

Plant Recovery Guideline

EPG-32-01

Applicability

ARTC Network Wide

SMS

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Amendment Record

Amendment Version #	Date Reviewed	Clause	Description of Amendment
1.0	18 Sep 24		First issue – to assist with field recovery of disabled and damaged equipment.

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1 Introduction

1.1 Purpose

The purpose of this guideline is to ensure appropriate situational control and management is in place for the safe recovery of vehicles, plant and equipment which may become bogged, disabled on track, overturn, or derailed during operation.

Proper job planning, site assessment and works execution may often avoid these unintended outcomes. This document cannot cover all foreseeable scenarios and is not a replacement for adequate training, experience and judgement. Appropriate risk controls must be in place for all recovery operations. If in doubt seek assistance from an experienced recovery professional.

1.2 Scope

This guideline covers the assessment and recovery operations for vehicles, plant and equipment in use for ARTC infrastructure maintenance activities. It should be applied by ARTC or Contractor staff operating on the ARTC network. Where ARTC plant is being operated on alternate networks, similar procedures shall be applied with the appropriate authorities being informed e.g. local Network Control centre and responsible site manager.

This document does not cover long distance towing on road or recovery of rollingstock by other accredited Rolling Stock Operators who may have their own recovery procedures

1.3 Document Owner

The General Manager Technical Standards and Assurance is the document owner. The Manager National Services is the initial point of contact for all queries relating to this procedure

1.4 Relevant Procedure

This guideline supports EPP-32-02 Plant Maintenance Procedures.

1.5 Responsibilities

Line Managers are responsible for the safe and effective recovery of equipment within their area of control or worksite. This includes vehicles, plant and equipment being used or transported between worksites, during, prior to or post completion of works.

1.6 Reference Documents

The following documents support this guideline:

- COR-PR-034 Event Response and Notification
- RLS-PR-044 Emergency Management
- ENV-WI-002 Pollution Event Response
- WHS-WI-010 Work Method Statement - Plant and Equipment Vehicle Recovery
- Route Access Standard – General Information
- EPP-32-01 Track Maintenance Vehicle Registration and Operation

1.7 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
ARTC	Australian Rail Track Corporation Ltd.
GVM	Gross Vehicle Mass
Line Manager	Initial responders' direct leader as determined by the Business Unit
RISSB	Rail Industry Safety Standards Board

2 Site Assessment

2.1 Stop and Think

Don't rush to recover plant and equipment. Implement the following key actions before attempting any recovery activity:

1. Prevent any further harm occurring.
2. Provide first aid treatment to any injured persons. Engage emergency services as required.
3. Contain environmental impacts, if safe to do so.
4. Consider any developing or potential risks e.g. fire, live overhead wires, equipment stability, ground conditions and other rail traffic.
5. Pause and reassess to ensure the site is safe.

2.2 Report the incident

In the event of a collision, derailment, equipment rollover or other serious plant related event within the rail corridor immediately notify your Line Manager and the local Network Control centre and advise of the nature and extent of the incident.

Follow all incident reporting guidelines and escalation procedures as required by the ARTC COR-PR-034 Event Response and Notification procedure.

Notify other parties, nearby workgroups or neighbours that may be immediately affected.

Ensure the local Area Manager is contacted and made aware of the situation, including specific details of track location and any current or potential infrastructure damage.

Collect any necessary information, photographs and measurements to ensure timely and accurate completion of a Horizon360 event notification.

Depending upon the level of severity, the site may need to be preserved (quarantined) for investigation purposes. This requirement shall be confirmed with your Line Manager prior disturbing anything or attempting any recovery operations.

2.3 Consider your options

In all instances where equipment recovery is required, the best course of action is to focus on the safest achievable outcome. This assessment should include:

- What is the initial event / situation and what hazards and risks are currently present
- What level of experience is available on site (including previous training)
- What hazards or risks may be encountered when attempting to recover the equipment e.g. equipment failure
- What equipment is available to undertake the recovery

Don't let time pressures cloud your decisions. The quickest solution will not always be the best.

Do not overestimate your own abilities – Seek a second opinion and when in doubt engage an experienced equipment recovery specialist.

