RIIMPO326E
Conduct water vehicle operations
Learner Guide

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1.1 Introduction

This course is based on the unit of competency **RIIMPO326E Conduct water vehicle operations**.

You will learn about:

- Planning and preparing for water vehicle operations.
- Conducting vehicle checks.
- Operating the water vehicle.
- Loading, transporting and discharging water.
- Carrying out maintenance tasks.
- Cleaning up and clearing the site.

1.1.1 What is a Water vehicle?

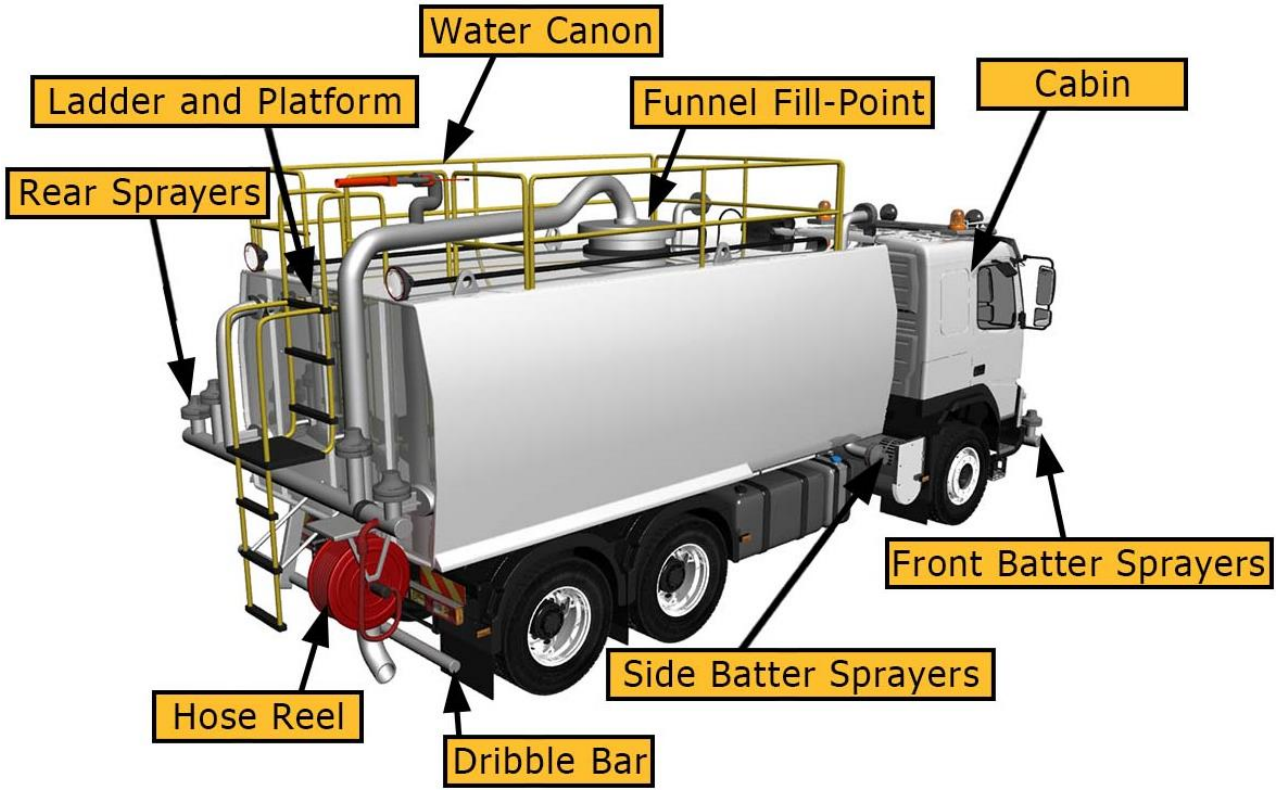
Water vehicles are purpose built vehicles or other vehicle/plant platforms that are used for loading, transporting, discharging and distributing water on civil construction work sites.

They can be created by putting tanks of water on a tray of a truck, or they can be built with the sole purpose of being water vehicles.

A water vehicle may be pulled behind other plant items on some sites.

1.1.2 Water vehicle Components

The following diagram shows some of the main components of a purpose built water vehicle:



Component	Description
Cabin	Part where operator controls the water vehicle from. Sprayer controls joysticks, buttons, timing controls and distance meters.
Batter Sprayers	These sprayers can distribute water in multiple directions. They are often used together for dust suppression.
Dribble Bar	Dribble bar at the back of the vehicle can be gravity or pressure controlled. Some can spray water in various patterns.
Rear Sprayers	Rear sprayers generally distribute water to the sides of the vehicle. These can be high pressure or soft sprays.
Hose Reel	Holds a length of hose that can be used by hand for watering smaller areas. Can also be used for landscaping purposes and fighting fires.
Water Cannon	This is most often used for fire fighting on site. It can shoot a high pressure stream of water over long distances.
Funnel Fill-Point	The main filling point for the water vehicle. The funnel helps to reduce spills and waste. This is often used underneath stand pipe systems.
Ladder and Platform	Allows easy access to the top of the water vehicle during loading or maintenance.

1.2 Site Policies and Procedures

You must follow all safety rules and instructions when performing any work. If you are not sure about what you should do, ask your boss or supervisor. They will tell you what you need to do and how to do it in a safe way.

Before starting your work you need to make sure you have access to all operations documentation for the job. This will help you to do your work in the safest way and make sure all work is compliant.

Operations documentation includes:

Site Details
The information and safety requirements of the workplace environment (where you will be working).

Hazard Details
Any hazards in the work area or related to the work. This could also include instructions on how to handle dangerous or hazardous materials.

Task Details
Instructions of what the work is or what you will be doing (this can include diagrams or plans). Also instructions on how to safely do the job.

Faulty Equipment Procedures
Isolation procedures to follow or forms to fill out.

Signage
Site signage tells you what equipment you need to have, or areas that are not safe to be in.

Emergency Procedures
Instructions on what to do in emergency situations, for example if there is a fire, accident or emergency where evacuation or first aid is needed.

Equipment and Work Instructions
Details of how to operate plant and equipment and the sequence of work to be done.

Your worksite will also have instructions for working safely including:

- Emergency procedures, including using fire fighting equipment, first aid and evacuation.
- Handling hazardous materials.
- Safe operating procedures.
- Personal protective clothing and equipment.
- Safe use of tools and equipment.

1.3 Work Instructions

You need to be clear about what work you will be doing. Make sure you have everything about the job written down before you start. This includes what you will be doing, how you will be doing it and what equipment you will be using.

Make sure you have all of the details about where you will be working. For example:

- **The Site** – Is there clear access for all equipment? Are there buildings, structures, facilities or trees in the way? What are the ground conditions like?
- **The Weather** – Is there wind, rain or other bad weather? Is it too dark?
- **Facilities and Services** – Are there power lines or other overhead or underground services to think about?
- **Traffic** – Are there people, vehicles or other equipment in the area that you need to think about? Do you need to get them moved out of the area? Do you need to set up barriers or signs?
- **Hazards** – Are there dangerous materials to work around or think about? Will you be working close to power lines or other people?

You also need to make sure you have all of the details about the kind of work you will be doing:

- **The Task** – What is the job you need to do? Where is it? How much water will you need?
- **Vehicle** – What type of vehicle will be used? How big is it? How much room does it need?
- **Communications** – How are you going to communicate with other workers?
- **Procedures and Rules** – Do you need any special permits or licences? Are there site rules that affect the way you will do the work?

