Australian Railway Historical Society (SA Division)

ABN 36 611 842 947
operating as

SteamRanger Heritage Railway

ABN 24 530 998 354

Rail Safety Occurrence Report ARHS-NO-14-21

Level Crossing Collision

Grantley Avenue, Victor Harbor, South Australia

December 19th, 2021

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1.0 EXECUTIVE SUMMARY:

At approximately 1101 hours on Sunday, December 19, 2021, train 1552 departed Victor Harbour station, destined for Goolwa with 115 persons on board ([1]).

Train 1552 comprised of Class 300 and Class 400 Diesel Passenger Motors (DPM's) 334 (leading) and 412 (trailing), with railcar trailer 824 marshalled between them.

Approaching Grantly Avenue level crossing at approximately 18 km/h, the Driver of 1552 observed a motor vehicle turn right from Hindmarsh Road into Grantley Avenue, across the path of the train.

The driver of the road vehicle either failed to notice, or wilfully ignored the closely approaching train, and failed to give way to it.

The Driver of train 1552 applied the brakes using the emergency position of the Driver's Brake Valve, but a collision could not be avoided.

The front of train 1552 collided with the drivers side of a red Holden VY Commodore which was propelled sideways along the railway for approximately 29 metres.

The point of collision at Grantley Avenue Level Crossing is located approximately 547 metres from the Victor Harbour Station platform.

The driver of the road vehicle, a female local resident, was only superficially injured and was assisted from the road vehicle by the Driver of train 1552.

Emergency Services personnel attended, and assumed command of the site.

The driver of the road vehicle was transported by the SA Ambulance Service, to the Southern Fleurieu Health Service, Victor Harbor, for medical assessment and attention.

No train crew or passengers were injured ([2]).

The Driver and Guard of train 1552 were subjected to Alcohol tests by both SAPOL and SHR personnel.

The Driver of train 1552 was relieved of duty at Victor Harbour Station.

Passengers were evacuated from the scene using DPM 412, to transport passengers back to Victor Harbour Station platform.

The road vehicle was removed from the track, and the site was returned to SHR control.

All remaining services for the day were cancelled.

Passengers requiring it, were transported to Port Elliot and Goolwa by bus.

The track and rail vehicles were inspected and certified to be in a safe serviceable condition, by 1450 hours.

1 This included 109 passengers, the Driver, Guard and 4 Passenger Attendants.

2 Following the incident, the wellbeing of the Driver and Guard of Train 1552 was monitored by members of the SteamRanger Management team, to detect any early signs of possible traumatic reaction.

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2.0 DOCUMENT CONTROL:

This is version 1.0 of this document.

2.1 VERSION HISTORY:

Version	Date	Author	Reviewer	Issued
1.0	December 26, 2021	RSM	RSC	For distribution

2.2 AMENDMENT DETAILS:

Version	Sections	Details
1.0	All	New document for distribution

2.3 DOCUMENT APPROVAL:

This document has been submitted to the ARHS (SA) Executive Committee and SteamRanger Board of Management for approval.

3.0 INVESTIGATIVE METHODOLOGY

3.1 INVESTIGATION STANDARDS:

This investigation has been conducted in accordance with the principles outlined in Australian Standard AS4292.7.

3.2 INVESTIGATION OBJECTIVES:

The investigation seeks to address the following elements:

- The factual information and evidence relating to the occurrence, including;
  - Sequence of events in detail;
  - Weather;
  - Topography;
  - Road-Rail Interface;
  - Rollingstock.
- Post-occurrence response;
- Initial remediation;
- Identification of failed or absent defences;
- Conclusions, inclusive of findings, and contributing factors;
- Safety actions.

3.3 INVESTIGATION PERSONNEL:

This report was produced by the SteamRanger Rail Safety Manager for the SteamRanger Board of Management, and the Executive Committee of the Australian Railway Historical Society Incorporated, South Australian Division ([3]).

Evidence was provided to the Rail Safety Manager, by personnel directly involved with the occurrence.

[3] The Australian Railway Historical Society (SA Division) Incorporated is the accredited Rail Transport Operator and Rail Infrastructure Manager for the SteamRanger Heritage Railway.

4.0 SEQUENCE OF EVENTS IN DETAIL

At approximately 0750 hours on Sunday December 19, 2021, a SHR Railcar Driver commenced duty at Goolwa Depot.

At approximately 0815 hours on Sunday December 19, 2021, a SHR Guard commenced duty at Goolwa Depot.

The Driver prepared the consist comprising two Diesel Passenger Motor (DPM) cars, 412 and 334, and one railcar trailer car, 824, for service for the day, carrying out pre-service checks as stipulated in SHR 300-400 Class operating procedures.

DPM 334 was operating with the A-End engine shut down and isolated, due to a previously identified fault.

This did not affect the safety of the movement, or significantly diminish the performance of the consist.

The Guard prepared for the operation of trains 1551, 1552, 1555, 1556, 1557 and 1558, between Goolwa Depot, and Victor Harbour, these being the SHR “Cockle Train” service for that day.

At 0857 hours, the SHR Train Controller issued Train Order 1 to the Guard of train 1551, authorising it to proceed from Goolwa Depot Main Line, to Victor Harbour.