2.4 Remove hazards and control risks

Assess the plant item, its location, stability, current condition, access to site, ground conditions and any potential hazards that may arise from the proposed recovery operation.

Set up and maintain a suitable exclusion zone around the proposed recovery area.

Conduct a risk assessment, identify a recovery team and develop a recovery plan. Refer to the enclosed recovery plan template and checklist for guidance.

Always inspect recovery equipment prior to use to ensure it is not damaged and is fit for purpose.

Keep people separated at a safe distance in case recovery straps or other equipment fail and recoil. A minimum clear radius of 2 x the recovery equipment length must be maintained at all times.

DO NOT use chains for pulling or towing recovery activities. Always use rated nylon or wire rope slings / towing strops.

Soft shackles are also preferred over rigid shackles where available (both types shown below). This reduces the risk associated with flying debris in the event of recovery equipment failure.



Clear the area of unnecessary personnel including bystanders.

Always use appropriate PPE when handling recovery equipment and undertaking the task.

Identify a recovery team leader to oversee the operation and provide clear directions.

Consider fatigue management. An unplanned event and subsequent recovery may take longer than anticipated. Be aware of the working hours already exhausted and what may be required to complete the task.

Any equipment which is registered for on-track use and is involved in an incident type covered by this document shall be flagged in Aquipa for further review and recertification.

If you have a concern about the health and safety of yourself or others, stop work and notify your leader if it is not safe to continue.

2.5 Seek assistance for recovery

For ARTC rail bound plant derailments, notify:

- Plant Maintenance Manager – Simon Lee (0409 744 751)

For ARTC work train (rolling stock) derailments, notify:

- Plant Coordinator Hunter Valley & Rolling Stock – Stephen Goldman (0409 887 803)

In the event heavy crane recovery is required for rolling stock or track machines, this may be engaged via the ARTC National Services (Plant) team. ARTC's preferred contractor for this activity is:

- Holdco Holdings (t/a Southern Shorthaul Railroad)

In the event ARTC owned rolling stock recovery and/or recertification is required this should also be arranged by or in consultation with the ARTC National Services (Plant) team.

Where critical incidents occur, identify and engage an experienced equipment recovery specialist.

3 Recovery of Bogged Vehicles & Equipment

3.1 Preparation

Consider whether ground conditions are suitable for the recovery, in some instances deferring the operation until ground conditions improve may provide the best outcome.

If a vehicle or plant item is to be left on site unattended, ensure it is locked and effectively barricaded with high visibility materials so as to not present a hazard to other potential traffic.

Where on site recovery is to be undertaken immediately, ensure a suitable recovery vehicle is selected and utilise sufficient length of towing equipment to prevent the recovery vehicle also from becoming bogged.

Ensure there is a clear recovery path – avoid obstacles and fixed infrastructure which may be damaged during the operation.

Identify suitable attachment points on both the bogged and recovery vehicle. This may not always be obvious – check the operators manual where available. Tie down points as indicated by the 'hook' in the photo below should only be used as a last resort if no other suitable attachment point is available.



It may be necessary to dig out dirt, mud and debris from around the bogged wheels/tracks to enable a safe and effective recovery. Clearing a path in the intended direction of travel will reduce the load on the recovery equipment and vehicles involved.