1.3.1 Reading and Checking Your Work Instructions

All work needs to follow worksite, environment and company safety procedures.

Procedures help to make sure that all work is done in a safe way, without damaging equipment or putting people in unsafe situations. They also help to make sure that work is done in the correct order and doesn't interrupt or get in the way of other work that is happening on the site.

Your work instructions will tell you the safest way to do the job, and the equipment that you will need to use. It is a good idea to check your work instructions with your boss or supervisor to make sure you know exactly what you need to do.

If you don't know where to get your instructions or you can't understand them, you can ask your boss or supervisor. They will tell you where to find your work instructions and explain what they mean.

1.3.2 Work Method Statements

Many worksites require a work method statement before any work can start. A work method statement is a list of steps that outlines how a job will be done. It also includes any hazards that occur at each step, and what you need to do about them.

These statements can also be known as Safe Work Method Statement (SWMS), Job Safety Analysis (JSA) or Safe Operating Procedure (SOP).

Work method statements are a great tool for organising your work activities and making sure you have completed everything. This is because they outline the details of all tools, equipment and coordination with other workers relating to your job. Make sure all of these are available and ready before you start.

1.3.3 Project Quality Requirements

Every civil construction project will have quality requirements. These outline when tasks need to be completed and the required standard of the work.

Your work instructions and plans or drawings will guide you, and help you to make sure you are achieving the quality standard for the project.

They can include:

- Project dimensions.
- Project tolerances.
- Standards of work.
- Material standards.

1.3.3.1 Plans, Drawings and Sketches

Some of your work instructions might be given to you in drawings and sketches. You will need to get the information out of these and use it to do your job.

Project plans and drawings give you an overview of the site, for example:

- Location of the site and earthworks in relation to the surrounding area.
- The position of structures, roads, access areas.
- Layout of drainage lines.
- Foundation details and landscaping features.

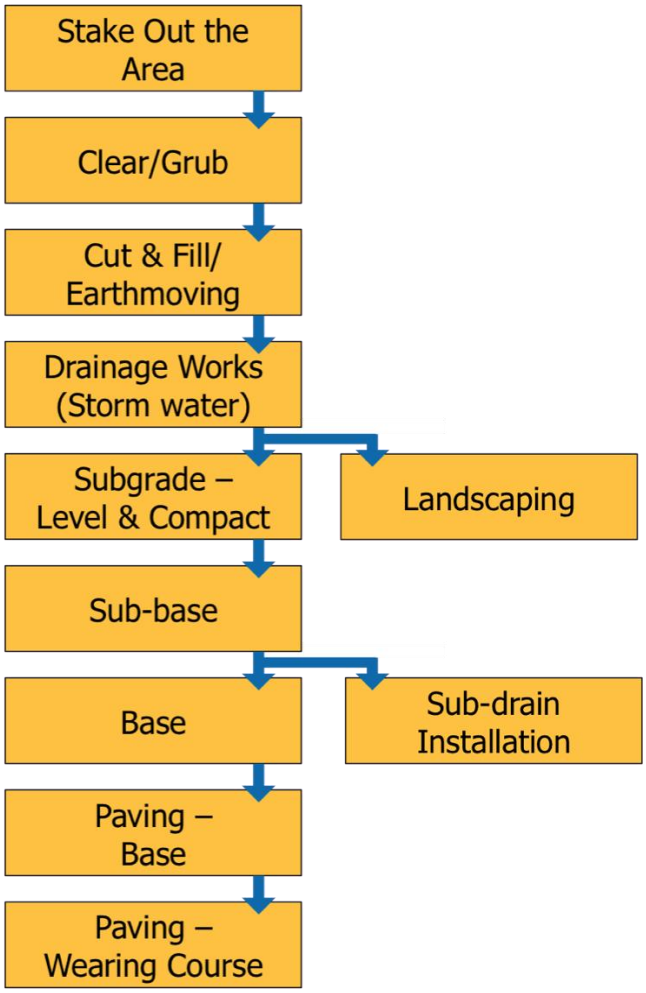
Depending on the project, drawings may be very detailed or they could be simple sketches.

You should learn about the conventions and symbols used in the plans and drawings so you can understand what the information means.

1.3.4 Civil Construction Sequences

Civil construction projects are made up of a range of smaller tasks or activities. It is important that these are done in the right order for the project to go smoothly.

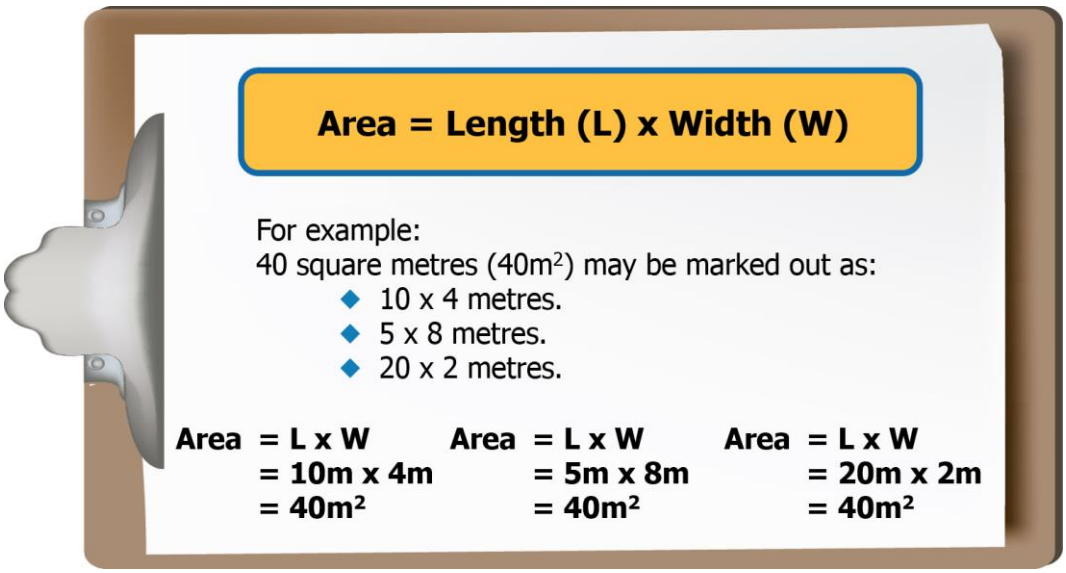
Here is a basic civil construction sequence from clearing the area through to road construction:



