Plan

Groundwater Management Plan

Environment

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100-PL-EN-1009

Fortescue
The New Force in Iron Ore

	Groundwater Management Plan		100-PL-EN-1009
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1. INTRODUCTION

Fortescue Metals Group (Fortescue) is an integrated business comprised of mine, rail and port operations based in the Pilbara region of Western Australia, with its head office located in Perth.

Detailed background information regarding the timing and nature of Fortescue's environmental approvals under the *Environmental Protection Act 1986* (WA), the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), current operations and plans for future expansion is contained in Appendix 1.

1.1 Requirement for Management Plan

The Groundwater Management Plan (this Plan) is required as part of development approval for Fortescue's Iron Ore related infrastructure in the Pilbara under Ministerial Statements 707.

Existing projects and future developments will be required to prepare and implement site-specific Groundwater Management Programs to give effect to this Plan or where required a Groundwater Operating Strategy in accordance with a licence issued under the *Rights in Water and Irrigation Act 1914*.

Guidance to develop Groundwater Operating Strategies is available in Operational policy 5.08: Use of operating strategies in the water licensing process (Department of Water).

The data flow diagram for this Plan is available in Appendix 2.

1.2 Objective and Scope

The objective of this Plan is to minimise direct and indirect impacts of Fortescue's groundwater management activities on groundwater quality and quantity in Fortescue Controlled Sites[1]. Groundwater management activities include groundwater investigations, groundwater monitoring, the construction and operation of infrastructure for purpose of groundwater abstraction (supply and use), dewatering/depressurisation and excess water disposal.

This Plan was initially developed to meet the requirements of Condition 9 of Ministerial Statements 707 but is intended to provide guidance on groundwater management across all Fortescue Controlled Sites. The sections of this Plan which address these conditions are identified in Appendix 3.

This Plan will replace the *Chichester Operations Groundwater and Bore Management Plan* (45-PL-EN-0005) and the *Groundwater Discharge Management Plan* (45-PL-EN-0019).

[1] Fortescue Controlled Sites are sites under the legislative control of Fortescue including exploration sites, sites under construction, operational sites (sites managed and operated by Fortescue and sites managed by Fortescue but operated by contractors) and the Perth offices.

1.3 Legislation and Regulatory Framework

Fortescue employees and contractors are obliged to comply with all relevant environmental Commonwealth and State legislation. There is a range of legislation that relates to groundwater in Western Australia (Table 1).

Table 1: Commonwealth and State Legislation Relating to Groundwater

Legislation	Application
Aboriginal Heritage Act 1972	Provides protection of Aboriginal Heritage Sites. Requires a Section 18 approval under the Act to disturb a registered Aboriginal Heritage Site.
Environmental Protection Act 1986 (WA)	Prevention, control and abatement or pollution and conservation protection and enhancement of the environment.
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	Protection of environmental matters of national significance such as national heritage sites, wetlands of international importance, nationally threatened species, ecological communities and migratory species.
Rights in Water and Irrigation Act 1914 (WA)	Relates to rights in water resources, to make provision for the regulation, management, use and protection of water resources, to provide for irrigation schemes, and for related purposes. Requires proponents to obtain a license under section 5C and 26D of the Act.
Wildlife Conservation Act 1950 (WA)	Provides for the conservation and protection of wildlife (flora and fauna). Special provisions and schedules cover protection and management of gazetted rare flora and fauna.

Table 2 outlines the legislative approvals required to undertake groundwater management activities and construct supporting infrastructure.

The following standards and guidelines are also of relevance to this Plan:

- ARMCANZ 2000, Australian Guidelines for Water Quality Monitoring and Reporting, National Water Quality Management Strategy no. 7
- Department of Mines and Petroleum and Office of Environmental Protection Authority (2011). Guidelines for Preparing a Mine Closure Plan
- Department of Mines and Petroleum (2002), Guidelines for the Protection of Surface and Groundwater Resources During Exploration Drilling
- Department of Water 2009, Operational policy 5.12 Hydrogeological reporting associated with a groundwater well licence
- Department of Water 2010, Operational policy 1.01 Managed Aquifer Recharge in Western Australia
- Department of Water 2011, Operational policy 5.08 Use of Operating Strategies in the Water Licensing Process
- Department of Water 2009, Pilbara Water in Mining Guidelines.

Table 2: Approvals that may be Required to Undertake Groundwater Management Activities and to Construct Supporting Infrastructure

Approval	Requirement	Legislation	Regulator
Programme of Works (PoW)	Any activity other than general access to tenements. These activities include, but are not limited to: • Construction of turkeys nest dams • Clearing and construction of groundwater management infrastructure • Construction of access roads.	*Mining Act 1978*	Department of Mines and Petroleum (DMP)
Mining Proposal[2]	Mining proposal must be submitted and approved prior to the commencement of mining operations on a tenement.	*Mining Act 1978*	Department of Mines and Petroleum (DMP)
Detailed Proposal[2]	Detailed proposal must be submitted and approved prior to the commencement of mining operations on a tenement.	*Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006*	Department of State Development (DSD)
Licence to Construct or Alter a Well (Section 26D)	Any activity (for both minerals and water) to: • Commence, construct, enlarge, deepen or alter any artesian well • Commence, construct, enlarge, deepen or alter any non-artesian well.	*Rights in Water and Irrigation Act 1914*	Department of Water (DoW)
Form 2 (Section 26E)	Form 2 is required to be provided 1-month after completion of a non-artesian well approved under a 26D licence.	*Rights in Water and Irrigation Act 1914*	DoW

[2] Dependent on whether the site is subject to the provision of the *Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006.*