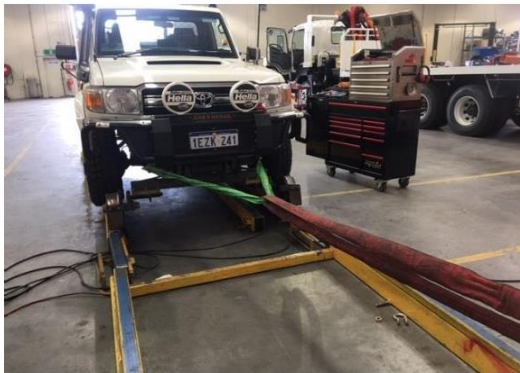


Recovery of Bogged Vehicles & Equipment

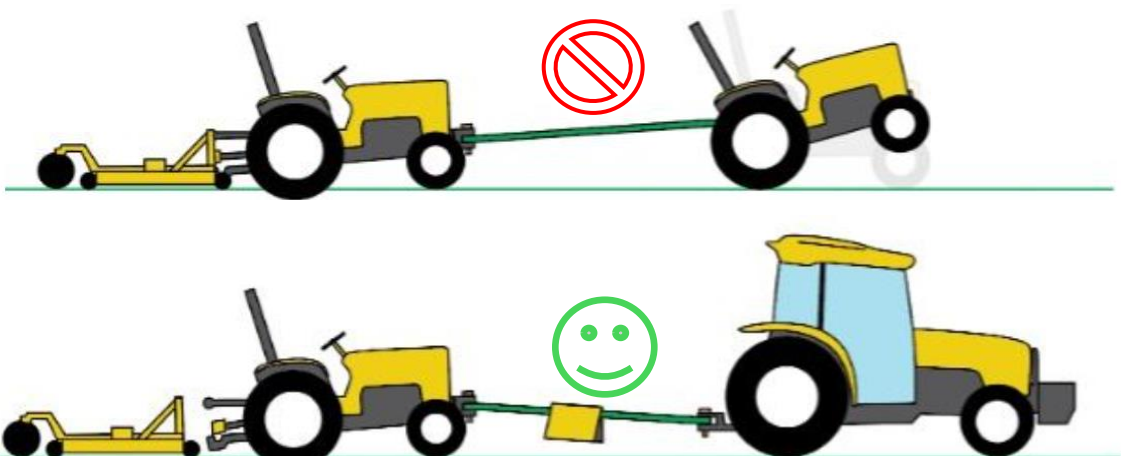
Do not attach recovery equipment to rail guidance kits as they are not designed to withstand this load. Specialised recovery hooks or tow points are usually installed at the front and rear of each vehicle.



Where 2 attachment points are provided, a 'Vee' configuration of recovery gear should be used to minimise damage to the rail guidance equipment.



Where possible, attach recovery kit to points near or below the axle centre line to prevent any risk of over equipment overturning.



Use recovery equipment / vehicles of adequate size and capacity which is rated for the towing task. This does not always have to be a larger item. The combined force of both vehicles attempting to move at once may be enough to free the stranded vehicle.

Always pull in a straight line wherever possible – this maximises pull force and limits load on the recovery equipment and the towing attachment points.

3.2 Execution

Where safe and practical, have an operator in the bogged vehicle with the engine running to assist in maintaining brake control and providing tractive effort during the recovery operation. A rolling vehicle will be much easier to extract.

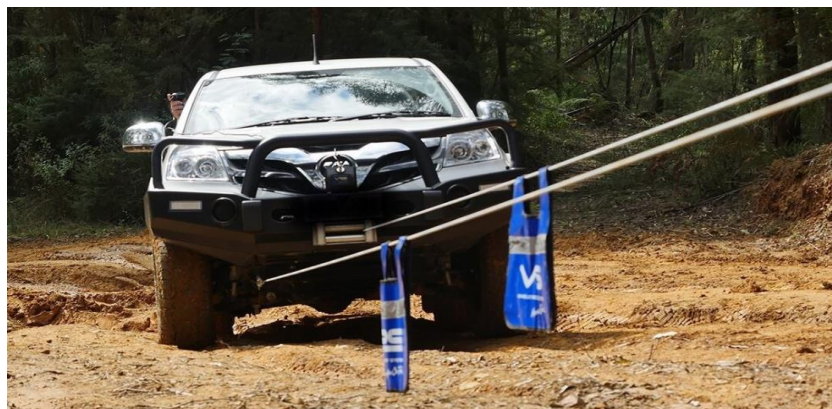
Maintain a clear line of communication between operators.

Pull slowly with even force from the recovery vehicles, do not jerk or put undesired stress on tow rigging.

Once the bogged vehicle begins to move, aim to continue in a smooth steady motion maintaining momentum rather than using a stop – start approach.

Snatch straps which store elastic energy may be used on light vehicles <4.5Tonne only.

Winches may be used to aid recovery, between stationery vehicles or fixed objects with suitable ground engagement. Winch cables can be doubled up as shown below to maximise recovery forces.