Train Order 1 included authority for the operation of trains 1552, 1555, 1556, 1557 and 1558.

Train 1551 consisted of DPM 412, Railcar Trailer 824, and DPM 334, this being a total of 117 tonnes, for a length of 59.1 metres.

Train 1552 departed Goolwa Depot at 0925 hours, arrived at Goolwa at 0930 hours, departed from Goolwa at 1002 hours, and arrived at Victor Harbour at 1036 hours.

Following arrival at Victor Harbour, the Driver isolated the controls on DPM 412, and moved to DPM 334, which was set up for lead-car operation.

Train 1552 departed from Victor Harbour at 1101 hours (a one-minute delay).

Train 1552 departed from the Victor Harbour platform, and travelled through the Victor Harbour Yard Limits via the Main Line.

Train speed was maintained at less than the permitted maximum of 20 km/h.

Approximately 125 metres prior to reaching the Grantley Avenue level crossing the Driver of train 1552 sounded an audible warning for the level crossing ([4]).

The Driver noted two unidentified road vehicles standing near the level crossing, each facing in a westerly direction, towards Hindmarsh Road.

One of these vehicles was standing clear of the railway, on the western side of the level crossing, and between the railway and Bridge Terrace.

The second vehicle was standing clear of the railway, on the eastern side of the level crossing between the railway and Hindmarsh Road.

4 This was a standard “long – short – long” code whistle as stipulated in the SHR Safeworking Rules.

A third vehicle, ([5]) was noted travelling "erratically" towards the intersection of Hindmarsh Road and Grantly Avenue, where it stopped in preparation to turn right.

When train 1552 was located approximately 10 metres from the level crossing, the Driver of train 1552 noticed that the vehicle that had been preparing to turn right into Grantley Avenue had commenced to do so, in the path of oncoming traffic on Hindmarsh Road, and in front of the approaching train.

The Driver of train 1552 sounded an audible warning comprising of a long blast of the horn, and simultaneously placed the Driver's Brake Valve Handle into the emergency position.

The road vehicle disappeared from his sight, as the front of DPM 334 collided with it ([6]).

The train slowed to a stand under full braking, and propelled the road vehicle approximately 29 metres toward Port Elliot ([7]).

On coming to a stand, the Driver of 1552 secured the train against movement, alighted to ground level, then assisted the sole occupant of the road vehicle to evacuate via its passenger side front door.

The Guard of 1552 joined the Driver at ground level to provide assistance.

The Guard of train 1552 called SHR Train Control, advised of the collision, and advised of the need for Emergency Services to attend.

Unbeknown to the Train Crew, an unidentified bystander had already called 000, and Emergency Services had been dispatched to attend.

The Driver of train 1552 controlled the site, until Emergency Services Service arrived.

A small number of unidentified bystanders, and a nurse who was travelling as a passenger on train 1552, provided some basic first aid to the car's driver, until SA Police (SAPOL) and the SA Ambulance Service (SAAS) arrived on site at approximately 1115 hours.

SAPOL assumed command of the site, and an SAAS officer boarded the train to check on the wellbeing of passengers.

SAPOL conducted Breath-Alcohol testing on the Driver and Guard of 1552, with both returning a negative result.

At approximately 1120 hours, the (Acting) SHR Human Resources Manager attended the scene and performed additional Breath-Alcohol testing on both train crew members, with both returning a negative result.

At around 1130 hours, a second SHR Railcar Driver arrived on site, and relieved the Driver who had been at the controls at the time of the incident.

Approval was sought from the attending SAPOL Officer in charge, and also from ONRSR to uncouple DPM 412 from trailer car 824, and use it to transport passengers in three movements, from the collision site to Victor Harbour Station.

5 Subsequently identified as a red Holden VY Commodore sedan, registration (SA) WWT-390.

6 Refer to photograph 3

7 Refer to photographs 3 and 6

At approximately 1145 hours, SAPOL concluded their investigations, and released the site back to the control of SHR.

ONRSR advised that their authorised testing officer was unable to attend the incident site and that evacuation of passengers to Victor Harbour Station could commence ([8]).

DPM 412 departed the site on the first of the three shuttles at 1158 hours ([9]).

By the time the passenger transfer shuttles had been completed, a tow truck had arrived and removed the damaged road vehicle from the track.

The roadworthiness of DPM 334 was checked, and on confirming that the railcar was capable of being moved safely, at 1255 hours, the consist of 1552 was moved back into the Victor Harbour Yard Limits and stabled at the platform.

Train Order 1 was cancelled at 1300 hours ([10]).

SHR's Track Manager, and Railcar Maintainer journeyed to Victor Harbor from the Adelaide Metropolitan area, and Mount Barker (respectively), to inspect the rollingstock involved, and the track, each arriving on site at approximately 1430 hours.

SHR's Railcar Maintainer removed ([11]) and replaced the Hassler Event recorder recording chart.

The rollingstock involved was found to have suffered only superficial damage, as the collision forces were borne primarily by the front coupler of DPM 334, and the buffer plate above the coupler.

It was confirmed that DPM 334 was fit for travel under its own power to Goolwa Depot.

