

Std. Dev. 0.0133795

Variance 0.00017901

At 1000 years

01% of values less than 0.0179575

05% of values less than 0.0207233

10% of values less than 0.0239536

50% of values less than 0.0409187

90% of values less than 0.0605708

95% of values less than 0.0646663

99% of values less than 0.0710374

Minimum 0.0155894

Maximum 0.0783819

Mean 0.0413031

Std. Dev. 0.0133795

Variance 0.00017901

Concentration of Zinc in groundwater [mg/l]

At infinity

01% of values less than 0.0180571		
05% of values less than 0.0208558		
10% of values less than 0.0243484		
50% of values less than 0.0416226		
90% of values less than 0.0621487		
95% of values less than 0.0675369		
99% of values less than 0.129865		
Minimum 0.0155919	Maximum 3.507	
Mean 0.0480258	Std. Dev. 0.114102	Variance 0.0130192

Phase: PRWMF HRA 2

Head on EBS [m]

At infinity

01% of values less than 3.07199		
05% of values less than 3.36894		
10% of values less than 3.7727		
50% of values less than 6.66247		
90% of values less than 9.32194		
95% of values less than 9.63982		
99% of values less than 9.92608		
Minimum 3.0032	Maximum 9.98334	
Mean 6.58528	Std. Dev. 2.00648	Variance 4.02597

Phase: PRWMF HRA 2

Leakage through EBS [l/day]

At 1000 years

01% of values less than 171.517

05% of values less than 195.037

10% of values less than 214.044

50% of values less than 482.622

90% of values less than 1659.29

95% of values less than 2230.7

99% of values less than 3370.02

Minimum 146.071

Maximum 4298.68

Mean 752.741

Std. Dev. 706.919

Variance 499735

At infinity

01% of values less than 171.517

05% of values less than 195.037

10% of values less than 214.044

50% of values less than 482.622

90% of values less than 1670.73

95% of values less than 2311.53

99% of values less than 3371.55

Minimum 146.071

Maximum 4298.68

Mean 758.065

Std. Dev. 718.091

Variance 515654

Phase: PRWMF HRA 2Aquifer Flow [m³/year]

At 300 years

01% of values less than 7762.3
05% of values less than 8632.3
10% of values less than 9252.83
50% of values less than 12632.6
90% of values less than 17084.3
95% of values less than 18380.2
99% of values less than 20288.7

Minimum 0

Maximum 21501.7

Mean 12866.6

Std. Dev. 3010.11

Variance 9.06076E+006

At 1000 years

01% of values less than 7762.3
05% of values less than 8649.26
10% of values less than 9252.83
50% of values less than 12633.4
90% of values less than 17084.3
95% of values less than 18380.2
99% of values less than 20288.7

Minimum 0

Maximum 21501.7

Mean 12873.6

Std. Dev. 3006.72

Variance 9.04037E+006

At infinity

01% of values less than 7762.3
05% of values less than 8649.26
10% of values less than 9252.83
50% of values less than 12633.4
90% of values less than 17084.3
95% of values less than 18380.2
99% of values less than 20288.7