As shown above, when towing or winching, ensure a weighted damper is placed on each cable. In the event of a failure of any part of the recovery equipment, this will assist in controlling the cable recoil and bring it to the ground safely.

Do not attempt to use manual hand winches as this will place the operator in the line of fire in the event of equipment failure.

Only anchor to a tree (suitably sized) if you have access to a trunk protector to minimise environmental damage. Do not wrap winch cables directly around the tree trunk.



Where specialised winching equipment and sheave blocks are available, typically through external contractors, much greater force multiplication can be achieved.

Recovery of Bogged Vehicles & Equipment



If two independent tow lines are used (as shown above), ensure even tension is applied to each. This will ensure the load is distributed evenly across both tow points. A straight pull will assist and where possible, avoid turning the towing or bogged vehicle which may otherwise create slack in one of the tow lines.

Inspect all equipment before use. Avoid damaged equipment and do not use any of the following items when attempting a vehicle / plant recovery operation:



Pintle Hooks



Tow balls



Unrated recovery hooks



Tow straps with hooks



Chains



Slings with tail chains

Use winch rope dampers to manage the kinetic energy and prevent recoil in the event of equipment failure. Where a specialty damper is not available, other flexible weighted items can be used e.g. a heavy blanket.



The following items are typical samples of what can be used to assist a vehicle to vehicle recovery (off track)



Strop Capacity (tonnes)	Bogged Vehicle Recovery Gross Vehicle Weight to be recovered (tonnes)			Towing of Vehicles Gross Vehicle Weight to be recovered (tonnes)			Weight (kg) Length 6m	Weight (kg) Length 10m
	Lightly Bogged Slippery Conditions	Medium Bogged	Severely Bogged	6° Incline 10 - 1 Slope	9.5° Incline 6 - 1 Slope	14° Incline 4 - 1 Slope		
30	60	30	20	120	80	50	11	16
50	100	50	35	200	130	80	13	20
70	140	70	50	270	180	120	16	25

Kevlar towing strops



Approved winching brackets



Recovery straps



Recovery Ropes

4 Recovery of Disabled Equipment

If the equipment is broken down or cannot be started, additional precautions may be required.

Some equipment may have fail-safe brakes fitted which will hinder the recovery operation.

Fail safe brakes may be temporarily released for towing only if the equipment can be made fundamentally stable first. This may require rigid connection to the towing vehicle, applying wheel chocks etc. Only qualified mechanical trades staff shall release these brakes following all OEM required instructions.

Propellor (drive) shafts may also need to be disconnected in some instances to isolate the driven axle from the engine and transmission. This again shall only be undertaken by qualified trade staff and only when essential.

If required to pull or tow disabled (unbraked) equipment down a grade; use a piece of equipment of adequate size as an anchor point to prevent uncontrolled movement. It must be attached using rigging of adequate size to an approved attachment point.

Before towing a piece of equipment that is in danger of tipping over or runaway, safety lines must be attached to the piece of equipment and to another anchor of equal or greater weight.

If the equipment being recovered is loaded, where practical ensure the load is dumped or removed by an excavator to minimize the total amount of weight being pulled.



5 Equipment Recovery – Rollover

5.1 Planning

Equipment which has rolled over on-site poses special challenges. Consider the following points before arranging recovery.

Ensure the equipment is stable and not at risk of further movement. Implement a clearly defined exclusion zone.

Careful consideration must be given to any attached loads which may dislodge and cause further injury or damage.

Ensure any equipment has been stopped and do not attempt to re-start as this may cause further damage to the equipment.

Where safe and practical to do so, isolate any energy sources. Turn off battery isolators and apply an E-stop where accessible.

Ensure any environmental spills are contained and minimised.

Be aware of potential fuel and oil leaks which may also present fire risks with hot engine or exhaust components.

DO NOT attempt to right the equipment yourself. Seek support from a specialist equipment recovery expert or a local crane company.



Engage a competent heavy equipment recovery specialist or local crane company to assess the site and recommend recovery options.