Approval	Requirement	Legislation	Regulator
Licence to Take Water (Section 5C)	Any activity which involves the taking of water from a watercourse, wetland or underground source. These activities may include, but are not limited to: • General camp purposes • Dust suppression • Construction purposes • Dewatering.	*Rights in Water and Irrigation Act 1914*	DoW
Native Vegetation Clearing Permit	Required when clearing native vegetation in an 'environmentally sensitive area' (e.g. Threatened Ecological Communities).	*Environmental Protection Act 1986*	Department of Environment Regulation (DER)
Works Approval	Construction of premises prescribed under Schedules 1 and 2 of the *Environmental Protection Regulations 1987*. In relation to this Plan a prescribed premises is classified as mine dewatering at a production or design capacity greater than 50,000 tonnes per year.	*Environmental Protection Act 1986*	DER
Operating Licence/ Registration	Operation of prescribed facilities and activities under Schedules 1 and 2 of the *Environmental Protection Regulations 1987*. In relation to this Plan a prescribed activity is classified as mine dewatering at a production or design capacity greater than 50,000 tonnes per year.	*Environmental Protection Act 1986*	DER

1.4 Internal Management Plans and Procedures

The following Fortescue documents are also of relevance to this Plan:

- *Chemical and Hydrocarbon Management Plan* (100-PL-EN-0011)
- *Chichester Operations Fauna Management Plan* (45-PL-EN-0007)
- *Christmas Creek Water Management Scheme Fauna Management Plan* (CC-PL-EN-0003)
- *Conservation Significant Fauna Management Plan* (100-PL-EN-0022)
- *Dewatering Discharge Contingency Procedure* (M-PR-EN-0001)
- *Environmental Consequence Descriptors Matrix* (100-MX-EN-0001)
- *Exploration Environmental Management Plan* (E-PL-EN-0002)
- *Fortescue Marshes Management Plan* (45-PL-EN-0009)
- *Ground Disturbance Permits Procedure* (100-PR-EN-0004)
- *Incident Event Management Procedure* (100-PR-SA-0011)
- *Rail Construction Environmental Management Plan* (R-PL-EN-0015)
- *Rail Corridor: Fauna Management Plan* (R-PL-EN-0017)
- *Railway Corridor: Subterranean Fauna Management Plan* (R-PL-EN-0009)
- *Rehabilitation and Revegetation Management Plan* (45-PL-EN-0023)
- *Significant Flora and Vegetation Management Plan* (45-PL-EN-0017)
- *Significant Flora and Vegetation Monitoring Guidelines* (45-GU-EN-0001)
- Site specific Groundwater Operating Strategies as approved by the Department of Water
- *Solomon Fauna Management Plan* (45-PL-EN-0027)
- *Stakeholder Consultation Reinjection Management Plan* (CC-PL-EN-0006)
- *Subterranean Fauna Survey Plan* (45-PL-EN-0010)
- *Surface Water Management Plan* (45-PL-EN-0024)
- *Vegetation Clearing and Topsoil Management Procedure* (45-PR-EN-0013)
- *Vegetation Health Monitoring and Management Plan –Cloudbreak* (CB-PL-EN-0019)
- *Vegetation Health Monitoring and Management Plan –Christmas Creek* (CC-PL-EN-0004).

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2. ROLES AND RESPONSIBILITIES

All Fortescue employees and contractors are required to comply with the requirements of this Plan.

Accountability for fulfilling the requirements of this Plan is dependent on the stage of project development (construction, operations, decommissioning) and the project type (port, rail or mine).

During exploration and design, the Group Manager Technical Services and the Group Manager Resource Geology will be accountable for ensuring the requirements of this Plan are met.

During construction and operations stages, whether activities are undertaken by an external service provider or internal Fortescue personnel, the Project Director or the General Manager (Port, Rail or Mine) will be accountable for ensuring the requirements of this Plan are met.

During decommissioning and closure stages, the General Manager (Port, Rail or Mine) will be accountable for ensuring the requirements of this GMP are met.

Where responsibilities are delegated, this must be clearly recorded and communicated.

In Section 6 specific Management Actions have been attributed to the appropriate personnel.

When site specific groundwater management programs and operating strategies are developed to support this Plan, the RASCI framework should be utilised to delegate roles, responsibilities, and review and approval levels. RASCI is used to denote:

R-Responsible	Those who do the work to achieve the task.
A-Accountable	Those who are ultimately accountable for the completion of the deliverable or task and the one to whom the Responsible person is accountable.
S-Supportive	Resources allocated to the Responsible person and who will also assist in completing the task.
C-Consulted	Those whose opinions are sought, two-way communication.
I-Informed	Those whom are kept informed, one-way communication.

3. STAKEHOLDER CONSULTATION

Fortescue has undertaken an extensive stakeholder consultation program whereby landowners, regulators and other relevant parties have been consulted with regard to investigation and design of the mine sites and rail infrastructure through the environmental approvals process (see Section 7 in Environ 2005a, and Section 6 in Environ 2005b, Section 6 in Fortescue Metals Group, 2010).

The Department of Environment Regulation (DER) was consulted and approved the final content of the original *Chichester Operations and Bore Management Plan* (45-PL-EN-0005).

This plan will be submitted to the Office of the Environmental Protection Authority (OEPA) in accordance with condition 9 of Ministerial Statement 707.

4. KEY ENVIRONMENTAL ACTIVITIES

Many of the groundwater management activities[3] associated with Fortescue's exploration, construction, operation and decommissioning phases have the potential to impact on the environment.

The key groundwater management activities undertaken by Fortescue which have the potential to impact on groundwater and groundwater dependent ecosystems are described in Appendix 4 and include:

- Vegetation clearing
- Ground disturbance
- Groundwater drilling and bore construction and testing
- Construction and establishment of groundwater management infrastructure
- Groundwater management activities
- Groundwater injection.

[3] Fortescue uses the term 'activities' to refer to 'Environmental Aspects' as defined by ISO14001.