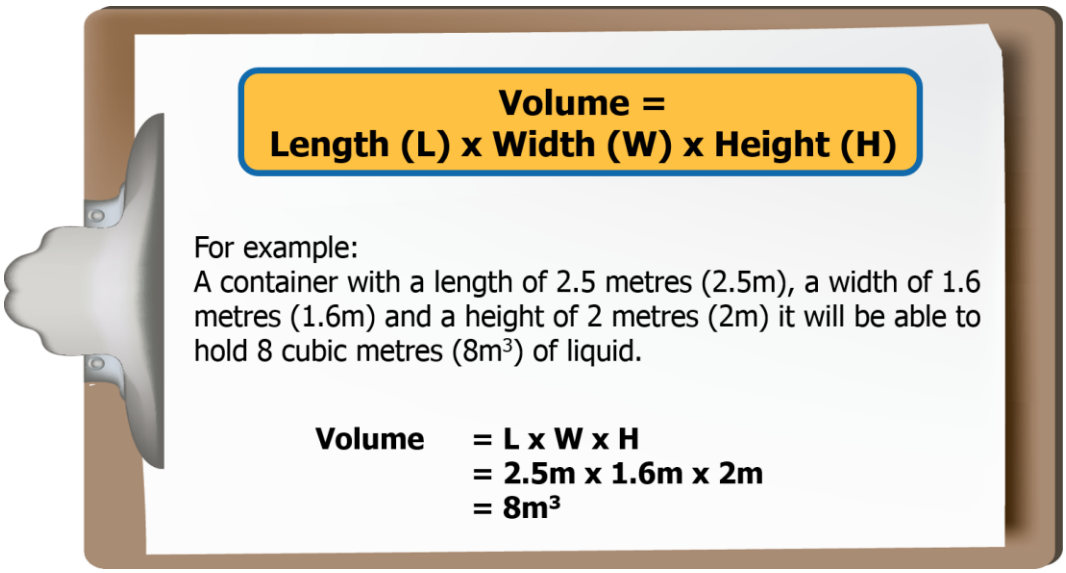
1.3.5 Basic Earthworks Calculations

As a water vehicle operator, the main calculation you will need to be able to apply is for Area and Volume.

Area can be calculated using the following formula:



Volume can be calculated using the following formula:



Calculating volume may come in particularly handy when deciding on how much water your vehicle can hold.

Generally, your vehicle will have a load chart that will list the maximum volume of the vehicle. It may be located on the water tank or inside the cabin of the vehicle. Always check this chart before loading your vehicle with water so that you do not overload the vehicle.

1.4 Emergency Procedures

Emergency procedures will vary depending upon the worksite. These procedures could include:

- Emergency shutdown.
- Evacuation.
- First aid.
- Fire fighting.

1.4.1 Emergency Shutdown of Equipment

If there is a fire, emergency or accident you might need to use the emergency stop on the equipment you are using. This will turn the equipment off immediately.

You can also use the emergency stop if the equipment stops working properly or you lose control of the equipment.

1.4.2 Evacuation

Things to remember are:

1. Keep calm.
2. Move away from the danger to a designated evacuation point, sometimes called an emergency assembly area.
3. Do not let other people into the area.
4. Call emergency services in accordance with workplace procedures and policies.

1.4.3 First Aid

First Aid is the quick care given to an injured or ill person. Every site will have a First Aid Officer. If somebody needs first aid you must tell your supervisor or First Aid Officer. Do not try to give first aid if you have not been trained.

1.4.4 Fire Fighting Equipment

Fire fighting equipment on site could be anything from small fire extinguishers through to large water cannons. Different fire fighting equipment should be used for different types of fire. Always check the equipment for information on what type of fire it can be used on.

Steps for using a fire extinguisher:

1. Evacuate the area.
2. Isolate the area.
3. Call emergency services or other designated on site procedure.
4. If it is safe to do so, use an extinguisher to attempt to control the fire using the **PASS** system.

The **PASS** system:

P	**Pull** the pin.
A	**Aim** at the base of the fire.
S	**Squeeze** the trigger.
S	**Sweep** the base of the fire.

Contact your site emergency management team as soon as possible and call the fire brigade on 000.

1.5 Hazard Identification & Control

Before you start work, you need to check for any hazards or dangers in the area. If you find a hazard or danger you need to do something to control it. This will help to make the workplace safer.

The best way to control hazards is to use a simple problem-solving approach:

1. **Identify the problem.** What is the hazard?
2. **Identify the cause of the problem.** What is causing the hazard?
3. **Work out the different options that you have to solve the problem.** What can be done to eliminate or minimise the hazard as much as possible?
4. **Choose the best option to solve the problem and apply it.** (What is the best option to eliminate or minimise the hazard?
5. **Check to see if the problem has been solved**. Has the hazard been eliminated or reduced to a safe level? If not, you will need to use additional, or better options for fixing the problem (controlling the hazard).

1.5.1 Identify Hazards

Part of your job is to look around to see if you can find any hazards before you start any work.

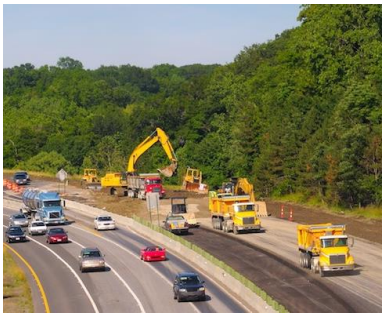
A **hazard** is a thing or situation with the potential to cause injury, harm or damage.

When you start checking for hazards, make sure you look everywhere. A good way to do this is to check:

- Up high above your head.
- All around you at eye level.
- Down low on the ground (and also think about what is under the ground).

Some hazards you should check for in the work area:

- Overhead and underground services.
- Uneven, soft, slippery or unstable terrain.
- Trees.
- Fires.
- Bridges.
- Excavations.
- Buildings.
- Traffic.
- Embankments.
- Water reservoirs and pumps.
- Cuttings.
- Hazardous materials.
- Structures such as site offices and scaffolds.
- Confined space of the tank.
- The weather and environment.
- Other workers or site visitors.
- Pedestrians and other public traffic.
- On site vehicles, plant, equipment and machinery.
- Poorly maintained or faulty equipment.
- Blocked or faulty jets, fans, spray bars, hoses.
- Hazards from components of the water vehicle.
- Water or fluid movement in the tank.
- Handling characteristics of the water vehicle.
- Chemical hazards such as fuel, chemicals, contaminants, gases or dusts.



1.5.2 Control Hazards

The Hierarchy of Hazard Control is the name given to a range of control methods used to eliminate or control hazards and risks in the workplace. The Hierarchy has 6 levels.

It is important to understand what each level in the Hierarchy stands for and how they can be applied to your work.

Hierarchy Level	Action
1. Elimination	Completely remove the hazard. This is the best kind of hazard control.
2. Substitution	Swap a dangerous work method or situation for one that is less dangerous.
3. Isolation	Isolate or restrict access to the hazard.
4. Engineering Controls	Use equipment to lower the risk level.
5. Administrative Controls	Site rules and policies attempt to control a hazard.
6. Personal Protective Equipment	The least effective control. Use PPE while you carry out your work.

It is important to think about all of the options available when deciding on the best hazard controls. You may need to use more than 1 control measure to bring the risk level down to an acceptable level.

Check the situation after you have applied a control measure to see if more controls, or different controls are needed to make the job safe. If more controls are needed, make sure they are applied before you start or continue the work.

1.5.2.1 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is clothing and equipment designed to lower the chance of you being hurt on the job. It is required to enter most work sites.

It includes:

- **Head protection** – hard hats and helmets.
- **Foot protection** – non-slip work boots.
- **Hand protection** – gloves.
- **Eye protection** – goggles, visors or glasses.
- **Ear protection** – plugs or muffs.
- **Breathing protection** – masks or respirators.
- **Hi-visibility clothing** – clothing that makes you stand out and lets other people know where you are.
- **Weather protection** – clothing that protects you from the sun or from the cold.

Make sure any PPE you are wearing is in good condition, fits well and is right for the job.