Equipment Recovery – Rollover

Ensure a lift plan is prepared and signed off by a competent person prior to commencement.

Review and implement the Critical Controls for Cranes & Lifted Loads.

Rushing the recovery without an adequate plan in place may result in further damage or personnel injury. Clearing any operational lines and returning the network servicablilty is important but not the first priority.

Consider transport of the affected equipment post recovery, where will it be placed, how can it be safely accessed for removal and repair.

5.2 Execution

Multiple attachment points may be required to effectively control the lift. As seen in the sequence below, the manipulation of individual winch cables enables the crane operator to safety control the load as the mass transfers over the point of balance.

Use soft slings where possible to prevent further damage to susceptible parts of the equipment.



6 Railbound Equipment Recovery – Breakdown

In all instances, first refer to the Route Access Standard – General Information pages for approved recovery methods and appropriate running speeds and conditions. Where no guidance is available, the following may assist.

6.1 Self-assisted recovery

Where any self-propelled rail bound plant has broken down and is unable to be repaired on site to allow clearing the rail network, the equipment may need to be recovered using approved means of towing by a 2nd vehicle.

Where both items of equipment are fitted with compatible automatic knuckle type couplers, these shall be used as the only means of connecting vehicles for towing. Appropriate brake control of the trailing vehicle shall be implemented preferably using train line brake systems.

Where automatic couplers are not fitted, rigid bar connections rated for the application or approved adapter couplings where available may be used. Temporary brake lines shall be installed to enable control of the disabled vehicle from the lead recovery vehicle.



Chains, slings or towing strops shall not be used for towing rail bound plant on track.

A disabled machine must only be towed to the next available siding where it can be safely stabled for the purpose of carrying out repairs. Where adapter couplings or towing bars are utilised, the disabled vehicles shall only be towed at a maximum speed of 25 kph.

Network Control shall be notified of these intentions to ensure that the sidings are available for stabling and sufficient time is made available to carry out the move.

Disabled vehicles shall not be pushed or propelled from the rear using tow bars or adapter couplings unless when being placed in a siding at the end of the transfer. In this case the movement shall be undertaken at less than 5kph and a spotter must be used on the ground to direct the movement.

6.2 Alternate recovery solutions

Where no suitable compatible equipment is available to recover the failed plant, a locomotive from a scheduled service or specifically engaged for recovery may be used. Refer also to the Route Access Standard - General Information section for further guidance.

6.3 Brake compatibility and operation

Under all circumstances when recovering a failed item of rail bound plant, it is imperative to ensure that the vehicle under tow has an operational brake system in service prior to departure. Preferably this shall be controlled from the towing vehicle by the use of appropriate connection hoses between the systems – noting the systems must be compatible for this to occur.

At a minimum, a second operator in the recovered vehicle may be used to control the brake system during travel but only if consistent and reliable communication can be achieved from the towing vehicle operator (e.g. radio).

Where recovery is via a locomotive or other heavy weight rail bound plant fitted with an automatic brake system (i.e. brake pipe & triple valve), then the automatic brake systems shall be connected where fitted.

Where no brake compatibility can be achieved, the towing vehicle must be at least twice the GVM of the vehicle to be towed in order to ensure the unbraked mass can be adequately controlled.

7 Railbound Equipment Recovery - Derailment

7.1 Self-Recovery

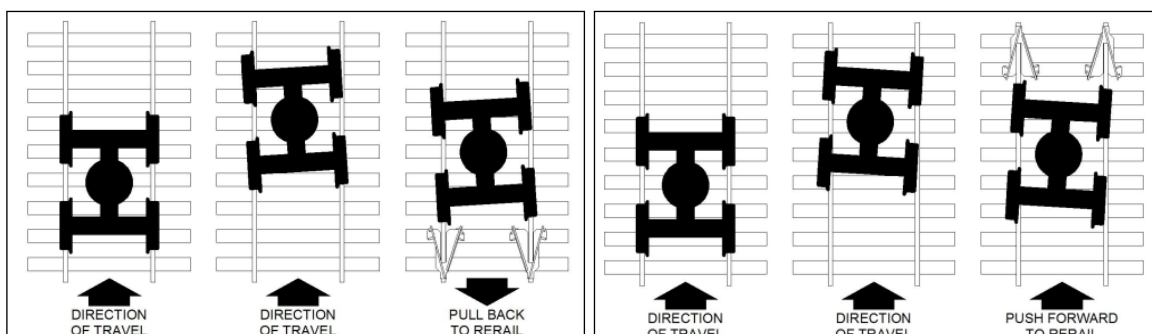
Only once the site and equipment condition has been assessed, reported and made safe, can recovery commence. Prior to commencing any recovery operation, ensure all personal are clear on the allocation of duties and responsibilities for each role