5. POTENTIAL ENVIRONMENTAL IMPACTS

The potential direct and indirect impacts to groundwater and groundwater dependent ecosystems arising from Fortescue's groundwater management activities are presented in Table 3.

Table 3: Potential Environmental Impacts Arising from Fortescue's Activities

Potential Environmental Impact	Details
Groundwater contamination	Contamination of groundwater from release of hydrocarbons and chemicals during groundwater management activities. Spills can continue to impact on groundwater quality if not properly remediated. Impact local and regional groundwater quality through changes to the hydrogeological regime (such as saline intrusion), transfer and injection of contaminated groundwater and exposure of groundwater to evapo-concentration and other geochemical processes (such as pit lakes)
Effects on phreatophytic vegetation	Expose vegetation to waterlogging, where elevated watertables intersect vegetation root systems. In waterlogged soils biological activity rapidly uses the available oxygen, retarding oxygen and water uptake and restricting root and plant growth. Elevated water levels also have the potential to transport and/or concentrate salts in soil profiles. Interfere with the availability of water in the soil profile accessible to phreatophytic vegetation.
Loss of stygofauna/ fauna habitat	Lowering the water table sufficiently can dry out the zone which some subterranean species live. A change in water quality can impact upon stygofauna species. Impact volume of flow into groundwater fed pools through reduction of flow and uncontrolled increase in flow from discharge of dewater close to pools.
Soil erosion	Erosion can result in modified soil infiltration characteristics.
Turbidity	Localised increase in turbidity resulting from dewatering and ground disturbance activities.

6. ENVIRONMENTAL MANAGEMENT

A series of environmental management objectives have been developed to mitigate environmental impacts on groundwater and groundwater dependent ecosystems that could potentially be caused by Fortescue's groundwater management activities during exploration, construction, operation and decommissioning phases. These are:

1. Minimise the potential environmental impacts associated with the development of groundwater management infrastructure.
2. Minimise the potential environmental impacts associated with groundwater management activities.
3. Minimise the potential impacts to phreatophytic vegetation and any other groundwater-dependent ecosystems.
4. Minimise the potential impacts to station bore supply within the area of groundwater drawdown.
5. Monitor and report sufficiently to demonstrate compliance and enable management to make informed decisions that minimise environmental impacts to groundwater dependent ecological systems.

For each objective, management actions have been developed to ensure the impacts from Fortescue's activities are managed, and that appropriate monitoring, reporting and corrective action functions are implemented to support the successful implementation of the management actions.

The key elements of the environmental management process associated with each objective are described in Table 4.

Table 4: Description of Key Elements of Environmental Management Process to Achieve Identified Objectives

Element	Definition/Description
Objective	What is intended to be achieved.
Management Action	Tasks undertaken to enable the objective to be met.
Performance Indicators	Metrics for evaluating the outcomes achieved by Management Action.
Reporting/Evidence	Demonstrates that the Management Action has been applied and the outcome evaluated.
Timing	Period during which the Management Action should be undertaken.
Responsibility	Accountability for ensuring management action is completed. The responsible role is dependent on project timing.

The key management actions, performance indicators, evidence, timing and responsibilities for each objective are provided in Table 5.

Table 5: Key Management Actions for Management of Groundwater Management Activities in Fortescue Controlled Sites

Objective 1	Minimise the potential environmental impacts associated with development of groundwater management infrastructure[4]				
Reference	**Management Actions**	**Performance indicators**	**Reporting/ Evidence**	**Timing**	**Responsibility**
1.1	Obtain the required approvals outlined in Table 2 prior to ground disturbance for groundwater management infrastructure. Where necessary, undertake environmental surveys as outlined in the *Significant Flora and Vegetation Management Plan* (45-PL-EN-0017), *Conservation Significant Fauna Management Plan* (100-PL-EN-0022) and the *Subterranean Fauna Survey Plan* (45-PL-EN-0010).	• PoW/licence/permit/works approval submitted and approved • Surveys undertaken when required	• Pow/licence/permit/works approval	Exploration/ Exploration Development/ Design/ Construction	Manager Environmental Approvals/ Manager Environmental Studies
1.2	Prior to undertaking groundwater management activities and constructing supporting infrastructure, conduct a risk assessment to identify high risk areas. Develop and implement management strategies that reflect risk assessment outcomes.	• Risk assessment conducted • No significant impacts to significant flora, vegetation, fauna or fauna habitat • Management strategies developed	• Risk assessment • Internal audit and inspection reports	Exploration/ Exploration Development/ Design/ Construction	**Exploration and Design** - Manager Exploration/ Manager Hydrogeology/ **Construction** - Manager Projects
1.3	Ensure infrastructure location, design, construction and operation reflects risk assessment outcomes (determined in Action 1.2) in minimising environmental impacts.	• Management measures implemented in high risk areas • Project design reflects risk assessment outcomes	• Project design • Monitoring program and report	Exploration/ Exploration Development/ Design/ Construction/ Operation	**Exploration, Design and Construction** - Manager Exploration/ Manager Hydrogeology/ Manager Projects **Operation** –Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
1.4	Where dewatering infrastructure may significantly impact on surface water flows in areas of sheet flow dependent Mulga communities to be protected from disturbance, ensure appropriate drainage infrastructure (defined in Action 1.2) is incorporated into the project design in accordance with the *Surface Water Management Plan* (45-PL-EN-0024).	• No significant impact on sheet flow dependent Mulga communities protected from disturbance • Compliance with Management Plan	• Project design	Design	Manager Hydrogeology/ Manager Projects
1.5	Complete a GDP Application in accordance with the *Ground Disturbance Permits Procedure* (100-PR-EN-0004). Where an environmentally sensitive area, significant species[5] and/or an Aboriginal Heritage Site is identified, relocate the groundwater management infrastructure, where possible. If the infrastructure is unable to be relocated comply with the: • Requirements of the *Significant Flora and Vegetation Management Plan* (45-PL-EN0017), the *Conservation Significant Fauna Management Plan* (100-PL-EN-0022) and the *Fortescue Marsh Management Plan* (45-PL-EN-0009) • Conditions of the applicable Land Access or Heritage Agreement.	• No impacts to aboriginal heritage or significant flora, vegetation, fauna or fauna habitat • Compliance with Procedure • Compliance with Land Access and Heritage Agreements	• Internal audit and inspection reports • GDP application and permit	Exploration/ Exploration Development/ Design/ Construction/ Operations	**Exploration and Design** - Manager Exploration/ Manager Hydrogeology/ **Construction** - Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
1.6	Minimise clearing and vegetation disturbance to ensure significant flora and vegetation are protected. Conduct vegetation clearing in accordance with the *Significant Flora and Vegetation Management Plan* (45-PL-EN-0017) and a permit issued under the *Ground Disturbance Permits Procedure* (100-PR-EN-0004).	• No significant impact on significant flora or vegetation • Ground disturbance permits obtained • Clearing within specified GDP boundaries	• Ground disturbance permits • BMS record • Incident reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Exploration **Construction** - Manager Projects/ Manager Hydrogeology **Operation** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)