Minimum 0

Maximum 21501.7

Mean 12874.9

Std. Dev. 3007.03

Variance 9.04224E+006



Appendix G: Sensitivity Analysis-Model

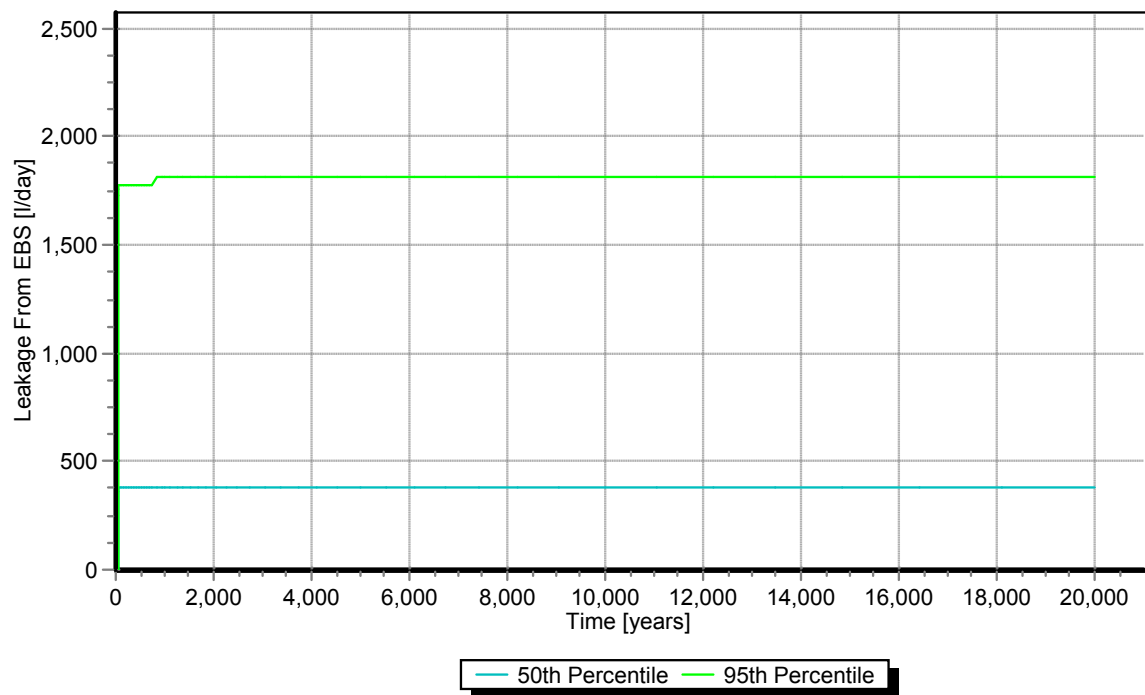
2

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: PRWMF HRA 2, Leakage From EBS [l/day]



\\TW18036-Onslow higher K and HOL.sim

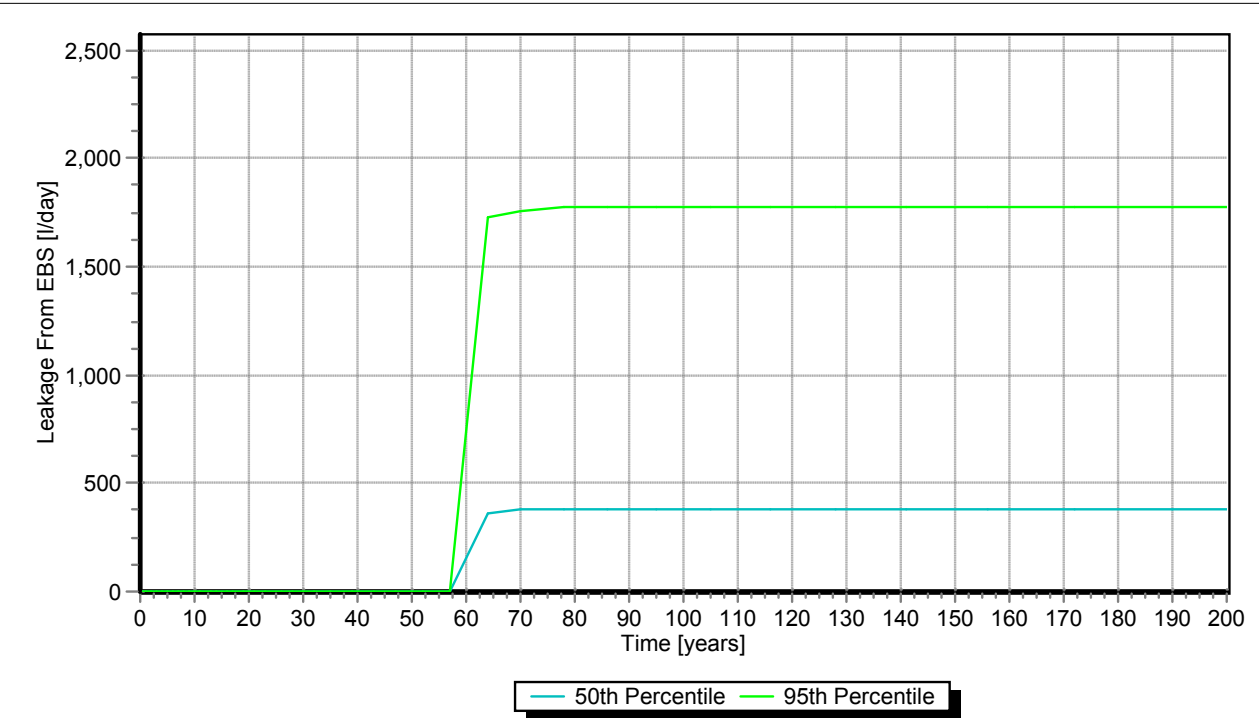
18/10/2018 03:17:44

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: PRWMF HRA 2, Leakage From EBS [l/day]