In the event of a minor derailment, straddle type re-railers (where available) may be used to re-rail plant or rolling stock.



Caution should be used when handling and installing such equipment. Re-railers weigh over 70kg each and should only be installed with mechanical lifting aids.

These must be used in pairs. They are designed to be used in a trailing action. Refer to the diagrams below and the Aldon operating guide.



Railbound Equipment Recovery - Derailment

Some older equipment may be fitted with centre jacks capable of lifting and re-aligning the machine to the rail head. This equipment shall only be used to assist re-railing where ground conditions (including slope and stability) permit.

7.2 Assisted recovery

Where self-recovery is not possible and cranning is required, the site must be assessed by a competent crane operator / rigger to ensure ground conditions, access and appropriate lifting plans and equipment can be engaged to undertake a safe and successful recovery with a minimum of further damage.

Appropriate crane sizing is critical to safe operations. Reach requirements and proposed loads, including moveable load contents e.g. ballast, must be assessed to ensure safety can be maintained at all times.

Depending on the equipment being recovered, further action may be required prior to the lift to secure or release bogies, wheelsets, brake rigging or drive componentry fitted to the equipment. Individual equipment operating manuals should be reviewed for further information (where available).

Designated lifting points shall always be used where fitted. These may be indicated by a red 'hook' label

Accurate equipment weights are available in the Aquipa Plant Registration system or via the Train Operating Conditions (TOC) manual / TOC waivers. Nominal equipment weights may be marked on the equipment or listed in the operating manual where available.

Spreader bars should be used to balance loads and avoid damage to equipment cabs and other structures.

Ensure a lift plan is prepared and signed off by a competent person before commencement of recovery actions.

Only approved and certified lifting equipment shall be used.



Railbound Equipment Recovery - Derailment

Review and implement the Critical Controls associated with Cranes and Lifted Loads.

Ensure all required rail safeworking protection is in place before attempting any recovery – including adjacent line protection where required. This also needs to consider the potential fall radius of the crane boom.

7.3 Post recovery assessment

Any derailed vehicle may have suffered damage during the incident. If re-railed on site, the equipment must be thoroughly checked by a competent person before being released back into service or travelled on the network for relocation or stabling purposes. Refer to the ARTC National Services (Plant) team and the Route Access Standard for further details.

Any registered rail vehicle which has been involved in an incident requiring recovery should be force flagged in Aquipa (where relevant) to ensure the vehicle is recertified as fit for use on rail prior to re-entering service.

Any recovery equipment used should be checked for damage and repaired or replaced as required.

Once equipment has been used for towing or recovery purposes, it cannot be used for lifting. This includes slings, shackles etc.

Ensure all relevant details have been included in a Horizon360 event report including:

- Incident details
- Injury details (if any)
- Environmental pollution (if any)
- Damage or destruction of vegetation or 3rd party property (if any).