[4] Groundwater management infrastructure may include bores, sumps and associated pumps, transfer ponds, power sources, interconnected pipelines, settlement ponds and direct conveyance pipelines.
[5] Significant species as defined in the *Significant Flora and Vegetation Management Plan* (45-PL-EN-0017) and the *Conservation Significant Fauna Management Plan* (100-PL-EN-0022).

Reference	Management Actions	Performance indicators	Reporting/ Evidence	Timing	Responsibility
1.7	When conducting excavations or trenching activities, develop and implement measures such as exclusion methods, exit structures, shelter and/or excavation/trench inspections to minimise potential impacts on conservation significant fauna in accordance with *Conservation Significant Fauna Management Plan* (100-PL-EN-0022) and the *Christmas Creek Water Management Scheme Fauna Management Plan* (CC-PL-EN-0003).	• Impact to fauna in excavations or trenching is minimised • Compliance with the Management Plan	• Internal audit and inspection reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Exploration/ Manager Hydrogeology **Construction** - Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
1.8	Develop and implement measures (e.g. fauna egress, buoyancy rings, fencing) at open sumps and transfer, settlement and storage ponds to prevent feral animal access and minimise potential impacts on fauna in accordance with the *Rail Corridor: Fauna Management Plan* (R-PL-EN-0017), *Chichester Operations Fauna Management Plan* (45-PL-EN-0007), *Conservation Significant Fauna Management Plan* (100-PL-EN-0022), *Solomon Fauna Management Plan* (45-PL-EN-0027) and the *Christmas Creek Water Management Scheme Fauna Management Plan* (CC-PL-EN-0003).	• No mortality of conservaiton significant fauna in active sumps • No significant increase in feral animal records from sightings and road transect counts.	• Intenal audit and inspection reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Exploration/ Manager Hydrogeology **Construction** - Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
1.9	When constructing or altering bores subject to soil erosion or adjacent to sensitive receptors, implement management measures to reduce discharge rates and prevent scouring.	• No significant soil erosion • Impacts to significant flora, vegetation, fauna or fauna habitat are minimised	• Internal audit and inspection reports	Exploration/ Exploration Development/ Design/ Construction/ Operation	**Exploration and Design** - Manager Exploration/ Manager Hydrogeology **Construction** - Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
1.10	Contain generators/pumps used for test pumping to reduce the risk of a hydrocarbon spill and potential soil and groundwater contamination.	• No soil or groundwater contamination • Generators/pumps are contained	• Internal audit and inspection reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Exploration/ Manager Hydrogeology **Construction** - Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
1.11	Once bore construction and test pumping activities are finalised and the water within the sumps has evaporated, backfill with stockpiled soil and progressively rehabilitate. Where the bore is for reinjection purposes AND located in an active mining area, the sump may be retained to mitigate potential spills during future bore development and test pumping activities.	• Rehabilitation of sumps • Where applicable, retention of sumps when it is a reinjection bore and located in an active mining area	• Internal audit and inspection reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Exploration/ Manager Hydrogeology **Construction** - Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
Objective 2	**Minimise the potential environmental impacts associated with groundwater management activities[6]**				
Reference	**Management Action**	**Performance indicators**	**Reporting/ Evidence**	**Timing**	**Responsibility**
2.1	When a groundwater management activity requires a 5C licence under the *Rights in Water and Irrigation Act 1914*, conduct a hydrogeological assessment in accordance with the parameters outlined in the Operational policy no. 5.12 Hydrogeological reporting associated with a groundwater well licence (DoW).	• Hydrogeological assessment report developed and approved by DoW • Compliance with Operational policy no.5.12 Hydrogeological reporting associated with a groundwater well licence (DoW)	• Hydrogeological assessment report • Correspondence with the DoW	Feasibility/ Design	Manager Hydrogeology/ Manager Projects

[6] Groundwater management activities include groundwater investigations, groundwater monitoring, the construction and operation of infrastructure for purpose of groundwater abstraction (supply), dewatering/depressurisation and excess water disposal.