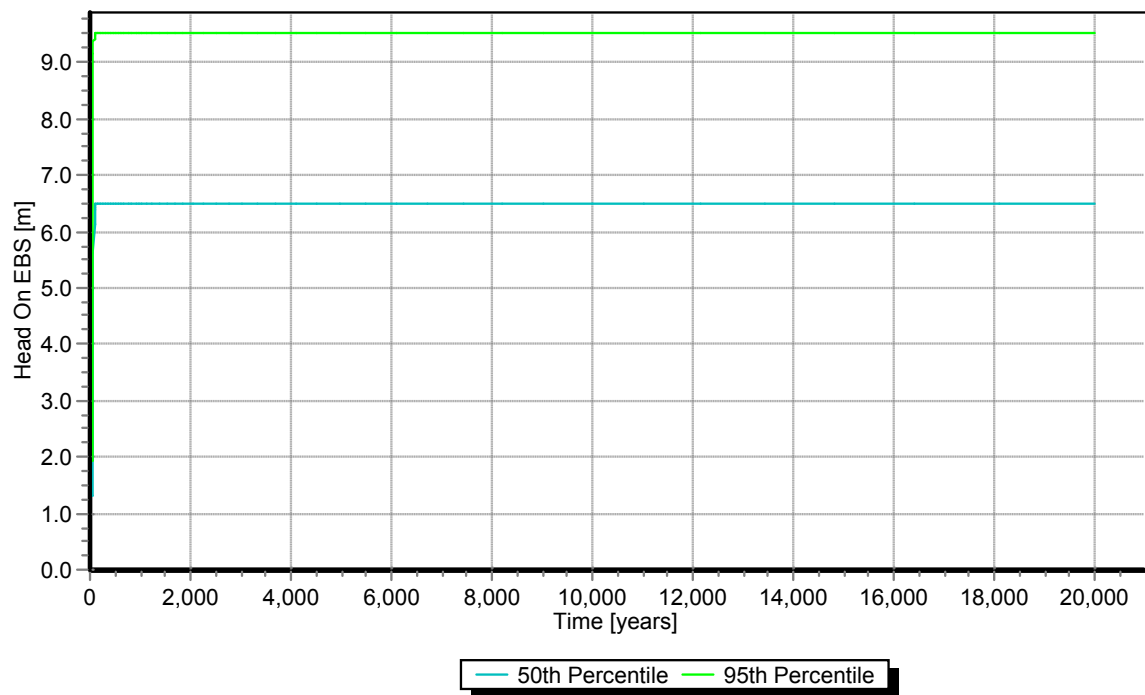


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: PRWMF HRA 2, Head On EBS [m]



\\TW18036-Onslow higher K and HOL.sim

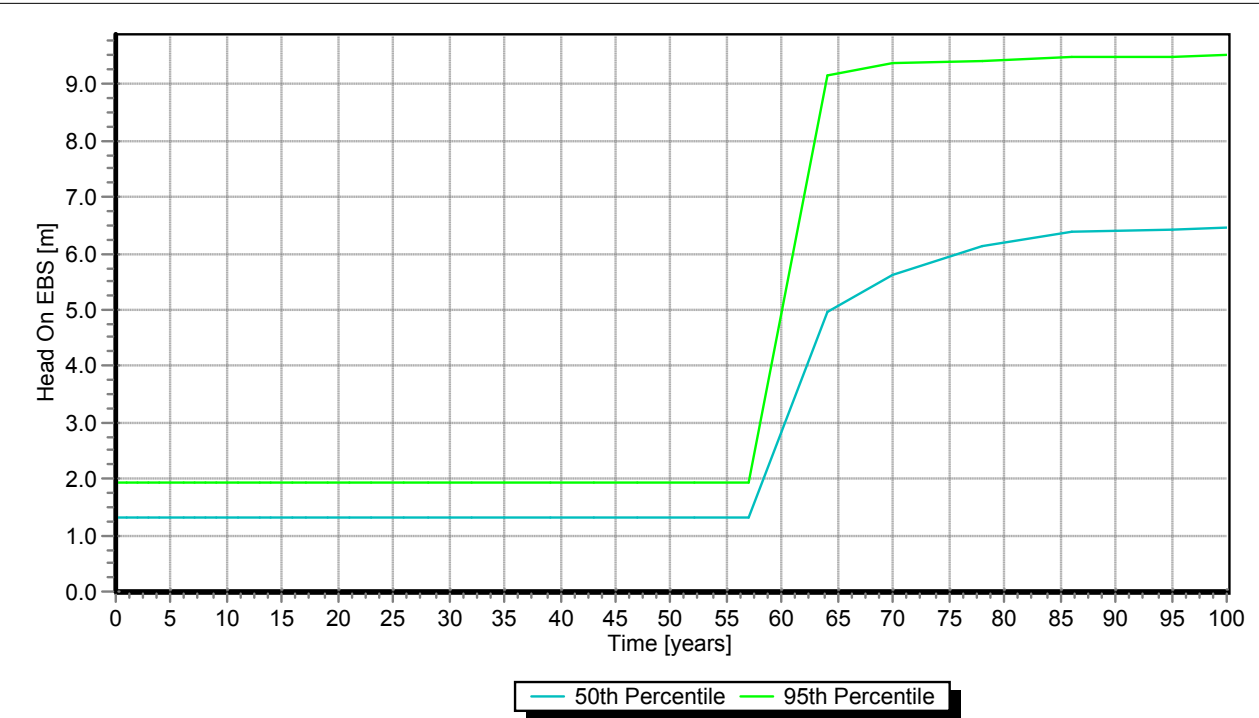
17/10/2018 08:57:13

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: PRWMF HRA 2, Head On EBS [m]