If you find any PPE that is not in good condition, tag it and remove it from service. Then tell your supervisor about the problem and they will organise to repair or replace the PPE.

1.5.2.2 Traffic Control Barricades and Signage

In some cases you may need to isolate the work area. Set up barricades and signage to warn others that you are working in the area and that it is dangerous for them to come too close.

On worksites it is often necessary to control the movement of traffic around and through the site. To do this there are 2 different types of traffic control plans:

Traffic Management Plan

Deals with traffic moving through the site, i.e. traffic on public roads and members of the public.

Vehicle Management Plan

Deals with on-site vehicle movements, haul circuits and dump runs, and material routes.

In the traffic or vehicle management plan, signs and the distances between signs will be listed. Reading the plans will show you where particular signs need to be placed.

Signs and barriers may include:

- Danger or warning signs like speed limits, 'workmen ahead' or 'reduce speed'.
- Flashing lights.
- Barricades and fences.

1.5.3 Environmental Protection Requirements

Environmental protection requirements are part of every worksite. Make sure you check with your supervisor about what environmental issues need to be managed during your work.

All environmental details should be listed in an 'Environmental Management Plan' for the site. It can include details for:

- Waste management.
- Water quality protection.
- Noise control.
- Vibration control.
- Dust management.

The plan will outline the steps and processes needed to prevent or minimise damage to the environment through the use of machinery and equipment.

1.5.3.1 Dust Management

The objective of dust suppression is to ensure that enough water is distributed to settle the dust in an area without flooding the surface.

Often there will be job-specific requirements for the suppression of dust, as too much water can cause problems such as mud sticking to roller drums, or vehicles leaving wheel tracks in earthworks.

Alternatively, insufficient water to settle the dust can cause issues such as poor visibility, or a lack of critical moisture.

Where very fine dust conditions exist it may be necessary to water these areas frequently but lightly so that the fine powdery dust does not potentially form into mud.

In many cases dust suppression requirements will be dependent on the types of work and materials on the site.

Dust suppression is vital on any civil construction site and must be performed in line with the job requirements. It is necessary for both safety reasons and to meet environmental legislative requirements.

2.1 Choose and Check Vehicle and Equipment

Once you have confirmed your job requirements you need to choose the right equipment and attachments to get the job done. Water vehicles can be used before, during and after other site activities.

Selecting the correct tool or piece of equipment for the task is essential to successful completion of the job at hand.

When choosing tools and equipment it is essential to ensure the correct tool is used for the specific task. Each type of water vehicle may have different tools and equipment that will apply to the particular attachments, nozzles or jets that are fitted to the vehicle.

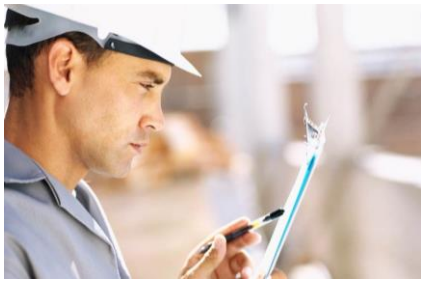
The type of water vehicle you use will depend on:

- The task requirements, specifications and goals.
- The appropriateness of the equipment for the completion of the task.
- The characteristics, correct use, operating capacity and limitations of each item.
- The potential risks to yourself and others in the intended use of the equipment.

Information about technical capabilities and limits can be found in the operator manuals for each item.

It is not safe to operate plant, equipment or attachments beyond the manufacturer's specifications. This may cause the vehicle to break and could also cause an accident.

2.1.1 Conduct Routine Checks



Before you use any piece of plant or equipment, you need to conduct routine checks to make sure it is safe to use. Check the vehicle logbook before you start your inspection to see if there are any faults that still need to be fixed before you can use the water vehicle.

Also make sure you are wearing the correct PPE before you start checking the vehicle.

Routine checks are made up of:

Pre-Start Checks
Visual checks that are made before you start the equipment.

Operational Checks
Checks of all functions once the vehicle has been started.

Generally, routine checks are performed at the start of each day or shift.

You can use an inspection checklist to keep a record of the checks you have made.

2.1.1.1 Pre-Start Checks

Pre-start checks are done before the engine is started. Walk around the water vehicle and look for anything that is out of the ordinary.

Part or Component	What to Check
Structure	Check the general condition of the water vehicle. Look for any obvious signs of wear and tear. Check for oil or other fluid leaks.
Wheels and Tyres	Check the condition of wheel. Check the condition and air pressure of the tyres to make sure they are within the manufacturer's specifications.
Fluids and Lubrication	Check that the oils (engine, transmission, hydraulic) and fuel are at the right levels. Check that the water in the engine or other approved coolant is at the right level. Transmission fluid needs to be checked in accordance with the manufacturer's specifications. Check that parts are lubricated to ensure smooth operation.
Engine	Check condition and security of battery. Check electrolyte levels. Check for any obvious signs of damage or wear.
Hoses and Pressure Bars	Hoses and pressure bars are checked for splits, leaks, fractures, bulges and warping.
Decals and Signage	Check that all decals and signage are present on the vehicle.
Windows	Check that the windows are clean and you have good visibility from the operator's chair.
Cabin	Check that the seat and safety belt are in good condition. Check that the cabin is clean.
Service History and Logbook	Check the vehicle hour meter, manufacturer's recommendation and logbook to find out if the water vehicle needs to be serviced. You can also check the instruments or computer for this information on later models.

For exact details on the components for the vehicle you are operating, check the operator's manual as different brands may have different requirements.

2.1.1.2 Start the Water vehicle

Start-up procedures will vary depending upon the site procedures and the manufacturer's requirements. It is essential that you identify what procedures you need to undertake during the start-up process.

You will find a detailed list of start-up procedures in your induction materials, company procedures manual, job descriptions and specifications, and daily task lists.

Ensure that the engine idles for the required amount of time. Depending upon the individual vehicle this time could range from 3 to 10 minutes. During this process, monitor the temperatures of oil, engines and accessories.

2.1.1.3 Operational Checks

Operational checks are made once the engine is started.

Climb to the operator's seat using 3 points of contact at all times (2 hands and 1 foot or 2 feet and 1 hand). This is the safest way to climb in and out of the water vehicle.

Adjust the seat until comfortable and make sure you have maximum visibility. Secure your safety belt.

Controls and functions that need to be checked on the water vehicle:

Part or Function	What to Check
Gauges and Instruments	Check that all instruments are displaying properly and are not signaling any alarms or warnings.
Safety Devices	Test all lights and other warning devices.
Sprayers and Water Systems	All spray systems will need to be checked to make sure they are operating properly. This includes ensuring there are no blockages and that adequate pressure is being used.
Travel, Turning and Brakes	Test all movements and brakes, including the emergency stopping device.
Ancillary Equipment	Test out all communications devices and any other systems or functions fitted.

Once you have finished your operational checks it is a good idea to check for external signs of oil or fluid leaks. It is common for the start-up process to cause a leak through hoses breaking.

2.1.2 Recording and Reporting Faults

Once all routine checks are finished, you will need to report any problems, faults, defects and damage that you found during the inspection so that they can be repaired and the vehicle and equipment are safe for you or the next operator to use.

Make sure the water vehicle is tagged out (isolated from use) until the repairs have been made.

Record the details of the problem in a fault report or the vehicle logbook.