SHR's Track Manager inspected the track at the incident site, and the track structure was found to have been fundamentally undamaged as a result of the incident, but one sleeper end was dislodged as the wheels of the road vehicle were forced sideways over it.

None of the level crossing sign assemblies were damaged in the incident.

At approximately 1450 hours SHR's Track Manager certified the track as fit and safe for traffic.

334, 824 and 412 departed Victor Harbor at approximately 1516 hours, travelling as train 1556 to Goolwa Depot.

8 The ONRSR Authorised testing officer who was to attend, was not COVID-vaccinated, and protocols prohibited their attendance.

9 Passengers were able to walk safely from car 824 into DPM 412 via the interconnecting platform.

10 Train Order 1 should have been cancelled before 1158 hours and replaced with one authorising the bi-directional movement of DPM 412, before that activity was commenced.

11 During the removal of the Hassler Event Recorder chart, it was damaged, and some evidence was made more difficult to interpret, as a result.

5.0 CONSEQUENCES OF THE INCIDENT:

The sole occupant of the road vehicle involved (its driver) sustained superficial injuries as a result of the collision, and was transported by SAAS, to the Southern Fleurieu Health Service, Victor Harbor.

Approximately 115 persons were on board train 1552 at the time of the collision, but no injuries were reported.

It was apparent that train 1552 could not continue to its destination.

All services were cancelled for the remainder of December 19, 2021, resulting in a significant loss of income.

In addition, SHR arranged for the provision of bus transport to return those passengers who had journeyed from Goolwa, on train 1551, back to Goolwa.

6.0 FACTUAL EVIDENCE AND CONTRIBUTING FACTORS

6.1 WEATHER:

The day of Sunday December 19, 2021 was fine with approximately 2 oktas of cloud cover ([12]).

Sunrise on that day was at 0554 hours and sunset at 2031 hours.

At 1103 hours the sun angle was 59° above the horizon, at 76° East North East ([13]).

Weather observations for Victor Harbour are as follows:

Daily Recordings				Observations (0900)				
Minimum Temperature	Maximum Temperature	Rainfall		Temperature	Relative Humidity	Wind Direction	Wind Speed (km/h)	Could (Oktas)
12.5	22.0	0.2mm		20.2	79%	W	22	2

Notes:

(i) *Rainfall is measured in the 24 hours from 0900 on December 19, 2021 to 0859 on December 20, 2021.*

(ii) *Cloud cover is measured in Oktas. 1 Okta is 12.5% of the sky obscured by cloud, and 8 Oktas is 100% of the sky obscured by cloud.*

The day was dry and sunny, enabling good daylight visibility of the area.

The sun was at 59° above the horizon, this being almost two-thirds of the way to vertically overhead, and high enough to have not caused a distraction to the participants.

The weather is not considered to have contributed to this incident.

6.2 TOPOGRAPHY

The incident site is on the SHR Main Line between Victor Harbour to Port Elliot, at kilometre post 131.400, which is 135 metres outside of the Victor Harbour Yard Limits.

The level crossing is located at 35.5495° S – 138.6248° E.

[12] Data source: Bureau of Meteorology: www.bom.gov.au/climate/dwo/IDCJDW5069.latest.shtml

[13] Data source: www.timeanddate.com/sun/@7839466

The track gradient ascends slightly from the incident site towards the north, towards Port Elliot, but is level for the 135 metres from the Victor Harbour Yard Limits to the Grantley Avenue Level Crossing.

The track at the incident site is easily accessible via Grantly Avenue, Hindmarsh Road, and Bridge Terrace.

The point of collision is 15.9 metres from the centre of the Hindmarsh Road carriageway, and 19.2 metres from the centre of the Bridge Terrace carriageway.

The incident site is located approximately 108 metres from the mean high water mark of the Southern Ocean (Encounter Bay).

From the intersection of Grantley Avenue and the railway, the natural gradient of the land falls gradually to sea level.

The topography is not considered to have had any influence on this incident.

6.3 ROAD-RAIL INTERFACE

The Grantly Avenue Level Crossing is located on a portion of Grantly Avenue, located between Hindmarsh Road and Bridge Terrace, Victor Harbor ([14]).

The Level Crossing is registered as level crossing RLX0168, and is located at railway kilometre reference 131.400 km.

The intersection of these three roads forms the shape of the letter “H” with the railway intersecting the horizontal line at 90°.

Hindmarsh Road forms the main thoroughfare into the City of Victor Harbor from Port Elliot (also Adelaide via Willunga) and is oriented at approximately 32° for 280 metres from its intersection with Eyre Terrace, to the intersection with Grantley Avenue.

From the intersection with Grantley Avenue, Hindmarsh Road is oriented at approximately 21° for about 200 metres.

Bridge Terrace forms an esplanade along the shore of Encounter Bay, and forms an arc as it follows the shoreline.

Through its intersection with Grantley Avenue, Bridge Terrace is oriented at approximately 26°.

Grantley Avenue is an urban street that terminates in a “T” intersection, with an angle of intersection with Bridge Terrace, of approximately 87°.

The portion of Grantly Avenue east of Hindmarsh Road is oriented at approximately 129°.

Between Hindmarsh Road and Bridge Terrace, Grantley Avenue is oriented at approximately 113°.