\\TW18036-Onslow higher K and HOL.sim

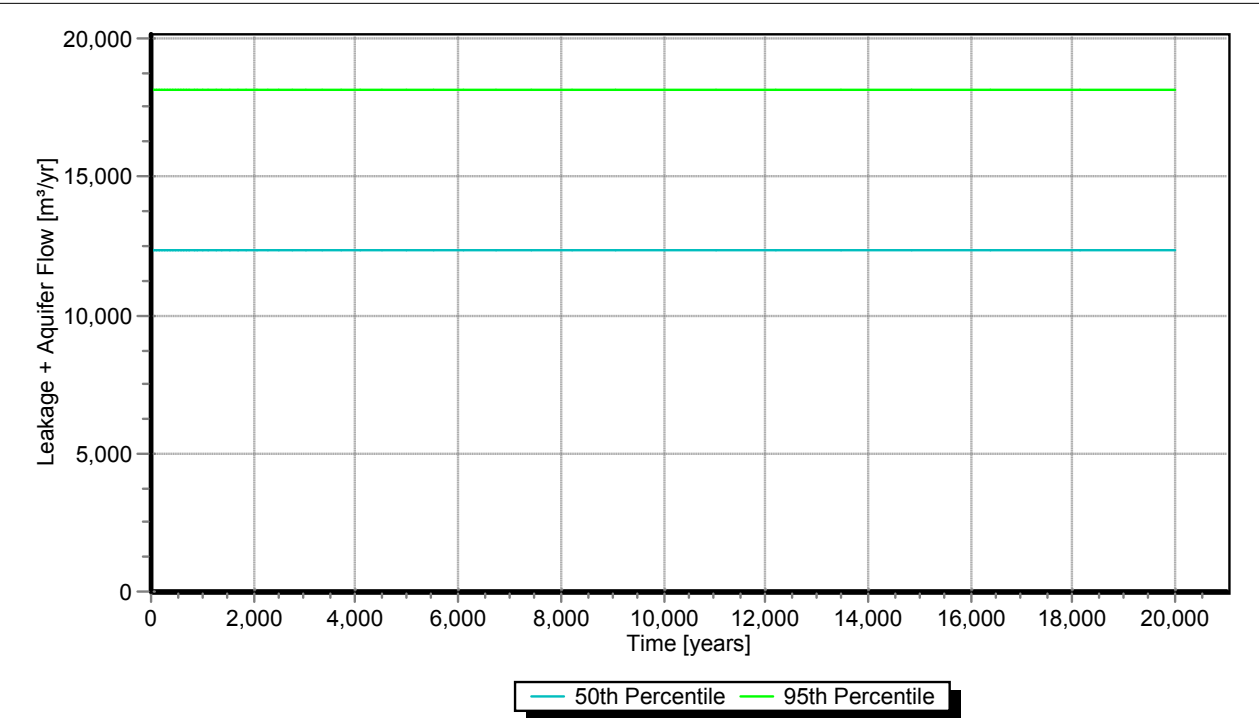
17/10/2018 08:57:13

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer:Shire of Ashburton

Results: PRWMF HRA 2, Leakage + Aquifer Flow [m³/yr]