2.2 Operate the Water vehicle

During civil construction water vehicle operations you will need to:

1. Assess the materials you are working with.
2. Use the equipment safely within the technical specifications and limits.
3. Use the equipment for tasks that it is specifically designed for.
4. Continuously monitor and check for hazards.

It is important to coordinate your activities with other workers when you are planning and carrying out the work to make sure everyone knows:

- The work being completed.
- How, when and where you will be operating.
- What they need to do.

All workers on site must understand their own role and the roles of others before starting work. It helps to make sure work is done safely and efficiently.

Workers you may need to coordinate with include:

- Supervisors and management.
- Other plant and vehicle operators.
- Traffic controllers or other workers on the site.
- Team leaders.
- Site safety personnel.

2.2.1 Assess Materials and Site Conditions

You will need to assess the materials you are working with to figure out the best way to handle them to aid in compaction and dust suppression. For example, clay is more cohesive and harder to add moisture to than topsoil.

There may be different types of materials being handled at the worksite. They may include:

Material	Description
Clays and Mud	Clay and mud can tend to be dense and sticky and may not discharge cleanly if wet or damp. Mud can purge plant and create damage.
Topsoil and Organic Materials	Generally these types of materials are loose. As topsoil can be reused in re-vegetation activities, it will normally be dumped in a quarantine area to keep it free from contaminants. It may be necessary to clean down the machine before starting work in other areas.
Stones, Rocks and Gravel	The techniques used will depend on the type of type of rock, and the size of gravel and stones. For example: ◆ Metamorphic rocks are heavy and hard. ◆ Igneous rock is volcanic and can be hard but may also be very light. ◆ Sedimentary rocks and shale could peel out when cut and removed.
Silts and Sands	Depending on the amount of moisture, silts and sands can move cleanly and easily or can be difficult because of the fine and sometimes crumbly nature of the materials.

If you are having difficulty with visual identification, you can feel the materials to check for clay content or plasticity.

When feeling the materials you are trying to identify the different components by the size of the aggregates and the amount of clay.

Clay is an important component of materials on a civil construction worksite as it gives the materials a plasticity, which allows the materials to bind together well.

Site conditions, terrain and grades will affect the operation of the vehicle and the effect of the water.

This in turn requires the operator to be able to change operational styles and techniques based on the prevailing conditions. For example, if the ground is rough or stony you should slow down accordingly to a safe speed.

2.2.1.1 Soil Technology and Compaction

Different types of soils compact in different ways. Some, like sand, will need to be mixed with other materials before any compaction activities could start.

Other materials, such as clay, will need to be at the correct moisture content (not too wet or too dry).

You will need to assess the type of materials to be worked with, the work area or circuit, and the grade of the site. This will help you determine if the vehicle you are operating is going to be able to provide the amount of moisture needed.

You will be able to find the percentage of moisture that you need to reach in site plans, quality assurance plans, specifications or by speaking with your supervisor or site quality assurance officer.

Compaction theory details how materials work together under compaction situations.

It is important that you have an understanding of how mechanical interlock and moisture work together to ensure compaction can occur.

Mechanical Interlocking is how the different sizes of the material work together to minimise the voids in the final product. Interlocking requires a good mix of different sized and shaped materials. If your materials are all similarly sized and shaped, voids between the materials will develop and compaction will not be achieved.

Moisture Content of the materials is critical to achieving the best compaction levels by swelling the clay particles in the materials, which allows good interlocking to be achieved. Materials that are too dry will not 'bed down' correctly.

Every civil construction project has very detailed and explicit specifications which outline acceptable ranges for all aspects of the project, including compaction percentages, acceptable materials and acceptable moisture contents.

2.2.1.2 Field Tests for Moisture Content

Moisture can be thought of as the amount of water in a substance or material. Too much or too little moisture affects the physical properties of the materials and how they will behave in construction, for instance; shrinking, binding, or strength.

Knowing the moisture content in the materials is essential for successful construction activities. Each project will have a specified range of moisture that is acceptable.

The type of moisture testing to be undertaken will be determined by the worksite requirements and resources. The 3 most common moisture content tests are:

- The simple field test.
- The practical field test.
- The speedie moisture content test.

The **simple field test** for moisture is to pick up a small handful of materials and create a sausage shape. If the material holds that shape without crumbling, the moisture content should be within the acceptable range.

A **practical field test** for moisture is to take a sample of the materials into a laboratory. The material is then weighed. Once the weight has been established the material is then heated in an oven or over a burner for a specified period of time. Once the time has passed, the materials are weighed again.

The **speedie moisture content test** is a laboratory test that is undertaken with a nuclear densometer. This is a test that is done by lab technicians. The moisture content of the materials is calculated based on the difference in the weights. This is expressed as a moisture material percentage.

Moisture of the materials is critical to the success of the project, so if necessary be prepared to do the tests more than once. The project specifications will outline the acceptable range of material moisture.

You will need to obtain the information related to the field moisture content, and specifications for the amount of water required for the task.

Designated laboratories will normally conduct field moisture tests for the majority of civil construction sites.

These tests are commonly used:

- To determine the amount of water that needs to be applied to the area.
- During stabilisation activities.
- In highly reactive soils – these are soils that retain high water concentrations or that may have elements which change the chemical composition of the soils when water is added.

It is extremely rare for water vehicle operators to be involved in field testing for moisture content. If you are asked to assist in these activities, follow your site procedures and instructions.

2.2.2 Safe Operating Techniques

It is important to follow all appropriate procedures and guidelines when operating the water vehicle. This will ensure the water vehicle is operated within applicable guidelines and that work is conducted in a safe manner.

To overcome some of the hazards associated with water vehicle activities it is necessary to use the appropriate safe operating techniques, regardless of the terrain.

General water vehicle safe operating techniques cover aspects such as:

- Monitoring speed – by keeping within the acceptable speeds for the area you will be able to respond quickly to any situation.
- Adjusting your driving to meet the conditions and the requirements of the site.
- Keeping the water truck operating within its tolerances and capacities – this reduces the risk of any issues or problems during operation, and reduces the likelihood of accidents or incidents.
- Following site safety procedures – these have been developed to keep the water truck operations as safe as possible for all members of the site.
- Knowing your vehicle and recognising signs of problems – this is a critical aspect of keeping activities as safe as possible.

Appropriate safe operating limits and techniques should be outlined in site procedural manuals and operator manuals.

2.2.2.1 Monitoring Road Conditions

Road and traffic conditions need to be constantly monitored to ensure safe operations of the water vehicle at all times.

Doing this and adjusting your operating techniques accordingly will help to prevent injury to people and damage to property and equipment.

When monitoring road conditions you will be looking at:

- Traffic flow, speed and smoothness.
- Conditions and standards of the road or route.
- Distances travelled. Don't forget driver fatigue management and take adequate rest breaks when they are allocated.
- Load behaviour and movements.

Experience and operator judgement are essential to successfully monitoring road and load conditions.

2.2.3 Managing Power Efficiency and Gear Selection

It is important to be effective and efficient when using the water vehicle in a civil construction environment.

Ensure that you are familiar with the capabilities and limitations of the vehicle you are operating.

When performing water vehicle operations, you must manage the engine power to ensure the efficiency of movements so that the gears and engine are not damaged.

This will allow you to manage the movements of both the vehicle itself and the water contained within it. Smooth movement of the vehicle and load helps to minimise damage to the vehicle.