The railway from Victor Harbour Yard Limits is oriented at 22° from the Home Signal at Victor Harbour, for approximately 340 metres.

The angle of intersection between Grantley Avenue and the railway is 91°.

[14] Refer to Diagram 1

Approximately 6.5 metres of clear standing room exists between the eastern side of the railway and Hindmarsh Road.

Approximately 9.8 metres of clear standing room exists between the western side of the railway and Bridge Terrace.

The risk of road vehicles queuing across the intersection, particularly for east-bound traffic, is recognised, and yellow box markings (as outlined in AS1742.7 Section 3.6) is provided for the east-bound carriageway.

No such box marking is provided for west-bound traffic.

For road vehicles approaching the railway crossing from the west-side, an RX1 sign assembly is provided on the north-western side of the level crossing, or, on the left side of Grantley Avenue, as seen by approaching road traffic ([15]).

For vehicles approaching the intersection of Hindmarsh Road and Grantley Avenue from the south, visibility of the railway is restricted by buildings to a point approximately 117 metres prior to the intersection of Hindmarsh Road and Grantley Avenue.

A wire-mesh fence extends parallel to the railway, from the northern end of the building, for approximately 40 metres, at the boundary of a car-park.

This fence may impede the visibility of the railway track itself, but not of a vehicle travelling or standing upon the railway.

A 1500mm-high corrugated-iron fence extends at approximately 90° from Hindmarsh Road, a distance of approximately 13 metres towards the railway.

This fence may also impede the visibility of the railway track itself, but not of a vehicle travelling or standing upon it.

From this point, extending approximately 70 metres towards the intersection of Hindmarsh Road and Grantley Avenue, a well-maintained grassed area exists.

Approximately 32 metres prior to the intersection between Hindmarsh Road and Grantley Avenue, an RX-4 sign assembly is provided on the mid-road traffic island, for road vehicles travelling north on Hindmarsh Road.

A single tree of significance is located approximately 25 metres from the Hindmarsh Road and Grantley Avenue intersection, set adjacent to the Hindmarsh Road foot path.

None of these features significantly impede the visibility of the railway or vehicles travelling or standing upon the railway.

For vehicles turning right from Hindmarsh Road into Grantley Avenue, visibility of rail traffic approaching Victor Harbour from Port Elliot is clear and unimpeded, and during the turn, the road vehicle will directly face the approaching rail traffic.

The visibility of rail traffic departing Victor Harbour is also clear and unimpeded, but requires a road driver to look to the right.

The road-rail interface is considered to have had influence on this incident, and is addressed further in the Safety Actions section.

[15] Refer to photographs 1 and 2

6.4 ROLLINGSTOCK

6.4.1 DIESEL PASSENGER MOTORS 334 AND 412

Diesel Passenger Motor (DPM) 334 and 412 were designed for suburban commuter service, and built at the SAR's Islington Railway Workshops at Kilburn, Adelaide.

They were operated by the South Australian Railways (SAR) and its successors, the State Transport Authority of South Australia, then TransAdelaide, over the Adelaide metropolitan railway network.

The maintenance and checking of these DPMs consists of a series of periodic services, known as A, B and C services, each determined by distance travelled, and in a recurring pattern of A – B – A – C – A.

This schedule outlines maintenance attention to various systems and is carried out by the SHR Railcar Maintainer, or delegate.

Both DPMs 334 and 412 were operating within the scheduled interval between services, and were not overdue for service.

In addition to periodic services, daily preparation checks are performed by the Driver for the day, at the commencement of the shift.

This includes checks of:

- engine and transmission systems
- propulsion and braking systems
- headlight, auxiliary lighting and Audible Warning Device operation
- general running serviceability

The Railcar Driver prepared DPM cars 412 and 334, and the railcar trailer car, 824, for service for the day, carrying out pre-service checks as stipulated in SHR 300-400 Class operating procedures.

DPM 334 was operating with one engine shut down and isolated due to a drive shaft fault which had been identified some time previously.

This fault did not affect the safety of the movement, or significantly diminish the performance of the consist.

No propulsion system, braking system, headlight, auxiliary lighting or Audible Warning Device operation faults were reported.

The general specifications of the 300 and 400 Class units are as follows:

Length	20.4 metres
Width	3.05 metres
Height	4.27 metres
Mass	43 tonnes
Maximum speed (SHR)	70 km/h
Seated passenger capacity (334)	86 persons
Seated passenger capacity (412)	80 persons

Both DPM 334 and DPM 412 are provided with a forward-facing headlight, a rotating beacon light on the forward portion of the roof, a two-chime air horn assembly, and "Day-glo" high-visibility panels at the front of the railcar ([16]).

These are provided with illumination for night operation.

DPM 334 is one of the 74-strong 300 Class and entered service in June, 1958, and after it's withdrawal from suburban service, it entered the SteamRanger fleet in August, 2012.

The car is provided with a driving cab at one end only, at the A-End, and train 1552 was being driven from this cab at the time of the incident.

DPM 412 is one of the 37-strong 400 Class and entered service in December 1960, and after it's withdrawal from suburban service, it entered the SteamRanger fleet in April, 1995.

The car is provided with a driving cab at both ends, and was marshalled with the A-End cab trailing.