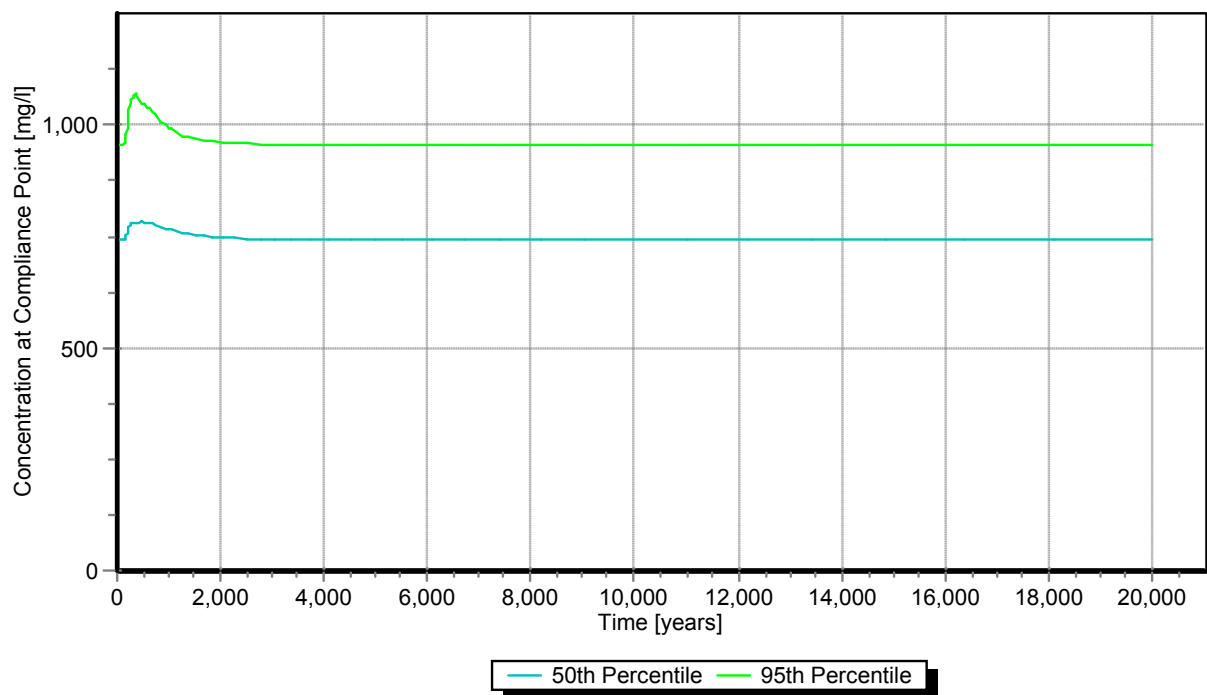


LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Chloride Concentration at Compliance Point [mg/l]



\\TW18036-Onslow higher K and HOL.sim

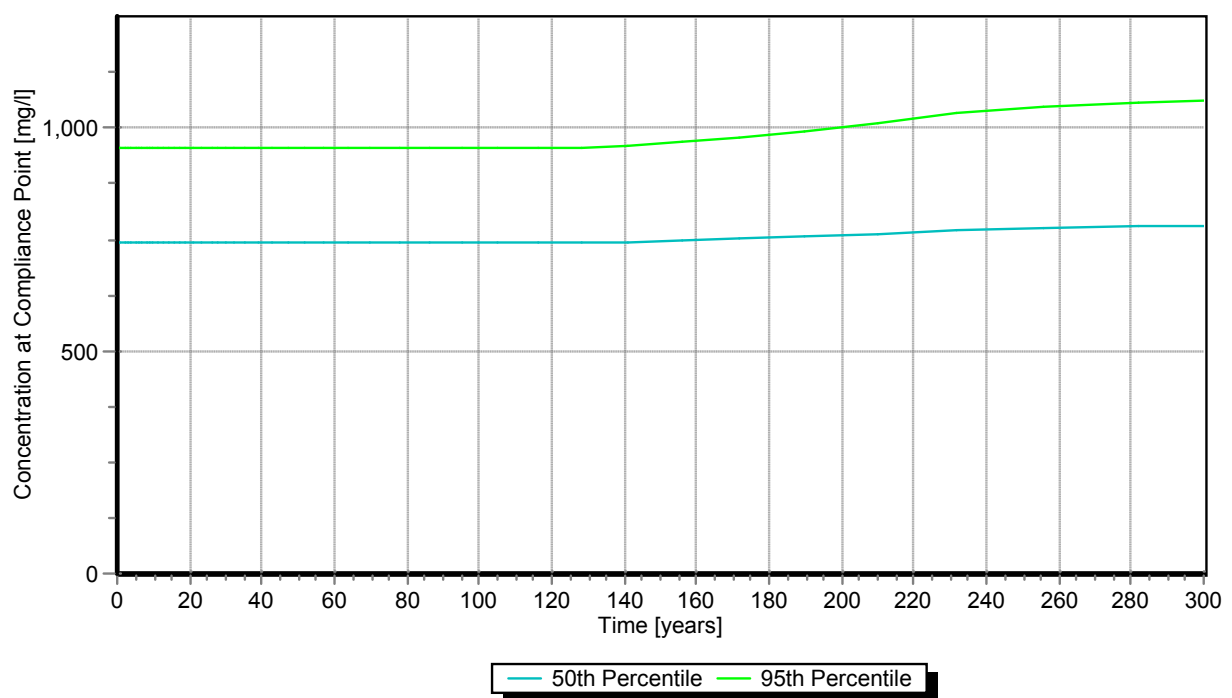
17/10/2018 09:03:31

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Chloride Concentration at Compliance Point [mg/l]