Reference	Management Actions	Performance indicators	Reporting/ Evidence	Timing	Responsibility
2.2	Where a subterranean fauna survey (conducted in Action 1.1) indicates a risk of loss of subterranean species or communities, and those species or communities are deemed significant due to their restricted distribution within the project area, develop a Subterranean Fauna Management Plan as required under the *Subterranean Fauna Survey Plan* (45-PL-EN-0010).	• Plan developed • No loss of significant subterranean species or communities • Relevant stakeholders consulted and approval obtained	• Plan • Monitoring report • Stakeholder consultation	Design	Manager Environmental Studies
2.3	When required as a condition of a licence issued under the *Rights in Water and Irrigation Act 1914*, develop and implement a Groundwater Operating Strategy in accordance with the Operational policy 5.08: Use of operating strategies in the water licensing process (DoW).	• Groundwater operating strategy developed, approved and implemented • Compliance with Licence conditions	• Groundwater operating strategy • Licence • Internal reports • Groundwater monitoring reports	Design/ Construction/ Operation/ Decommissioning/ Closure	**Design** - Manager Hydrogeology **Construction** - Manager Projects **Operation, Decommissioning and Closure** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
2.4	Establish monitoring bores to monitor and where necessary mitigate the effects of dewatering and injection on subterranean fauna in accordance with an applicable Subterranean Fauna Management Plan (developed in Action 2.2).	• Monitoring bores are established • Monitoring requirements are included in the site specific Groundwater Operating Strategy	• Groundwater Operating Strategy • Groundwater monitoring reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Hydrogeology **Construction** - Manager Projects **Operation** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
2.5	When groundwater management activities may result in impacts on other stakeholders, including other mining operations, consult with those potentially affected and where necessary develop and implement measures to mitigate the identified impacts.	• The Groundwater Operating Strategy is updated • Relevant stakeholder groups are consulted	• Groundwater Operating Strategy • Records of stakeholder consultation (i.e. emails, letters, meeting minutes)	Design/ Construction/ Operation	**Design and Operation** - Manager Hydrogeology **Construction** - Manager Projects
2.6	Where required, monitor the effects of dewatering and injection on subterranean fauna and where monitoring results indicate a risk of loss of significant subterranean fauna species, implement mitigation strategies to mitigate or minimise the effects of dewatering and injection on subterranean fauna in accordance with an applicable Subterranean Fauna Management Plan (developed in Action 2.2).	• Monitoring conducted, where required • Mitigation measures implemented, where necessary • Compliance with the Management Plan	• Internal reports • Annual Environment Reports (may include Compliance Assesssment Report, Annual Environmental Monitoring Report)	Construction/ Operation	**Construction** - Manager Projects **Operation** - HSE Manager
2.7	Where possible, utilise water from dewatering for onsite activities, such as dust suppression and OPF operations.	• Dewater reused as much as possible • Groundwater Operating Strategy is updated	• Audit report	Construction/ Operation	**Construction** - Manager Projects **Operation** - Manager Mining
2.8	When injecting excess dewater into a compatible aquifer utilise methods outlined in the Operational Policy 1.01 Managed Aquifer Recharge in Western Australia (DoW).	• Groundwater Operating Strategy updated • Excess dewater injected according to approved methods	• Groundwater Operating Strategy • Audit Report	Construction/ Operation	**Construction** - Manager Projects **Operation** - Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
2.9	When construction or maintenance activities results in dewatering volumes in excess of what can be disposed of in accordance with the applicable Groundwater Operating Strategy, adopt temporary alternative disposal options as outlined in the *Dewatering Discharge Contingency Procedure* (M-PR-EN-0001).	• Compliance with Procedure and Groundwater Operating Strategy	• Dewatering Discharge Contingency Application Form • Groundwater monitoring review	Construction/ Operation	**Construction** - Manager Projects **Operation** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)

Reference	Management Action	Performance indicators	Reporting/ Evidence	Timing	Responsibility
2.10	Ensure chemicals and hydrocarbons are managed in accordance with the *Chemical and Hydrocarbon Management Plan* (100-PL-EN-0011) to reduce the risk of soil or groundwater contamination.	• Compliance with the Management Plan • Water quality and flow of groundwater remains similar to background levels • Appropriate training has been provided to relevant staff and contractors	• Laboratory records • Audit reports • Training registers	Exploration/ Exploration Development/ Construction/ Operation/ Decommissioning/ Closure	**Exploration** - Manager Exploration **Construction** - Manager Projects **Operation, Decommissioning and Closure** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)/ HSE Manager
2.11	When an uncontrolled release of water has occurred as a result of Fortescue activities and the release has caused or is likely to cause pollution or environmental harm as defined in the *Environmental Consequence Descriptors Matrix* (100-MX-EN-0001), investigate and report the incident in accordance with the *Incident Event Management Procedure* (100-PR-SA-0011).	• Incident reported in BMS • Incident investigated according to Procedure • Incident reported to Regulator within the specified legislative timeframe, where required	• Incident Report in BMS • Correspondence with relevant Regulator • Regulator notification	Exploration/ Exploration Development/ Construction/ Operation/ Decommissioning/ Closure	**Exploration** - Manager Exploration **Construction** - Manager Projects **Operations, Decommissioning and Closure** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon) **External Reporting** - Manager, Environment Governance and Sustainability
2.12	To ensure erosion, water quality and groundwater flow regimes are minimally impacted conduct progressive rehabilitation in accordance with the *Rehabilitation and Revegetation Management Plan* (45-PL-EN-0023) or where applicable a Mine Closure Plan developed in accordance with the Guidelines for Preparing Mine Closure Plans.	• Comparison post mining monitoring data and closure objectives • Compliance with the Management Plan/ Guideline	• Post closure hydrogeological reporting • Mine Closure Plan	Construction/ Operation/ Decommissioning/ Closure	**Construction** - Manager Projects **Operation, Decommissioning and Closure** – Manager Operational Projects/ Manager Mine Services or Site Manager Mining (Solomon)
Objective 3	**Minimise impacts to phreatophytic vegetation and any other significant groundwater dependent ecosystems**				
Reference	**Management Action**	**Performance indicators**	**Reporting/ Evidence**	**Timing**	**Responsibility**
3.1	Establish monitoring bores to monitor and where necessary mitigate the effects of dewatering and injection on phreatophytic vegetation in accordance with the *Significant Flora and Vegetation Management Plan* (45-PL-EN-0017), the *Vegetation Health Monitoring and Management Plan – Christmas Creek* (CC-PL-EN-0004), *Vegetation Health Monitoring and Management Plan – Cloudbreak (CB-PL-EN-0019)* and the *Fortescue Marshes Management Plan* (45-PL-EN-0009).	• Monitoring bores are established • Monitoring requirements are included in the site specific Groundwater Operating Strategy	• Groundwater Operating Strategy • Groundwater monitoring reports	Exploration/ Exploration Development/ Construction/ Operation	**Exploration** - Manager Hydrogeology **Construction** -Manager Projects **Operations** – Manager Operational Projects/ Manager Mine Services or Manager Technical Services (Solomon)
3.2	Where required, monitor the effects of dewatering and injection on phreatophytic vegetation in accordance with the *Significant Flora and Vegetation Management Plan (*45-PL-EN-0017), *Vegetation Health Monitoring and Management Plan – Christmas Creek* (CC-PL-EN-0004), *Vegetation Health Monitoring and Management Plan – Cloudbreak (CB-PL-EN-0019)* and the *Fortescue Marshes Management Plan* (45-PL-EN-0009).	• Monitoring conducted, where required • Mitigation measures implemented, where necessary • Compliance with the Management Plan	• Internal reports • Annual Environmental Reports (may include Compliance Assessment Report, Annual Environmental Monitoring Report)	Construction/ Operation	**Construction** - Manager Projects **Operation** - HSE Manager
3.3	Where required, monitor groundwater conditions in groundwater dependent pools to be retained and protected from disturbance to detect and where necessary mitigate any changes arising from groundwater dewatering and injection activities.	• Water levels of retained groundwater dependent pools managed within defined target range • Monitoring requirements included in the site specific Groundwater Operating Strategy	• Internal reports • Groundwater monitoring reports • Annual Environmental Reports (may include Compliance Assessment Report, Annual Environmental Monitoring Report) • Groundwater Operating Strategy	Construction/ Operation	**Construction** - Manager Hydrogeology/ Project Manager **Operation** - Manager Mine Services or HSE Manager (Solomon)