2.2.3.1 Gear Selection and Transition

Smooth operation is essential. This is achieved through correct gear selection and engine revolutions.

Gear transitions must be smooth and coordinated to prevent damage to the motor and transmission of the vehicle.

Smooth gear changes allow you to operate the water vehicle within the appropriate torque range. Commonly you will hear a difference in the engine when you need to change gear.

Smooth gear transitions and correct engine torque promote better engine life and minimise driveshaft and transmission issues in the long term.

The primary focus of gear selection and power management is to minimise possible damage to the water vehicle and to provide fuel and fluid efficiency.

Water vehicles can be quite large items of plant, and without effective power management, you will not achieve the maximum efficiency from the fuel and fluids used.

2.2.4 Bring Water vehicle to a Halt

Being able to bring the water vehicle to a halt safely to minimise wear and tear on the vehicle is essential.

The way you do this will depend upon site conditions and the size of the load. Don't forget the water movement within the water vehicle will be the main impact on your driving and halting techniques.

When bringing the vehicle to a halt ensure you make full and correct use of the:

- Brakes.
- Engine retarder.
- Gears.
- Other features or halting functions available to you.

Each model and make of water vehicle will have its own processes for halting, which must be known and followed.

2.3 Load, Transport and Distribute Water

Before discharging any water the vehicle must be driven to the work area and loaded with water.

You should make sure that the route and direction of travel is clear and that you travel at a safe speed. Always check over both shoulders to ensure the direction of travel is clear before reversing.

2.3.1 Position the Water vehicle

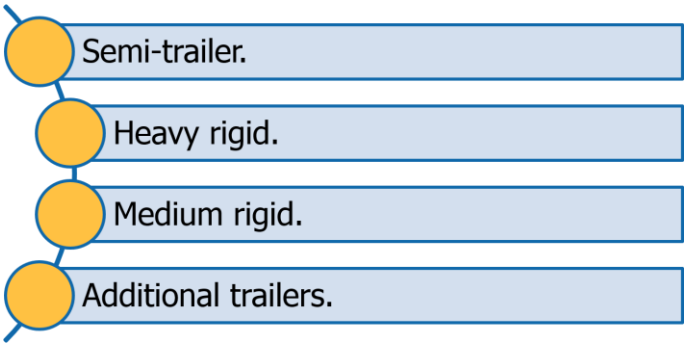
When you arrive at a loading or water distribution point, the first thing you will need to do is position the water vehicle in a manner that allows safe, efficient and easy loading or distribution. This will depend upon the water loading and distribution system being used.

You will also need to be aware of the location of the loading funnel or pump on the water vehicle. Input points could vary. You may need to park at an angle so that pipes and pumps can be readily connected in accordance with your vehicle configuration and the distribution system.

When positioning the water vehicle try to minimise movement. This will help to reduce wear and tear on the vehicle.

Water vehicle configuration will assist in determining how the vehicle will approach the water loading or distribution point.

Common configurations could include:



For many water drawing locations, designated water vehicle access routes will be documented in the site vehicle movement plans.

2.3.2 Load the Water vehicle

When loading the water vehicle you must keep within the authorised carrying capacity of the tank.

Site conditions, vehicle configuration and location will dictate how much water will be loaded at any one time.

Always abide by the manufacturer's specifications, legal loading limits and site requirements.

The two most common water loading systems used within civil construction are:

- Standpipe or standpoint systems.
- Water drawn from a reservoir.

Other pumps and pumping systems can be used.

2.3.2.1 Standpipe Systems

Standpipe (or standpoint) water distribution systems are normally operated by local councils. In irrigation areas you may also have access to privately owned systems. These are monitored and operate on a user-pays basis.

The water from standpipes is normally treated and potable (suitable for drinking). Standpipes will normally have a record or register system to access and monitor how much water is removed.

Standpipe systems could include:

- Overhead delivery systems.
- Plain hydrant systems as opposed to fire control hydrants.
- Reservoir delivery systems – designated pumping outlets from reservoir storage areas.

2.3.2.2 Water Drawn from Reservoirs

Water drawn from reservoirs can include local water supplies such as dams, creeks or rivers.

You must have permission to draw water from creeks or rivers. Permission can be obtained through the local management authority for the supply.

To draw water from dams you will need permission from the owner. When pumping water from dams ensure you draw from the surface to keep the water as clear of debris as possible.

Most civil construction sites will draw from creeks, rivers or dams because of the cost involved with standpipes and the distances that must be travelled to gain access to the water.

The use of grey water systems is becoming more popular. This water that may otherwise be released into other systems must be tested prior to use to ensure it will not impact the integrity of the works.

2.3.2.3 Pumps and Pumping Systems

Methods for loading and unloading water will be determined by the type of water vehicle you are using and the water distribution point you are drawing from.

Small pumps are commonly used to draw water from reservoirs. These pumps will vary in their technical capabilities and limitations, and each type will have different requirements for use.

Examine each pump to determine exactly how it should be used.

The water will be pumped out during distribution. To determine the capabilities, limitations and scope of the pump to be used, make sure that you analyse the type of pump, the manufacturer's specifications and the relevant site procedures.

2.3.3 Move the Loaded Water vehicle

Once you have loaded the water vehicle you will need to relocate it to the required discharge and distribution point.

Surge and Sway

When driving a fully loaded water vehicle, you need to be aware of potentially hazardous factors such as surge and sway.

Surge and sway is the movement of water within a confined space. The impact of water moving can cause balance issues with the truck as you round corners, drive on sloping surfaces or when braking.

The most dangerous time for surge or sway is when the vehicle is half to two thirds full. With a full tank there is minimal space for movement, and when the tank is less than full there is not enough water in the tank to balance the vehicle.

2.3.3.1 Minimising Movement and Relocating Safely

Custom-designed water vehicles have baffles within the tank to section the water into smaller cells. These smaller cells minimise the amount of movement that is possible, thereby decreasing the chances of loss of control.

To minimise movement of the load, it is important to drive as smoothly as possible. This reduces the impact of moving water on the mechanics of the truck.

Always be aware that the weight and movement of the water can affect the balance and drivability of the vehicle.

Configuration of the vehicle will also have an enormous impact on the driving techniques that should be used.

Ensure that you maintain constant awareness while driving, particularly when taking off, turning corners and braking.

2.3.4 Discharge and Distribute Water

Once you have reached your designated location you will be required to discharge or distribute the water in accordance with the task specifications.

Water vehicles will often work in conjunction with other plant items to ensure the successful completion of civil construction activities.

In the civil construction industry water vehicles are generally used for dust suppression on work sites. They may also be used to add moisture to the materials on site and assist in compaction activities.

Most water vehicles discharge and distribute water from a variety of spray bars, nozzles and pumps, for example:

Rear Sprayers

Dribble Bar

Front Sprayers	
	

Side Sprayers	Water Cannon	Pumps and Hoses
		

2.3.4.1 Discharging Water

Water discharge relates to moving water from the water vehicle through the lines, pipes, nozzles and spray bars into the civil construction area you are working in.

This may be achieved through gravity feed or pressure pumping methods, depending upon the needs of the site.

Discharging of water is normally done to assist in:

- Dust suppression.
- Compaction activities.
- Stabilisation operations.
- Road maintenance activities.
- Fire fighting activities.