It is reasonable to conclude, that because of the correct operation of the DMP's lighting, audible warning and visibility systems, that rollingstock matters are not likely to be a causative factor for this incident, other than being an agent for realisation of the risks associated with the passage of rail traffic over road level crossings.

6.4.2 RAILCAR TRAILER 824

Railcar Trailer car 824 is one of the 13-strong 820 Class of wooden-bodied carriages, and entered service in December 1912, and became part of the ARHS / SteamRanger fleet soon after 1976.

This carriage was designed for suburban commuter service, and was built at the SAR's Islington Railway Workshops at Kilburn, Adelaide.

The general specifications of the 820 Class units are as follows:

Length	18.3 metres
Width	3.05 metres
Height	4.11 metres
Mass	31 tonnes
Maximum speed (SHR)	70 km/h
Seated passenger capacity	56

The inclusion of Railcar Trailer car 824 in the consist of train 1552 did not in any way contribute to this incident.

16 This "Day-glo" high-visibility panels consist of a series of yellow chevron-shaped stripes, on the front of the DPM, immediately below the front windscreens. Refer to photographs 3, 4,and 6.

6.4.3 EVENT RECORDER DATA

DPM 412 is provided with a Hasler type RT9 event recorder.

No event recorder is provided to DPM 334.

It is SteamRanger's policy to not operate the 300 Class DPMs as single units, or with any other 300 Class DPM, and it has been determined that an event recorder installation is not required.

Hasler type RT9 event recorders produce a chart on a waxed-paper chart, by the use of a stylus for each data input recorded ([17]).

The event recorder on DPM 412 records:

- Time;
- Speed;
- Brake Cylinder pressure

During the removal of the Hasler event recorder paper chart, it was damaged, and was torn at the point at which the incident data was recorded.

The event recorder paper chart was also crumpled prior to delivery for audit, causing additional unrelated marks on the recorder chart.

The stylus pressure exerted on the waxed-paper recording chart appears to be insufficient to provide distinct lines on the chart, particularly for the time recording line.

This may be as a result of wear, incorrect adjustment, or the incorrect installation of the speed recorder chart.

Nonetheless, an interpretation of the event recorder data was obtained, and confirmed that DPM 412:

- departed Goolwa Depot at 0925 hours
- arrived at Victor Harbour at 1036 hours
- was operated a below the maximum permitted speed for the journey.

The event recorder data also confirmed that DPM 412:

- departed Victor Harbour at 1101 hours
- accelerated to 19 km/h
- slowed to 14 km/h, then accelerated to 18 km/h at approximately 1103 hours
- rapidly decelerated to zero km/h at 1103 hours
- was subjected to a sudden development of full Brake Cylinder pressure
- remained stationary until approximately 1155 hours
- made 5 short movements at less than 20 km/h between 1155 hours and 1250 hours.

The events recorded by the event recorder are consistent with the stated sequence of events.

[17] Refer to Diagram 2

6.5 PERSONNEL:

6.5.1 RAIL SAFETY WORKER 1:

Rail Safety Worker 1 was the Driver of train 1552, and:

- is a male aged approximately 36 years;
- commenced duty at 07:50 hrs on December 19, 2021;
- did not work on December 18, 2021, and slept at home, that evening;
- is medically fit for duty (current Category 1 medical – last assessed on April 21, 2018, and next due for assessment on April 21, 2023);
- has been assessed as competent in the SHR Safeworking Rules;
- is competent in the operation of 300/400 class DPMs;
- is competent to drive trains operated by 300/400 class DPMs between Goolwa Depot and Victor Harbour (assessed as competent on September 16, 2020);
- is competent to administer First Aid (due for re-training on November 8, 2022);
- is a resident of Redwood Park, South Australia, and drove to Goolwa on the morning of December 19, 2021.

6.5.2 RAIL SAFETY WORKER 2 :

Rail Safety Worker 2 was the Guard of train 1552, and:

- is a male, aged approximately 37 years;
- commenced duty at 08:00 hrs on December 19, 2021;
- did not work on December 18, 2021, and slept at home, that evening;
- is medically fit for duty (current Category 2 medical – last assessed on October 11, 2019, and next due for assessment on October 10, 2024);
- has been assessed as competent in the SHR Safeworking Rules;
- is competent to perform Guard's duties on trains operated by 300/400 class DPMs between Goolwa Depot and Victor Harbour;
- is competent to administer First Aid (due for re-training on March 4, 2024);
- is a resident of Tanunda, South Australia and drove to Goolwa on the morning of December 19, 2021.

6.5.3 ROAD VEHICLE DRIVER :

The driver of the Holden sedan with which train 1552 collided:

- is a female, aged approximately 63 years;
- is a resident of Encounter Bay (Victor Harbor);
- was injured as a result of the collision, and was transported by the SA Ambulance Service, to the Southern Fleurieu Health Service, Victor Harbor.

6.5.4 PERSONNEL CONCLUSIONS

It is reasonable to conclude that the Rail Safety Workers involved in this incident were competent in the operation of train 1552.

It is reasonable to conclude, that because the incident occurred within three hours of the crew commencing duty, they were not suffering from the effects of fatigue at the time of the incident.

The actions and fitness of the train crew, and their competency to perform the required tasks did not contribute to the incident.