Objective 4	Minimise the potential impacts to station bore supply within the area of groundwater drawdown				
Reference	**Management Action**	**Performance indicators**	**Reporting/ Evidence**	**Timing**	**Responsibility**
4.1	Establish water usage rates and baseline water data for existing station bores. Where dewatering drawdown may affect the station bore, develop a contingency plan in consultation with the station manager/ lease owner to manage potential impacts to supply, including identification of alternative water supplies.	• Contingency plan for pastoral water supply developed where potential for impact is identified through hydrogeological assessment • Committments made in the contingency plan are met	• Groundwater Operating Strategy	Feasibility/Design	Manager Exploration / Manager Hydrogeology
Objective 5	**Monitor and report sufficiently to demonstrate compliance and enable management to make informed decisions that minimise environmental impacts to groundwater dependent ecological systems**				
Reference	**Management Actions**	**Performance indicators**	**Reporting/ Evidence**	**Timing**	**Responsibility**
5.1	Develop and implement a groundwater monitoring program in accordance with an approval, license or works approval issued under the *Environmental Protection Act 1986*, an approval under the *Environment Protection and Biodiversity Conservation Act 1999, a* licence issued under the *Rights in Water and Irrigation Act 1914* and where applicable a Groundwater Operating Strategy developed in accordance with the Operational policy 5.08: Use of operating strategies in the water licensing process (DoW).	• Monitoring program developed and implemented • Trigger levels and monitoring strategies developed • Water levels of retained groundwater dependent pools managed within defined target range • Monitoring requirements included in the site specific Groundwater Operating Strategy	• Groundwater monitoring reports • Groundwater Operating Strategy • Compliance Document • Annual Environmental Reports (may include Compliance Assessment Report, Annual Environmental Monitoring Report)	Construction/ Operation/ Decommissioning/ Closure	**Construction (Develop)** - Manager Hydrogeology and Manager Environmental Approvals **Construction (Implement)** - Manager Projects **Operation, Decommissioning and Closure (Implement- Mine)** – Manager Operational Projects/ Manager Mine Services/ Manager Technical Services or HSE Manager (Solomon) **Operation, Decommissioning and Closure (Implement- Port and Rail)** - HSE Manager
5.2	Comply with the reporting requirements outlined in an approval, licence or works approval issued under the *Environmental Protection Act 1986*, an approval under the *Environment Protection and Biodiversity Conservation Act 1999* and a license issued under the *Rights in Water and Irrigation Act 1914*. Reporting under a 5C Licence issued under the *Rights in Water and Irrigation Act 1914* should be in accordance with Operational policy no. 5.12 Hydrogeological reporting associated with a groundwater well licence (DoW).	• Reporting requirements fulfilled • Compliance with the approval/license/works approval conditions	• Compliance Document • Annual Environmental Reports (may include Compliance Assessment Report, Annual Environmental Monitoring Report) • Groundwater monitoring reports	Exploration/ Exploration Development/ Design/ Construction/ Operation	**Reporting under** *Rights in Water and Irrigation Act 1914* - Manager Hydrogeology **Reporting under** *Environmental Protection Act 1986/Environment Protection and Biodiversity Conservation Act 1999* - Manager Environmental Approvals/ Manager Environment Governance and Sustainability

7. AUDIT

Fortescue ensures compliance with its legal obligations through first party quality assurance by site environment teams with a focus on effective environmental management through the corporate Environmental Management System (EMS).

Fortescue has adopted a risk based approach to monitor compliance with its legal obligations. Site environment teams will monitor their compliance with this Plan and the required site specific management and monitoring programs using the *Self-Verification of High Risk Environmental Legal Obligations Guideline* (100-GU-EN-0030). Corporate environment teams will monitor business-wide compliance with this Plan through *EMS Management Reviews* (100-PR-EN-1014).