Whether you are discharging or distributing water, you must follow your site procedures and instructions. These will dictate:

- What activity is to be completed.
- When the activity needs to be done.
- How it needs to be completed.
- Water application rates.
- All other pertinent information.

Adhering to your site procedures and instructions will ensure that the water is placed in the designated location in the right quantity and in the correct manner.

2.3.4.2 Dust Suppression Operations

On most civil construction work sites, the water vehicle will be used for dust suppression operations.

This involves discharging water in areas with large amounts of dust to minimise the effects of the dust and help to compact the soil and prevent further dust build up.

Before carrying out dust suppression operations, you will need to assess the materials you are working with to ensure you understand the best way to suppress the dust in the area. This may include using multiple sprays or bars on the truck, or making multiple runs with certain sprays in operation.

You will also need to ensure you use the correct amount of water for the situation to ensure that the activity is completed successfully and that the area is not flooded.

The most common ways for a water vehicle to complete dust suppression and compaction operations is by using the dribble bar at the back of the truck and making multiple runs on the site. This spray bar can discharge water through the use of gravity or pressurised pump systems.

Some newer water vehicles operate automatically. For example, the water rate is adjusted in line with driving speed – when the vehicle is stopped, the water stops and more water is distributed when travel speed increases.

Interval spraying distances can also be set by the operator. For example the dribble bar can be set to spray a burst of water every 5 metres along a pass.

Always check your work instructions and project quality requirements for the best method to be used on your site.

2.3.4.3 Water Distribution

Water distribution relates to the movement of the water from the water vehicle into another form of water storage area or receptacle.

The most common way of doing this is by attaching a pump hose to the water vehicle and pumping the water directly into the water storage areas. Water may be moved either under gravity feed or by pressure pumping.

Some sites will have specific locations set up for this and may even have raised tanks that will pump the water out of your vehicle for you.

This may be done for filling:

- Water tanks.
- Water points.
- Fire points.

2.3.5 Monitor Discharge and Distribution System

When releasing water at the worksite, you will need to closely monitor the discharge and distribution system to ensure the task is completed in accordance with site and task requirements.

You can monitor and maintain this system by:

- Using mirrors to observe the water leaving the vehicle.
- Monitoring the dispersal rate and size of the water as it leaves the vehicle.
- Monitoring the spray fans so you can see if a problem occurs.

Water must leave the vehicle in a manner that is safe, efficient and effective, and that meets the task requirements.

Ensure that you are aware of, and maintain the correct application rates, amounts, frequency and timeframes or intervals. Consistent application of the water is the most important aspect of dispersal.

2.4 Monitor and Check for Hazards

While you work it is important to always be on the lookout for new hazards, and to check that hazard controls are still in place and working effectively. This will help to ensure the safety of yourself, other personnel, plant and equipment.

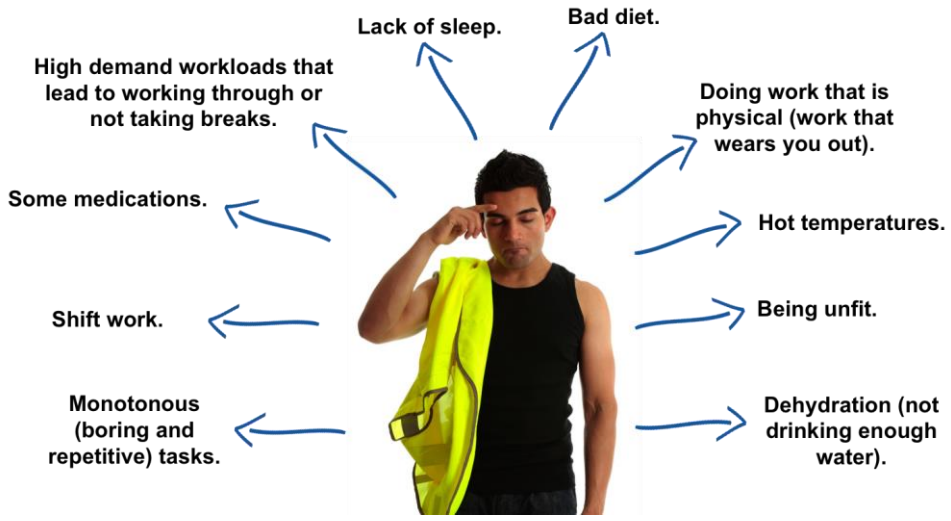
Check the following things while you work:

Other Machines – At all times you need to know when other machines are working near the water vehicle. Know and stick to your agreed speeds, travel paths or roads. Good communication between operators is essential to avoid collisions.

Personnel – Good communication is the key to working with other personnel. Be aware of people in the work area and keep them safe by making sure they are not in danger and are a safe distance from the water vehicle. If you are authorised, tell them to leave if they shouldn't be there, or call on someone who is authorised.

Operator Fatigue – Fatigue is one of the leading causes of accidents for operators of all types of vehicles and equipment.

Fatigue can be caused by:



Warning signs that you are suffering fatigue include:

Physical	◆ Slow reaction time. ◆ Tiredness, yawning or sore eyes. ◆ Headaches, stomach or other problems. ◆ Micro sleeps (nodding off for a short period of time).
Mental	◆ Trouble concentrating and thinking clearly. ◆ Shorter than normal attention span. ◆ Boredom, irritability or lack of motivation.
Work	◆ Poor or careless performance. ◆ Overlooking minor but potentially important details. ◆ Lower levels of communication and cooperation with others.

It is very important that fatigue is managed properly. Here are some ways you can manage fatigue:

- Get enough sleep.
- Drink plenty of water.
- Take regular breaks.
- Keep a healthy diet.
- Keep a reasonable level of fitness.

Talk to your boss or supervisor about breaking up boring or monotonous tasks or rotating the work you are doing with other workers if possible.

2.4.1 Reporting Hazards

Any hazard or environmental issue that you identify during your work will need to be reported.

If you have taken any action you will also need to report those details. This could include written or verbal reports.

Your worksite may have standard paperwork that needs to be filled out, for example:

- Hazard report forms.
- Work method statements.
- Other reports or documents.

2.5 Checking Completed Work

The key to completing tasks efficiently is good time management and knowing how to use your equipment properly.

Once you have completed your work you will need to check it against:

- Your work instructions and project plans and drawings.
- Project quality requirements and timelines.

Speak to your supervisor when the work is completed to see if there are any other tasks that need to be done to complete the job.

3.1 Park and Shut Down the Water vehicle

Every piece of machinery has slightly different park and shutdown procedures. For the exact procedure for the vehicle you are operating, check the operator's manual.

3.1.1 Parking the Water vehicle

Water vehicles needs to be parked in a safe way that will allow easy access to the vehicle.

Safe parking practices include:

- Stop the water vehicle on a flat level surface in the designated area and keep the access points clear.
- Park the water vehicle away from overhangs, excavations, access ways and tidal or flood areas.
- If the water vehicle must be parked on a sloping surface it should be facing across the slope.
- Keep the water vehicle away from refuelling sites and areas when parking or you can block the rest of the machines on the site from accessing fuel.
- Apply all locks and brakes.

If the vehicle has to be parked on a public access way, lights, signs and barricades should be erected to warn people.