It is reasonable to conclude that the road vehicle driver involved in this incident was task-focussed on negotiating road traffic approaching from the opposing direction, on Hindmarsh Road.

It is reasonable to conclude, that when an opportunity to turn right into Grantley Avenue became available, the road vehicle driver focussed on completing the right-turn into Grantley Avenue, and across the railway track, but not on rail traffic approaching from her right.

It is reasonable to suggest, that as the driver of the road vehicle was a local resident, she may have been subject to what is termed "the close to home effect" ([18]).

The actions of the road vehicle driver significantly contributed to the incident.

6.6 WORKPLACE CONSIDERATIONS

The workplace in this instance is confined to the area within the DPM railcars, and interaction with infrastructure facilities at points along the route.

Nothing about this workplace is considered to be particularly uncharacteristic of railway operations in general, and is not considered to be a direct cause of the occurrence.

As outlined above (in regards to Rollingstock factors), the workplace – that is, the rollingstock, is an agent for realisation of the risks associated with the passage of rail traffic over road level crossings, but not a cause.

6.7 TASK CONSIDERATIONS

Distinct tasks were performed by each crew member as part of the operation of the train, prior to the incident.

The Driver was primarily responsible for the safe operation of the railcar consist within speed limits, and smoothly, for passenger comfort.

The Guard was primarily responsible for attending to the dispatch of the train from stations, shunting operations as required, and liaison with Passenger Attendants provided for revenue protection and passenger safety.

The particular tasks associated with each role are not considered to have had influence on the occurrence.

[18] The "close to home effect" may be described as the complacency exhibited by some individuals when driving on familiar roads ("The close to home effect in road crashes"; Burdett. B.R.D., Starkey. N.J., Charlton. S.G.; Safety Science Volume 98; University of Waikato, New Zealand, October 2017).

6.8 PROCEDURAL CONSIDERATIONS

Various SHR procedures address the operations of trains on the railway, and are primarily associated with safeworking tasks.

Most of the instructions relating to these tasks and safeworking are contained within the SHR Safeworking Rules document, the Heritage Railways of South Australia Safeworking Rules, which were introduced to the railway, in March 2021.

The approach to, and passage over road level crossings is addressed by the Safeworking Rules, and mandate requirements for train crew vigilance and attention, the operation of the leading-vehicle headlight, the operation of visibility lights (where provided) and sounding of an audible warning.

Train 1552 was authorised for travel by the issue of a written Proceed Authority, delivered via a Train Order form.

The Train Order was issued by the SHR Train Controller, and recorded by the Guard of train 1551, before the commencement of the day's operations.

SHR procedures address the preparation, operation and stabling of 300 and 400 Class DPM's, and these include an outline of the function and safety checks to be performed each day.

SHR procedures address the periodic maintenance and servicing of rollingstock.

Procedural factors are not considered to have contributed to the occurrence.

7.0 POST-OCCURRENCE RESPONSE

Following the incident, activity was, understandably, focussed on caring for the injured road vehicle driver.

An unknown member of the public alerted Emergency Services to the collision, but this action was also carried out by the Guard of train 1552.

Local Emergency Services personnel had arrived on site by 1115 hours, and SAPOL assumed command of the site.

SAPOL and SHR independently conducted BAC tests on the Driver and Guard of train 1552.

The injured road vehicle driver was transported to hospital, for medical attention as outlined previously, above.

ONRSR was notified about the incident at 1140 hours.

The welfare of the passengers remaining on train 1552 was of concern, and arrangement were made for their conveyance to Victor Harbour Station.

This was completed by 1255 hours.

The track and rolling assets were inspected to assure their safe condition, following the incident.

This was completed by 1450 hours.

8.0 INITIAL REMEDIATION

No immediate remediation actions were necessary.

The outcome from this investigation will be considered by the SHR Board of Management.

In particular, the recommended Safety Actions will address remedial requirements.

9.0 IDENTIFICATION OF FAILED OR ABSENT DEFENCES

The following are systemic failures that contributed to the realisation of the incident:

(1) Signs were provided and erected in compliance with AS1492.7 at the Grantley Avenue level crossing.

It appears as if these did not provide a sufficient level of spatial awareness to the driver of the road vehicle of her approach to the railway crossing, and of the potential necessity to give way to rail traffic.

(2) The sounding of an audible warning was conducted within 125 metres of the level crossing.

It appears as if this did not provide a sufficient warning to the driver of the road vehicle of the rail traffic approaching the level crossing.

It is noted that the windows of the car were closed, but it is not known if there were any audible devices in operation within the vehicle.

(3) DPM 334 was provided with operating headlights, high-visibility rotating beacon lights, and was also provided with high-visibility panels on the front of the DPM.

It appears as if this failed to make the approaching train conspicuous to the driver of the road vehicle.

10.0 FINDINGS

(1) The incident resulted due to the failure of a 63 year old female driver of a road vehicle to give way to a rail traffic movement approaching the Grantley Avenue level crossing, Victor Harbor.

As a result of this failure, train 1552, with DPM 334 leading, collided with a red Holden VY Commodore sedan, registered (SA) WWT-390.

The road vehicle was propelled 29 metres beyond the point of collision, towards Port Elliot.