Where non-conformance issues or opportunities for improvement are identified these will be documented and tracked via the Business Management System (BMS).

8. REVIEW

It is important that plans and procedures are frequently reviewed and revised as Fortescue's operations change and opportunities for improved management practices are identified.

This Plan will be reviewed every five years, or when significant additional information comes to hand. Upon review, the document will be revised where appropriate and the revision status will be updated in accordance with Fortescue's *Document Governance Standard* (100-ST-DC-0002).

REFERENCES

ARMCANZ 2000, Australian guidelines for water quality monitoring and reporting, National Water Quality Management Strategy no. 7, Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

Department of Mines and Petroleum (2007), Mineral Exploration/ Rehabilitation Activities Guidelines.

Department of Mineral and Petroleum Resources (2002) Guidelines for the Protection of Surface and Groundwater Resources During Exploration Drilling.

Department of Mines and Petroleum and Office of Environmental Protection Authority (2011). Guidelines for Preparing a Mine Closure Plan.

Department of Water 2009, Pilbara Water in Mining Guidelines, Department of Water, Perth.

Environ Australia (2005a). Pilbara Iron Ore and Infrastructure Project. Stage B East-West Railway and Mine Sites. Public Environmental Review, January 2005.

Environ Australia (2005b). Pilbara Iron Ore and Infrastructure Project. Cloud Break. Public Environmental Review, January 2005.

Fortescue Metals Group, (2010). Solomon Public Environmental Review, November 2010.

Water and Rivers Commission (2000). Water Quality Protection Guidelines No.11, Mining and Mineral Processing: Mine dewatering.

Appendix 1: Project Background

Fortescue Metals Group Background

Fortescue Metals Group (Fortescue) is an integrated business comprised of mine, rail and port operations based in the Pilbara region of Western Australia with its head office located in Perth.

Fortescue has commenced operation of the Pilbara Iron Ore and Infrastructure Project (the Project), which consists of several iron ore mines and associated rail and port infrastructure in the Pilbara region of Western Australia.

The Project was granted Major Project Facilitation Status in December 2004 and Fortescue has signed two Agreements with the State of Western Australia:

- *The Railway and Port (The Pilbara Infrastructure Pty Ltd) State Agreement* for the port and rail infrastructure to transport ore from the mines to the port
- *The Iron Ore (FMG Chichester Pty Ltd) Agreement* for the iron ore mines.

The Project has been developed in the following stages:

- Stage A, consisting of a two-berth iron ore export facility at Port Hedland and a north-south railway from the central Pilbara to Port Hedland, approved under Ministerial Statement 690
- Stage B, consisting of iron ore mines in the eastern Pilbara (Christmas Creek) and an east-west spur rail line connecting to the Stage A railway; approved under Ministerial Statement 707. (Note this approval included the Mindy Mindy mine site but this has not been developed to date)
- Cloudbreak iron ore mine west of the Christmas Creek area, approved under Ministerial Statement 721 and federal approval under the EPBC Act (EPBC 2005/2205)
- Port facility upgrade consisting of a third berth at Anderson Point, Port Hedland, approved under Ministerial Statement 771
- Port Facility upgrade of a fourth berth at Anderson Point, Port Hedland, Not Assessed - Public Advice Given in 2010
- Solomon iron ore project consisting of two new mines and a railway connecting to the existing Fortescue rail line, approved under Ministerial Statement 862 and federal approval under the *EPBC Act* (EPBC 2010/5567 and 2010/5513) in 2011
- Additional rail infrastructure between Herb Elliot Port Facility and Cloudbreak Mine Site, approved under Minsiterial Statement 690 and 707 and federal approval under the EPBC Act (EPBC 2010/5513)
- Christmas Creek water management scheme to increase the mine dewatering rate and to inject surplus water into two brackish and one saline injection zones, approved under Ministerial Statement 871
- Cloudbreak Life of Mine, approved under Ministerial Statement 899 (supersedes the conditions of Ministerial Statement 721)

- Northstar Hematite Project, Not Assessed - Public Advice Given in 2012 and federal approval under the EPBC Act (EPBC 2012/6530).

Changes to Ministerial Statements 690, 707, 721 and 771 were made and approved under Section 45 or 46 of the *Environmental Protection Act 1986 (EP Act).*

Fortescue is extending its current operations in the Pilbara by developing the Solomon Project, which includes two new mine sites (Firetail and Kings), and a rail line to support the new sites. The Solomon Project area (Solomon) is located approximately 60 kilometres (km) north of Tom Price and is situated on both sides of the rail line operated by Pilbara Iron (Rio Tinto). Access to Solomon is via the public roads running north of Tom Price and also from the Pilbara Iron rail access road.

