

SteamRanger Heritage Railway

TRACK & CIVIL CODE OF PRACTICE WATERWAYS & DRAINAGE

Document: SHRI-004-WPT-10



Track & Infrastructure Services

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AMENDMENTS REGISTER

Issue Date	Summary of Change	Change
14/10/2013	New document - complies with DIRN CoP Infrastructure Vol 2&3, to meet requirements under Rail Safety (National) Law Act, 2012 to determine engineering principles for drains and culverts.	TC Barker SHR BoM



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1.0 PURPOSE

The purpose of this procedure is to set standards to check condition and effectiveness of surface and sub-surface drainage systems including, pits, sumps, subsoil drains, pipes and minor under track openings and culverts. Without regular inspections and routine maintenance of drains, they may eventually become blocked with either sediment, debris or weed growth. If drains are allowed to become blocked or damaged they will fail in their function of draining the formation. They may even make matters worse, as water standing or ponding in parts of the drainage system may seep into the formation, via pipe slots or through the base of drainage trenches. This may lead to softening and loss of firm support for the track.

2.0 PRINCIPLES

This procedure complies with the principles set out in the "Code of Practice for the Defined Interstate Rail Network", volume 4, part 3, section 10.

Further civil plans detailing the engineering standards for all culverts and waterways on the Mt Barker Junction - Victor Harbor Line are stored in the Track & Infrastructure Library, Plan Section at Mt Barker. These plans are referred to for decision making under assessment and action.

3.0 DEFINITIONS

Drainage is defined as:

- The surface flow of water away from the track structure and cess.
- Top and side drains along the railway reserve to direct water away from the rail track formation to recognised water courses.
- Pipes installed expressly to collect water from between or beside tracks and direct it away to a recognised side drain or water course.
- Waterways constructed under the track, whether pipes, culverts, or similar.

4.0 PRACTICE

4.1 DESIGN AND RATING

4.1.1 Waterway and drainage system design

Catchment parameters, waterway and drainage system capacity design and scour prediction should be determined in accordance with the following manuals and codes of practice:

(a) Australian Bridge Design Code

- (b) Waterway Design Manual
- (c) Australian Rainfall and Runoff
- (d) Australian Standards as applicable.

4.1.2 Special locations

The defined events at flood special locations should be determined and reviewed through detailed inspection and analysis in accordance with the above manuals and codes, or from records of actual flood events. The analysis should take into account the environmental conditions at the location and documentation relating to unscheduled inspections resulting from previous defined event occurrences.

A register of flooding special locations and the defined events requiring actions should be established and maintained.



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4.2 CONSTRUCTION AND MAINTENANCE

4.2.1 Maintenance of waterways and drainage systems

Waterways and drainage systems should be cleaned, with water diverted away from the formation, to a profile and grade sufficient to ensure the structural integrity of the track work, formation and associated earthworks.

Care should be taken when undertaking maintenance, particularly at the toe of embankments or other retaining structures to ensure that they are not undermined causing a slip or collapse.

4.2.2 Drainage systems owned by other organisations

Where drainage systems owned by other organisations present an unacceptable risk to train operations the following action should be taken:

a) Appropriate operational restrictions should be imposed;

b) The owner should be advised to take appropriate action.

4.3 INSPECTION AND ASSESSMENT

4.3.1 Special locations

Track sections prone to (eg. with a history of) flood damage should be identified and managed as special locations.

4.3.2 Scheduled waterway and drainage system inspection

(a) Patrol inspections

The interval between patrol inspections of waterway and drainage systems should not exceed 7 days on mainlines or as otherwise specified by SteamRanger.

Track patrol inspections should keep a lookout for defects and conditions (ie. indicators of a defect) that may affect waterway and drainage system capacity or indicate increased risk of flooding (eg. debris build-up in waterways) including the following:

(i) scour;

(ii) blockage or partial blockage of the waterway, track drain or cess due to debris, rubbish or silt;

(iii) damage to waterways, drains or cesses by construction or vehicle access;

- (iv) indications of floods overtopping a structure;
- (v) culvert/drain damage or collapse.

Sections of track with suspected defects related to inadequate or reduced waterway or drainage capacity should be subject to general inspection.

The speed at which the inspection is carried out should be consistent with the local conditions and the full scope of the inspection being carried out (eg. the type and number of other infrastructure elements being inspected). Particular attention should be paid to conditions at special locations. Defects are to be recorded on Length Inspection Form SHRI-004-WFTC-02.

The patrol inspections should be timed to suit seasonal factors in particular at the onset of the wet season.



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(b) General inspections

Scheduled general inspections should be of sufficient detail to observe and document significant catchment, waterway, track drain and cess conditions and changes in condition that affect the vulnerability of the infrastructure to future flood events, including those changes resulting from flood damage.