(2) The road vehicle was extensively damaged as a result of the collision.

DPM 334 suffered only superficial damage, and did not require any repairs prior to it being transported from the incident site.

No damage was inflicted to the track as a result of the incident.

(3) The driver of the road vehicle suffered minor injuries, and was transported to the Southern Fleurieu Health Service at Victor Harbor, by the SA Ambulance Service.

No injuries were reported from any of the 115 persons on train 1552.

(4) The train crew of train 1552 were competent and medically fit for the operation of the train.

(5) Train 1552 was authorised to travel on the route from Victor Harbour to Goolwa.

The train was travelling at 18 km/h immediately prior to the collision, which is within the speed limits prescribed for the rollingstock, and the location of the incident.

(6) The rollingstock that comprised the train consist was fit for service, and had been maintained within the parameters prescribed by SteamRanger.

The railcar Driver performed the required preparation and safety checks for the vehicles, including confirming the correct operation of the brake and propulsion systems, as well as lighting and audible warning equipment.

(7) The actions of the train crew did not contribute to the occurrence.

10.1 OBSERVATIONS

(1) SteamRanger's incident response procedures were adequate to ensure that the incident was responded to in a timely and effective manner.

SteamRanger's duty Train Controller effectively and efficiently coordinated a well managed response, ensuring that the safety of personnel and the requirements of rail safety incident investigation were achieved.

(2) The decision to evacuate passengers on train 1552 to the Victor Harbour station was taken in good faith, and in consideration of the safety and wellbeing of the personnel on board the train.

Regrettably, the action was performed without the workers involved taking the necessary steps to cancel the Proceed Authority held by the crew of train 1552, and replace it with an appropriate Work Authority ([19]).

This is a technical breach, and perhaps a minor oversight, in light of the circumstances, but train 1552 was – if only just – completely within the Victor Harbour to Port Elliot Section, outside of Yard Limits.

It did not have an appropriate Authority for the bidirectional movement, as required by the Safeworking Rules.

No specific safety risks were created by this breach, as the occupancy of the Section was reserved by the Proceed Authority in effect.

(3) The actions taken by the crew of train 1552 assisted in the effective recovery from the incident, and included immediate consideration for the wellbeing of the driver of the road vehicle involved.

(4) The removal of the Hasler event recorder paper chart from DPM 412 was executed poorly.

The event recorder chart was damaged, and was torn at the point at which the incident data was recorded.

Additional unrelated marks on the recorder chart were caused during its retrieval.

This action had the potential to significantly compromise essential evidence about the incident, and jeopardise the incident investigation.

[19] A “Proceed Authority” is a unidirectional Authority for rail traffic to move in the forward direction only.
A “Work Authority” is a bidirectional Authority for rail traffic to move in either direction within defined limits.

11.0 SAFETY ACTIONS

The ARHS (SA) is urged to enter into discussions with the City of Victor Harbor, about the risks associated with the interface between the railway and Grantley Avenue, and the risks associated with the flow of road traffic through the Hindmarsh Road - Grantley Avenue and Bridge Terrace - Grantley Avenue intersections.

A review of the Safety Interface Agreement between the ARHS (SA) and the City of Victor Harbor should be carried out to reflect the proposed and agreed actions.

Discussions between the parties must seriously consider:

(1) closure of Grantley Avenue between Hindmarsh Road and Bridge Terrace.

This action will effectively remove the risk of collision at the level crossing.

It is recognised that this will divert road traffic to Eyre Terrace, on which a level crossing also exists, and which is subject to sighting deficiencies for east-bound road traffic.

As a result, serious consideration must be given to the provision of active level crossing control equipment at the Eyre Terrace level crossing.

If closure of Grantley Avenue cannot be agreed upon, consideration must be given to the provision of:

(2) rail and road-coordinated road traffic signals at the Hindmarsh Road - Grantley Avenue, and Bridge Terrace - Grantley Avenue intersections.

This action will significantly reduce but not eliminate the risk of collision, and will significantly assist with the safe flow of road traffic through these intersections.

If rail and road-coordinated road traffic signals at the intersections of Hindmarsh Road and Grantley Avenue, and also Bridge Terrace and Grantley Avenue cannot be agreed upon, consideration must be given to the provision of:

(3) active level crossing control equipment at the Grantly Avenue level crossing.

This action may reduce but not eliminate the risk of collision, and further, will not assist with the safe flow of road traffic through the Hindmarsh Road - Grantley Avenue, and Bridge Terrace - Grantley Avenue intersections.

If active level crossing control equipment at the Grantly Avenue level crossing cannot be agreed upon, consideration must be given to:

(4) prohibiting east-bound road traffic from entering the portion of Grantley Avenue between Hindmarsh Road and Bridge Terrace.

This action may reduce but not eliminate the risk of collision, and may assist with the safe flow of road traffic through the Hindmarsh Road - Grantley Avenue intersection.

Traffic that would otherwise cross the railway in an east-bound direction will need to be directed via Eyre Terrace.

The visibility of rail traffic by east bound road traffic drivers at the Eyre Terrace level crossing is significantly better than that afforded to west-bound road traffic drivers at that intersection.