\\TW18036-Onslow higher K and HOL.sim

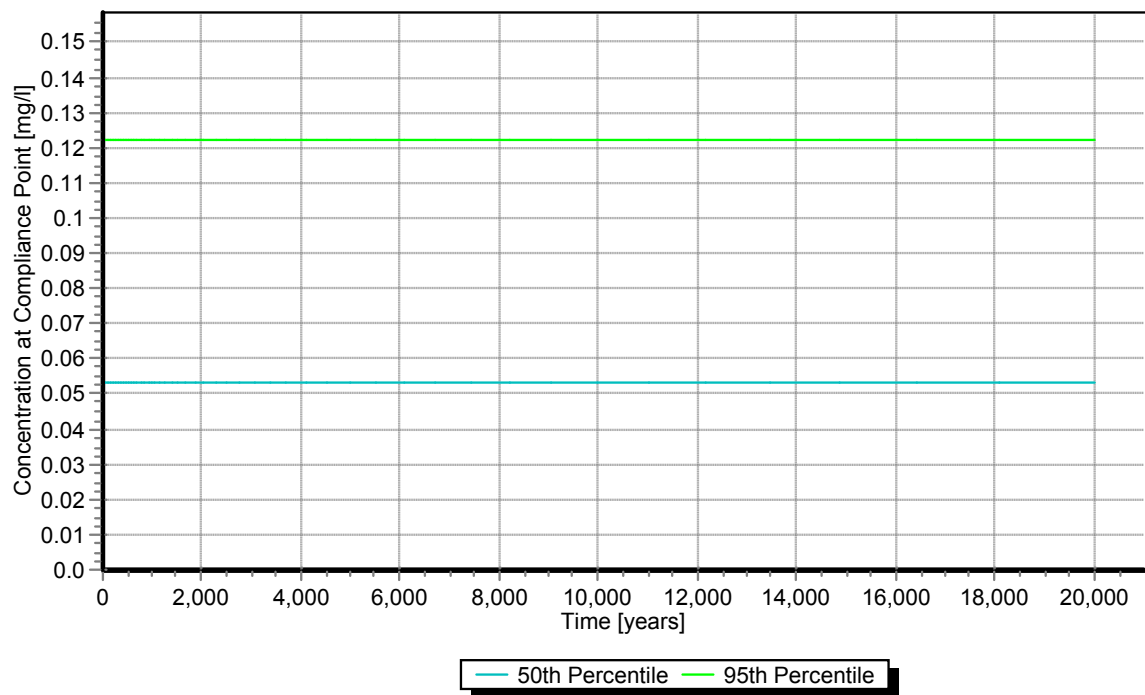
17/10/2018 09:03:31

LandSim Version 2.5

Project Name: PRWMF HRA2

Customer: Shire of Ashburton

Results: Ammoniacal_N Concentration at Compliance Point [mg/l]



\\TW18036-Onslow higher K and HOL.sim

17/10/2018 09:03:31

Concentration of Ammoniacal_N in groundwater [mg/l]

At 30 years

01% of values less than 0.0228333

05% of values less than 0.027157

10% of values less than 0.0319582

50% of values less than 0.0546019

90% of values less than 0.107573

95% of values less than 0.128408

99% of values less than 0.148863

Minimum 0.0205379

Maximum 0.167546

Mean 0.062689

Std. Dev. 0.0299847

Variance 0.000899082

At 100 years

01% of values less than 0.0228333

05% of values less than 0.027157

10% of values less than 0.0319582

50% of values less than 0.0546019

90% of values less than 0.107573

95% of values less than 0.128408

99% of values less than 0.148863

Minimum 0.0205379

Maximum 0.167546

Mean 0.062689

Std. Dev. 0.0299847

Variance 0.000899082

At 300 years

01% of values less than 0.0228333

05% of values less than 0.027157

10% of values less than 0.0319582

50% of values less than 0.0546019

90% of values less than 0.107573

95% of values less than 0.128408

99% of values less than 0.148863

Minimum 0.0205379

Maximum 0.167546

Mean 0.062689

Std. Dev. 0.0299847

Variance 0.000899082

At 1000 years

01% of values less than 0.0228333

05% of values less than 0.027157

10% of values less than 0.0319582

50% of values less than 0.0546019

90% of values less than 0.107573

95% of values less than 0.128408

99% of values less than 0.148863

Minimum 0.0205379

Maximum 0.167546

Mean 0.062689

Std. Dev. 0.0299847

Variance 0.000899082

Concentration of Ammoniacal_N in groundwater [mg/l]

At infinity

01% of values less than 0.0228333		
05% of values less than 0.027157		
10% of values less than 0.0319582		
50% of values less than 0.0546019		
90% of values less than 0.107573		
95% of values less than 0.128408		
99% of values less than 0.148863		
Minimum 0.0205379	Maximum 0.167546	
Mean 0.062689	Std. Dev. 0.0299847	Variance 0.000899082

Concentration of Chloride in groundwater [mg/l]