This inspection should include identification of defects and conditions as described for the patrol inspection in addition to conditions or changes in the conditions which may affect the capacity of the waterway or drain including the following:

(i) scour around culvert walls, ends and barrels;

(ii) scouring or damage to or around foundations, abutments, wing-walls, or temporary supports;

(iii) erosion or damage to levee banks or channels;

- (iv) condition of sumps;
- (v) any other blockage or loss of slope of track drains or waterways.

General inspections should be scheduled at an interval appropriate to each location, dependent on its nature and condition, and other seasonal factors but should not exceed 12 months. Waterways, drainage systems and flood protection works should be inspected prior to the risk season appropriate to the area. Annual inspection of this type is to be recorded on form SHRI-004-WFTC-07 Drainage & Waterways Annual Inspection.

Sections of track with identified conditions significantly restricting water capacity should be nominated and managed as special locations until rectification or water capacity improvement work can be carried out. Detailed inspections may be required for this purpose.

4.3.3 Unscheduled waterway and drainage inspection

(a) Flood inspections—Special locations

At waterway and drainage systems nominated as special locations, defined events (eg. rain events or stream flows as may be indicated by remote monitoring systems) exceeding a specified magnitude in the waterway catchment should be subject to unscheduled general flood inspection until rectification or water capacity improvement work can be carried out.

Waterway and drainage systems with a history of flooding should be nominated as special locations.

These inspections should collect information on the physical condition of the waterway in flood and monitor the flood conditions until the risk to train operations is assessed as acceptable. Detailed inspections may be required for this purpose. Operating restrictions may also be appropriate at some special locations prior to and during the general flood inspection.

Records should be maintained showing the history of rain events and results of unscheduled general flood inspections for special locations.



(b) General inspections

These inspections should be carried out to confirm the presence of suspected defects identified from track patrol inspections or in response to reported flooding or heavy rain in areas prone to flooding (eg. by drivers) to allow required actions to be determined. The condition of the waterway and drains at the location should be determined in terms of its impact on the waterway and drainage system capacity.

Sections of track with identified reduced waterway or drainage system capacity should be nominated as special locations until rectification or water capacity improvement work can be carried out. Detailed inspections may be required for this purpose.

Traffic may need to be restricted until the suspected defect or failure is inspected and the necessary actions assessed.

4.4.4 Assessment and actions

The integrity of waterway and drainage system structures, openings and catchments should be assessed to verify their capacity to safely perform the required function or determine the required actions. This is required in particular at special locations where significant changes in condition have been identified that may require reassessment of the defined event.

During defined events requiring inspection, assessments of the condition should be made to determine the required actions to maintain safety.

4.4.5 Reporting of Flood Events

A report is to be provided to SteamRanger BOM following significant flood events, including any effects on SteamRanger infrastructure.

4.4.6 Response to Defects in Track Drains and Cesses

The response to defects in the condition of track drains and cesses shall be in accordance with the following Table A. See note below.



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TABLE A				
Defect	Response Time	Action		
Blockage or partial blockage of waterway > 20% loss of area due to debris, rubbish or siltation	28 days	Repair/restore waterway so that it effectively carries out its intended function		
Loss of shape in cross section	90 days	Repair/restore waterway so that it effectively carries out its intended function		
Loss of longitudinal continuity	90 days	Repair/restore waterway so that it effectively carries out its intended function		
Erosion or damage to levee banks or channels	90 days	Repair/restore waterway so that it effectively carries out its intended function		

4.4.7 Response to Defects in Waterways

The response to defects in the condition of waterways shall be in accordance with the following Table B. See note below.

Defect	Response Time	Action
Scour of formation	As soon as practicable	Apply temporary speed restriction as determined by severity of defect. Assess and repair or replace
Scouring around foundations or abutments and wingwalls, or temporary supports. Scouring around culvert end walls and barrels	As soon as practicable	Apply temporary speed restriction as determined by severity of defect. Assess and repair or replace
Culvert/drain barrel damage or collapse	As soon as practicable	Apply temporary speed restriction as determined by severity of defect. Assess and repair or replace
Blockage or partial blockage of the waterway > 20% loss of area due to debris, rubbish or siltation	28 days	Repair waterway
Erosion or damage to channels. Erosion or damage to levee banks	56 days	Repair/restore defective areas
Ineffective or defective sumps	28 days	Repair
Developments in adjoining properties that may change water flows	As soon as practicable	Notify SteamRanger BOM of circumstances

TABLE B

NOTE

The response times shown in tables A and B are the absolute maximum. The



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actual response times should be as short as practicable, taking into account the timing of the next expected rainy season and the risk profile involved.