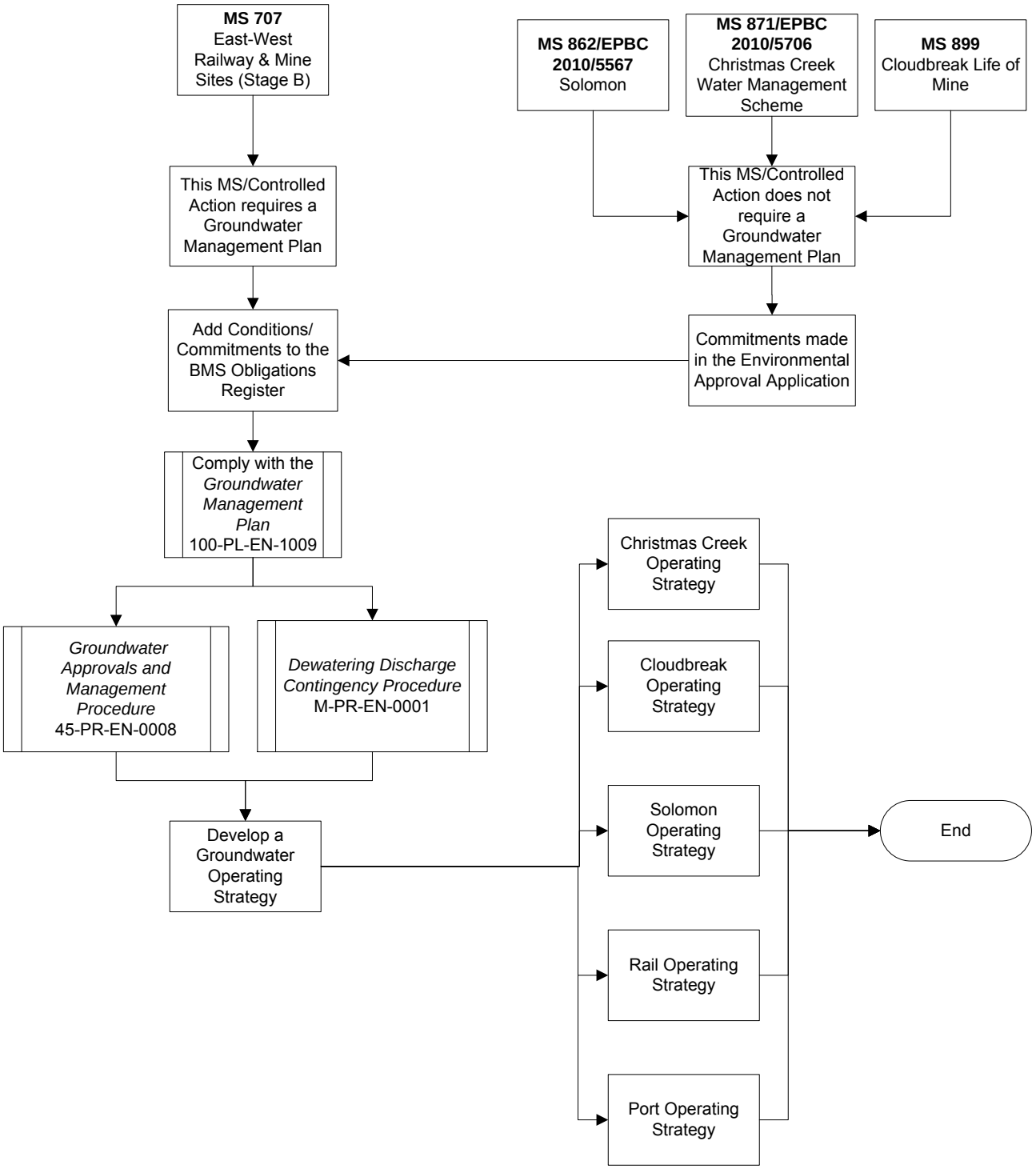
In addition to the Solomon project, expansion of mining to the west is proposed within the Western Hub Project area which contains approximately 10 ore bodies. Expansion of mining is also proposed east of Solomon at Nyidinghu and north east at North Star.

Fortescue is also conducting drilling programmes to further delineate resources and iron ore reserves within tenements surrounding Solomon and in additional locations throughout the Pilbara.

In addition to its wholly owned tenements, Fortescue is party to joint ventures and agreements with other tenement holders within the Pilbara region and is the manager of iron ore exploration operations upon these tenements.

Appendix 2: Data Flow Diagram

Groundwater Management Plan
Data Flow Diagram



Appendix 3: Cross Reference to State and Federal Statutory Requirements

Ministerial Statement	Requirement or Issue	Location in this Plan
MS 707	The layout and specifications of appropriate monitoring sites	Table 5, Objective 3, 5
MS 707	Protocols and procedures for monitoring and quantitatively assessing the salinity and effects of water abstraction and dewatering on phreatophytic vegetation and any other groundwater-dependent ecosystems.	Table 5, Objective 3
MS 707	Threshold levels to be used to determine if and when action is to be taken to protect phreatophytic vegetation and any other groundwater-dependent ecosystems	Table 5, Objective 3
MS 707	The actions (including an immediate reduction in the rate of bore water abstraction from affected bores) which will be taken to address the increase in salinity or adverse effects if monitoring reveals that salinity in the production or monitoring wells is increasing and/or if abstraction is affecting phreatophytic vegetation and other groundwater-dependent ecosystems.	Table 5, Objective 2, 3, 5
MS 707	Contingency plans for an alternative source if insufficient water is available from this borefield at sustainable levels of abstraction to meet demand.	Table 5, Objective 2, 3, 4, 5
MS 707	Reporting requirements	Table 5, Objective 5
MS 707	Closure procedures	Table 5, Objective 1, 2

Appendix 4: Key Activities

Key Activities	Description
Vegetation clearing	Causing substantial damage to native vegetation. This includes: • the killing or removing of native vegetation • the severing or ringbarking of trunks or stems • the draining or flooding of the land • the burning of vegetation • the grazing of stock • any other activity that kills or damages native vegetation. A guide to clearing permits under the *Environmental Protection Act 1986*. The definition includes all types of native vegetation, including those found in aquatic and marine environments. It includes all native grasses, shrubs and trees but does not include intentionally sown native vegetation.
Ground disturbance	Disturbance of the topsoil or surface rock layer of the ground, or a waterway, by machinery in the course of grading, excavating, digging, dredging or deep ripping. Includes: • Top soil removal • Growth medium recovery • Earthworks.
Water Bore Drilling	Drilling for water.
Construction/ establishment of infrastructure	Construction and establishment of groundwater management infrastructure
Construction/ establishment of linear infrastructure	Construction and completion of linear groundwater management infrastructure
Groundwater abstraction and distribution	Removal of ground water from underground aquifer.
Groundwater injection	Re-injection of previously abstracted groundwater to underground aquifer.