8 Recovery Plan Template (non-crane recovery)

Site Details					
Location:			Date:		Time:
On Track <input type="checkbox"/>	Track KM:	Track segment:		Single Line <input type="checkbox"/>	Multi Line <input type="checkbox"/>
Off Track <input type="checkbox"/>	Worksite <input type="checkbox"/>	In Corridor <input type="checkbox"/>	Roadside <input type="checkbox"/>	Weather:	
Surface: Bitumen / concrete <input type="checkbox"/> Grass/scrub <input type="checkbox"/> Gravel / stone <input type="checkbox"/> Clay / Mud <input type="checkbox"/>					
Overall Gradient (front to rear): Level <input type="checkbox"/> <5° <input type="checkbox"/> 15° <input type="checkbox"/> 30° <input type="checkbox"/> 45° <input type="checkbox"/>					
Overall Gradient (side to side): Level <input type="checkbox"/> <5° <input type="checkbox"/> 15° <input type="checkbox"/> 30° <input type="checkbox"/> 45° <input type="checkbox"/>					
Affected Vehicle / Equipment Details					
ID:		Description:		Owner:	
Marked GVM: Tonne		Load Estimate: Tonne		Estimated Total Mass: Tonne	
Current Condition: Broken down <input type="checkbox"/> Bogged <input type="checkbox"/> Derailed <input type="checkbox"/> Overturned <input type="checkbox"/>					
Minimum Recovery Equipment Capacity Requirement (for winching or towing off track)					
Greater of either GVM or Estimated Total Mass (M)				Tonne (A)	
Add ground condition factor: - Bitumen / Concrete = 0.1 x M - Grass / Scrub = 0.25 x M - Gravel / Loose stone = 0.5 x M - Heavy Clay / Mud = 0.5 x M - Wheels deep bogged = 2 x M - Body deep bogged = 2.5 x M				Tonne (B)	
Add direction of travel gradient factor: - 15° = 0.25 x M - 30° = 0.5 x M - 45° = 0.75 x M				Tonne (C)	
Total Recovery Capacity Requirement = A + B + C (Select your recovery gear and attachment points based on this number)				Tonne	
Description of proposed recovery process					
Recovery Team Leader		Name:		Signature:	

9 Sample Recovery Checklist

Answering 'No' to any of the following questions requires the user to stop, reassess and address the concern or call a recovery expert if the issue is unable to be resolved with the tools and resources available on site.

The site has been made safe	Yes	No
All personnel injuries, where relevant have been attended to (First aid etc)	Yes	No
The affected equipment is fundamentally stable	Yes	No
Environmental impacts have been assessed and controlled where practical	Yes	No
Any developing or potential risks have been assessed and managed (fire, electricity, traffic etc)	Yes	No
All required safeworking arrangements have been implemented with the local Network Control Centre	Yes	No
Appropriate exclusion zones have been implemented	Yes	No
The total GVM of both vehicles involved is known (including any existing loads)	Yes	No
The current weight of the recovery vehicle is equal to or greater than the total weight of the affected vehicle	Yes	No
The estimated additional recovery load has been factored in (ground conditions / gradient)	Yes	No
All recovery equipment is rated above the calculated recovery mass (preferably 2-3 times)	Yes	No
Suitable rated attachments points are available on both vehicles / plant	Yes	No
Braking can be effectively controlled for the affected vehicle	Yes	No
The recovering vehicle can line up straight with the affected vehicle	Yes	No
A clear recovery path has been identified (free from hazards and obstacles)	Yes	No
A recovery team leader has been identified to provide directions	Yes	No
Clear and reliable communications are available between the recovery team leader and any operators	Yes	No
Additional requirements for Winching or Towing (off track):		
A radius 2 x the recovery equipment length has been setup as an exclusion zone	Yes	No
All bystanders have been cleared from the area – including ahead of and behind the vehicles / plant involved	Yes	No
An effective dampening device has been placed on all cables / towing devices to prevent recoil	Yes	No
Appropriate PPE is available for handling the towing equipment	Yes	No
Additional requirements for on track recovery		
Rigid coupling in place between the recovery and affected vehicle (e.g Auto-coupler, towbar, adapter coupling)	Yes	No
Brake controls implemented from recovery vehicle	Yes	No
Recovery path & distance identified (note maximum 25kph for temporary tow couplings)	Yes	No
Stabling siding identified, is suitable in length and operating condition to meet axle load requirements	Yes	No
Additional requirements for crane recovery		
Appropriate lifting points have been identified	Yes	No
A dedicated lift plan has been developed and approved by a competent person	Yes	No
A clear lifting path and landing location have been identified	Yes	No
All non-essential personnel are clear of the planned lift zone	Yes	No
Safeworking protected area covers any possible boom fall zone	Yes	No