At 30 years

01% of values less than 508.756

05% of values less than 551.418

10% of values less than 583.517

50% of values less than 747.128

90% of values less than 910.205

95% of values less than 945.987

99% of values less than 1004.53

Minimum 483.778

Maximum 1051.2

Mean 745.976

Std. Dev. 122.073

Variance 14901.9

At 100 years

01% of values less than 508.756

05% of values less than 551.418

10% of values less than 583.517

50% of values less than 747.128

90% of values less than 910.205

95% of values less than 945.987

99% of values less than 1004.53

Minimum 483.778

Maximum 1051.2

Mean 745.976

Std. Dev. 122.073

Variance 14901.9

At 300 years

01% of values less than 528.907

05% of values less than 572.585

10% of values less than 605.799

50% of values less than 782.795

90% of values less than 972.242

95% of values less than 1040.69

99% of values less than 1464.2

Minimum 498.252

Maximum 2398.24

Mean 797.841

Std. Dev. 173.26

Variance 30019.1

At 1000 years

01% of values less than 525.091

05% of values less than 570.353

10% of values less than 602.81

50% of values less than 773.357

90% of values less than 945.016

95% of values less than 998.873

99% of values less than 1132.25

Minimum 499.227

Maximum 1760.9

Mean 776.357

Std. Dev. 136.686

Variance 18683

Concentration of Chloride in groundwater [mg/l]

At infinity

01% of values less than 508.756		
05% of values less than 551.418		
10% of values less than 583.517		
50% of values less than 747.128		
90% of values less than 910.205		
95% of values less than 945.987		
99% of values less than 1004.53		
Minimum 483.778	Maximum 1051.2	
Mean 745.976	Std. Dev. 122.073	Variance 14901.9

Phase: PRWMF HRA 2

Head on EBS [m]

At infinity

01% of values less than 3.09293		
05% of values less than 3.40333		
10% of values less than 3.7163		
50% of values less than 6.59752		
90% of values less than 9.25251		
95% of values less than 9.5847		
99% of values less than 9.87332		
Minimum 3.01004	Maximum 9.99615	
Mean 6.51938	Std. Dev. 1.98114	Variance 3.92492

Phase: PRWMF HRA 2

Leakage through EBS [l/day]

At 1000 years

01% of values less than 144.882

05% of values less than 156.371

10% of values less than 172.076

50% of values less than 384.062

90% of values less than 1254.13

95% of values less than 1809.18

99% of values less than 2572.54

Minimum 134.66

Maximum 3291.68

Mean 583.377

Std. Dev. 531.499

Variance 282492

At infinity

01% of values less than 144.882

05% of values less than 156.371

10% of values less than 172.076

50% of values less than 384.062

90% of values less than 1254.13

95% of values less than 1809.18

99% of values less than 2572.54

Minimum 134.66

Maximum 3291.68

Mean 583.973

Std. Dev. 532.786

Variance 283861

Phase: PRWMF HRA 2Aquifer Flow [m³/year]

At 300 years

01% of values less than 7796.39

05% of values less than 8506.36

10% of values less than 9194.68

50% of values less than 12318.2

90% of values less than 16987.3

95% of values less than 18171.5

99% of values less than 20162.3

Minimum 0

Maximum 21233.4

Mean 12753

Std. Dev. 2967.48

Variance 8.80593E+006

At 1000 years

01% of values less than 7796.39

05% of values less than 8506.36

10% of values less than 9194.68

50% of values less than 12318.2

90% of values less than 16987.3

95% of values less than 18171.5

99% of values less than 20162.3

Minimum 0

Maximum 21233.4

Mean 12753

Std. Dev. 2967.48

Variance 8.80593E+006

At infinity

01% of values less than 7796.39

05% of values less than 8506.36

10% of values less than 9194.68

50% of values less than 12318.2

90% of values less than 16987.3

95% of values less than 18171.5

99% of values less than 20162.3

Minimum 0

Maximum 21233.4

Mean 12753

Std. Dev. 2967.48

Variance 8.80593E+006



Appendix H: Control Levels

Analyte	Control Level
Ammoniacal Nitrogen (as N)	0.18
Nitrate	14.8
Nitrite	0.48
Calcium	100
Chloride	1,060
Sodium	426
Potassium	81
Sulphate	158
Arsenic	0.005
Cadmium	No detect
Copper	0.048
Lead	0.002
Manganese	0.232
Mercury	No detect
Nickel	0.01
Zinc	0.08
Benzene	No detect
Toluene	No detect
Xylene	No detect