3.1.2 Shutting Down the Water vehicle

Shutdown procedures include:

- Cooling of the engine before shutting it down. This depends on the vehicle but is usually the same amount of time as the engine warm up time.
- Monitoring the controlled lowering of temperatures and pressures.
- Walking around the water vehicle looking for any signs of damage or faults that may have occurred during the task.
- Securing the water vehicle, using any applicable lock out or isolation devices and removing the keys. This will prevent any unauthorised movement of the water vehicle.
- Ensuring equipment is correctly stowed in accordance with site and manufacturer's requirements.

Any problems found during the shutdown procedures need to be documented in the way required by the worksite.

3.2 Post-Operational Checks

Post-operational checks need to be done to make sure the water vehicle is ready for the next operator.

General maintenance activities are done to keep all plant and equipment working safely for longer.

As part of your job as a water vehicle operator, you need to inspect your vehicle to find and report any faults or damage that may have occurred during your work activities.

Your inspection should include:

Visual Inspection of the Water Cart	Physically looking for anything odd, wrong, broken or damaged.
Visual Inspection of the Environment	Is any fluid leaking?
Signals	Alarms, lights, electronic indicators showing that something may be wrong.
Gauges	Showing temperatures and the levels of fuel, oil and other fluids.

Post-operational checks should include all of the things you look for when conducting pre-start checks. For example:

- Fluid levels.
- Condition of tyres.
- Visibility (windows and mirrors).
- Pumps and hoses.
- Structure and attachments for damage or wear.

3.2.1 Reporting Faults

Once a fault has been found, it needs to be reported and fixed.

Most sites have a fault report form that will need to be filled in with the details. The form will generally need the vehicle or equipment make and model numbers, the site identification numbers, the type of fault and the person reporting the fault.

You also need to make sure the water vehicle is tagged out (isolated from use) until the repairs have been made.

Some sites will have a verbal system of reporting where you speak with a supervisor who then documents the fault, while others may require the operator to organise repairs of the fault directly.

3.3 Clean the Water vehicle and Carry Out Routine Maintenance

It may not be practical to clean the water vehicle after every use but you should clean it thoroughly as often as possible. Mud and other contaminants left for long periods will eventually damage the vehicle and equipment.

Cleaning is also a good way to do an even closer inspection of the water vehicle, and may highlight issues you didn't see during the walk-around inspections.

Cleaning will need to be done in a designated area to avoid any negative impact on the environment or contamination of the site.

Before carrying out any routine maintenance and minor repairs make sure you have all of the tools and equipment you will need to finish the job.

3.3.1 Carry Out Maintenance Tasks

Maintenance activities could include:

- Cleaning the water cart.
- Authorised servicing and minor replacements or repairs.
- Refuelling.
- Recording and reporting of faults through workplace procedures.

When conducting maintenance activities it is important to keep people in the area safe by using barricades or fences if necessary and locking out machines.

Tasks should be completed within designated areas and others should be informed of what you are doing.

You should conduct servicing, maintenance and housekeeping tasks to ensure the vehicle stays at its operating capacity for as long possible.

You will also need to coordinate with mechanics, maintenance supervisors or other site workers to ensure the vehicle is serviced at regular programmed intervals.

3.3.2 Vehicle Refuelling Procedures

All refuelling of equipment needs to be done in line with safety procedures and workplace instructions.

Some sites may have refuelling areas for plant and machinery set up to make sure any spills or incidents can be contained without causing damage to the environment. Spill response procedures need to be clear and spill kits available to manage any incident.

Other sites use a service truck or fuel tanker that travels to each vehicle to refuel. On these sites it is very important that all procedures are followed to avoid any incidents (such as fires in a coal mine environment) or damage to the environment. For example, there may be site rules against refuelling plant and equipment near a waterway or sensitive area.

Refuelling can be a dangerous activity, so it is important that you know and understand the correct procedures and techniques. If you are not sure what to do, speak with your supervisor.

These are some general guidelines for refuelling plant and equipment. Always check the procedure for your work site before any refuelling is done.

- Park the vehicle in an appropriate location or within a bunded area. This contains any environmentally sensitive fluids or spills from entering and causing damage to the environment.
- Shut down the vehicle and apply all brakes and isolations.
- Leave the cabin, or if company procedures do not allow this make sure you do not restart the vehicle until you have permission from the refuelling operator.
- If you are responsible for refuelling the water vehicle make sure you have the right PPE on before you start. This may include safety glasses, face shields, gloves or other approved gear.
- Activate the fuel pump correctly and make sure all safety procedures are followed.
- Shut down the fuel pump once the water vehicle has been refuelled.
- Roll up or safely tidy all fuel lines or hoses.

3.3.3 Processing Maintenance Records

Most sites have maintenance forms, logbooks or checklists for writing down details of all vehicle and equipment maintenance work.

They are used to record the history of the vehicle and equipment so that all operations and any problems can be monitored.

They are also a way of making sure that all repairs and maintenance are done correctly and on time.

Written maintenance records for your water vehicle may include:

- Inspection checklists.
- Fault reports.
- Fuel, oil, hydraulic and other fluid usage.
- Computer readings of various water vehicle functions.
- Diary entries.
- Service manuals or logbooks.
- Repair request forms.
- Part requisition forms.

You will usually need to include details like the vehicle make and model number, site identification numbers, the type of maintenance carried out, the repairs or replacements that were done and the person who did the work.

Follow your site record keeping and reporting procedures. If in doubt about completing and processing written maintenance records, talk to your supervisor or an experienced worker.

3.4 Clean Up After Work

Once all of your water vehicle tasks are finished, you will need to clean up the site. This includes removing any tools and equipment that have been used.

3.4.1 Clearing the Work Area

In clearing your work area you will be carrying out housekeeping activities.

Housekeeping procedures on your site may include:

- **Eliminating or controlling any potential hazards.** Your duty of care means you shouldn't leave a possible source of danger or accident for others.
- **Using the correct PPE.** Make sure you use appropriate PPE when dealing with waste or possible hazardous materials as you clear up. For example, chemicals used for cleaning can be dangerous unless used correctly.
- **Removing any hazard controls that are no longer needed**, e.g. temporary fences, barricades and signage.
- **Recycling or disposing of materials**, e.g. clays, mud, topsoil, organic materials, stones, rocks, gravel and bituminous mixes, paper and site rubbish. Put any waste materials in the bins provided, and recycle where possible, in line with the site plans for environmental management or waste disposal.
- **Maintaining and storing plant, equipment and tools.**

Good housekeeping will help you to see any problems or hazards on the worksite. This will help you to make sure the working environment is safe.

It is your responsibility to clean up after your work activities and not leave it to someone else to do.

3.5 Process Written Records

Site record keeping procedures keep the site running smoothly.

Part of your role will include completing and processing records for your water vehicle and the tasks that you have completed.

As well as the maintenance records you have filled in, some other records, reports and paperwork that may be needed include:

- **Computer readings** – from process monitoring, test results, activity reports, and materials readings.
- **Logs** – supply logs, work activity logs, training logs, stockpile logs, usage or driver logs.
- **Shift documents** – end of shift, end of process, quality information.
- **Fault reports.**
- **Hazard reports** – including Take-5 forms.
- **Incident reports** – accident forms, incident reports, environmental incident reports, WHS investigation reports, quality assurance (QA) reports.

It is important that you keep detailed records of all your activities, especially any problems you had during your shift.

Make sure you keep notes about what problem happened and what you did to fix it. This includes faulty or broken equipment, operational issues (mistakes or not following procedures correctly for some reason) and any other unusual things.