Appendix I: Trigger/Compliance Limits

Analyte	DER 2014 NPUG (mg/L) ¹	DER 2014 LT Irrigation (mg/L) ²	DER 2014 Fresh Waters (mg/L) ³	WHO, 2008 (mg/L) ⁴	Stock- water (mg/L) ⁵	NEPM 2013 HSL D Vapour Intrusion 4 to <8 m (mg/L)
TRH						
C6-C10 less BTEX	-	-	-	-	-	6
C6-C10	-	-	-	-	-	-
>C10-C16 less naphthalene	-	-	-	-	-	-
>C10-C16	-	-	-	-	-	-
>C16-C34	-	-	-	-	-	-
>C34-C36	-	-	-	-	-	-
C10-C16 Aromatic	-	-	-	0.9	-	-
C10-C16 Aliphatic	-	-	-	1.0	-	-
C16-C35 Aromatic	-	-	-	0.9	-	-
BTEX						
Benzene	0.01	-	0.95	-	-	-
Toluene	0.025	-	-	-	-	-
Ethylbenzene	0.003	-	-	-	-	-
Xylenes	0.02	-	0.55	-	-	-
MTBE	0.02	-	-	-	-	-
Metals						
Aluminium	0.2	5	0.055	-	-	-
Arsenic	0.1	0.1	0.037	-	0.5	-
Cadmium	0.2	0.01	0.0002	-	0.01	-
Calcium	-	-	-	-	1,000	-
Chromium (III&VI)	-	0.1	-	-	1	-
Copper	20	0.2	0.0014	-	0.4	-
Cobalt	-	0.05	-	-	-	-
Total Cyanide	-	-	0.007	-	-	-
Iron	0.3	0.2	0.3	-	-	-
Lead	0.1	2	0.0034	-	0.1	-
Manganese	5	0.2	1.9	-	-	-
Mercury	0.01	0.002	0.00006	-	0.002	-
Nickel	0.2	0.2	0.011	-	1	-
Zinc	3	2	0.008	-	20	-
Thermotolerant Coliforms (E.Coli)	-	10 (for direct contact with crops)	-	-	100	-

Analyte	DER 2014 NPUG (mg/L) ¹	DER 2014 LT Irrigation (mg/L) ²	DER 2014 Fresh Waters (mg/L) ³	WHO, 2008 (mg/L) ⁴	Stock- water (mg/L) ⁵	NEPM 2013 HSL D Vapour Intrusion 4 to <8 m (mg/L)
PAH						
Acenaphylene	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-
Benzo(a)anthracene	-	-	-	-		-
Benzo(a)pyrene	0.0001	-	-	-		-
Benzo(a)pyrene TEQ Zero	-	-	-	-		-
Benzo(b),(l),(k) fluoranthene	-	-	-	-		-
Benzo(g,h,i)perylene	-	-	-	-		-
Chrysene	-	-	-	-		-
Dibenz(a,h)anthracene	-	-	-	-		-
Fluoranthene	-	-	-	-		-
Fluorene	-	-	-	-		-
Indeno(1,2,3- c,d)pyrene	-	-	-	-		-
Naphthalene	-	-	0.016	-		-
Phenanthrene	-	-	-	-		-
Pyrene	-	-	-	-		-
PCBs						
Aroclor 1242	-	-	0.0003	-		-
Aroclor 1254	-	-	0.00001	-		-
2,4,6-trichlorophenol	0.2		0.02			
2,4-dichlorophenol	2		0.16			
2-chlorophenol	3		0.49			
Pentachlorophenol	0.1		0.01			
2,3,4,6- tetrachlorophenol			0.02			
Total Nitrogen	-	5	1	-	-	-

Analyte	DER 2014 NPUG (mg/L) ¹	DER 2014 LT Irrigation (mg/L) ²	DER 2014 Fresh Waters (mg/L) ³	WHO, 2008 (mg/L) ⁴	Stock- water (mg/L) ⁵	NEPM 2013 HSL D Vapour Intrusion 4 to <8 m (mg/L)
Total Kjeldahl Nitrogen	-	-	-	-		-
Nitrite	30	-	-	-		-
Nitrate	500	-	-	-	400	-
Ammonia	0.5	-	0.9	-		-
Total phosphorous	-	-	0.1	-		-
DDT	0.09	-	0.00001	-	-	-
g-BHC (Lindane)	0.1	-	0.0002	-	-	-
Endrin	-	-	0.00002	-	-	-
Heptachlor	-	-	0.00009	-	-	-
Azinophos methyl	0.3	-	0.00002	-	-	-
Diazinon	0.04	-	0.00001	-	-	-
Dichlorvos	0.05	-	-	-	-	-
Dimethoate	0.07	-	0.00015	-	-	-
Ethion	-	-	0.04	-	-	-
Fenitrothion	0.07	-	0.0002	-	-	-
Malathion	0.7	-	0.00005	-	-	-
Methyl parathion	0.007	-	-	-	-	-
Parathion	0.2	-	0.000004	-	-	
Inorganics						
TDS	-	-	-	-	2,400	-
TSS	-	-	-	-	-	-
Sulfate	1000	-	-	-	1,000	-
Chloride	250	-	-	-	-	-
PFAS						
PFOS	-	-	0.00000023	-	-	
PFOA	-	-	0.019	-	-	

1: DER 2014 Non-potable use guidelines (NPUG) which are derived from DoH 2014 guidelines.

2: DER 2014 Long-term Irrigation which are derived from (ANZECC & ARMCANZ (2000).

3: DER 2014 Fresh Waters these investigation levels are based on and are equivalent to the ANZECC 2000 95% Fresh Water guidelines.

4: World Health Organisation Petroleum Products in Drinking Water (multiplied by a factor of 10 for non-potable setting)

5: Stock Water 2000 guidelines which are derived from ANZECC & ARMCANZ (2000).

*As un-ionised Cyanide

#As o-xylene

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