In the immediate short term, serious consideration should be given to the immediate adoption of Safety Action 4 above, as an interim action, pending evaluation and consideration of a more permanent and effective control.

11.1 ADDITIONAL RECOMMENDED SAFETY ACTIONS

Recommended Safety Actions arising from this incident, but not directly related to its cause, include a need to:

(1) Evaluate the condition and suitability of level crossing signs in currently place, including their location.

Consideration should be given to the installation of additional RX4 advance warning sign assemblies in Hindmarsh Road, and RX2 Stop sign assemblies facing road traffic travelling eastbound on Grantley Avenue.

This action should be conducted in conjunction with the Safety Actions recommended in section 11.0, above.

(2) Re-paint the road markings, including the Box Markings on the westbound carriageway, at the Grantley Avenue level crossing.

Some of the existing lines are fading and indistinct.

(3) Evaluate the installation of visibility lighting to SHR DPM's as described in Australian Standard AS7531:2015, Part 4.

It is acknowledged that if this were to be done, some care will be needed to accomplish it in a manner that is sympathetic to heritage considerations.

(4) Replace the Hasler RT9 event recorder in DPM 412.

The data provided by the event recorder provided to DPM 412 is sub-standard.

Some data lines are indistinct, and the horizontal alignment of the recorder chart is not correct (the speed line commences below the zero km/h line).

(5) Restrict the authority for the retrieval of essential event recorder data to the following key personnel:

(a) The Rail Safety Manager

(b) The Rail Safety Coordinator

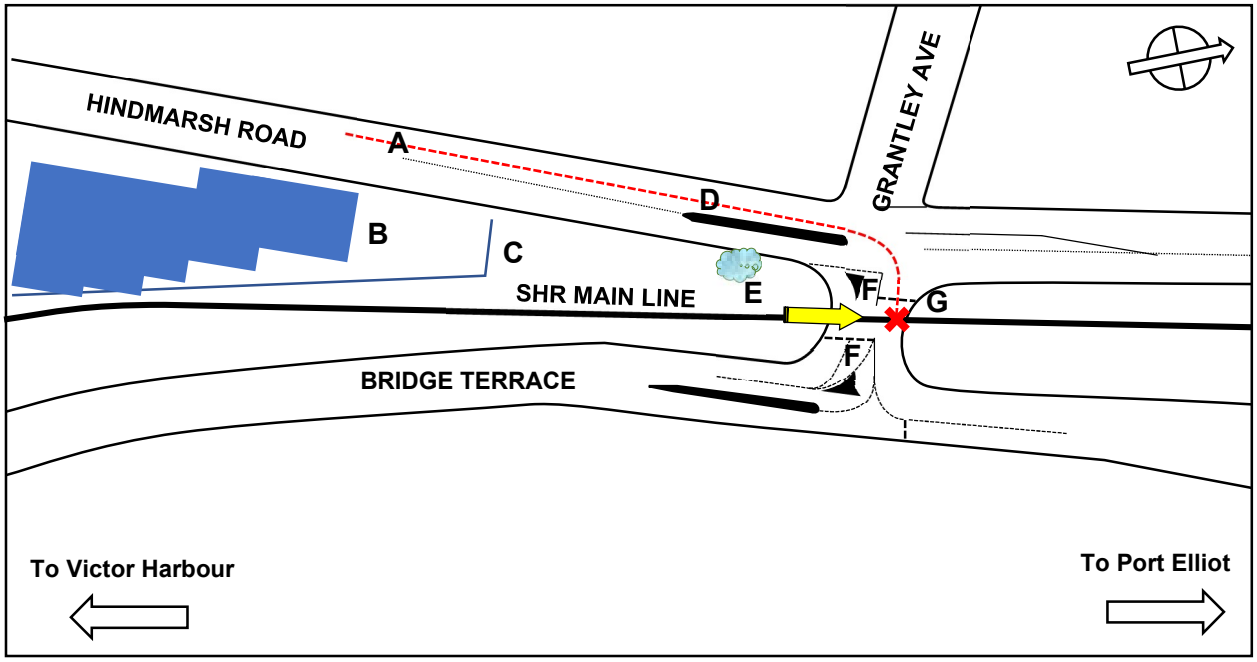
(c) The Mechanical Services Manager

(6) Reenforce the necessity for the correct occupancy Authority to be held at all times, as determined by the activities intended.

All workers involved in incidents need to be reminded to consider Safeworking requirements only secondary to the immediate consideration for safety.

12.0 DIAGRAMS AND PHOTOGRAPHS

12.1 DIAGRAM 1 – SITE DRAWING



A – Path of road vehicle WWT-390 (shown as red line)
B – Buildings (117 metres from Hindmarsh Road and Grantley Avenue intersection)
C – Corrugated Iron fence (79 metres from Hindmarsh Road and Grantley Avenue intersection)
D – RX-4 sign assembly (32 metres from Hindmarsh Road and Grantley Avenue intersection)
E - Tree (29 metres from Hindmarsh Road and Grantley Avenue intersection)
F – Unidentified westbound road vehicles standing clear of level crossing
G – RX-1 sign assembly facing towards Hindmarsh Road.
The path of train 1552 is represented by the Yellow arrow.
The collision point is represented by the Red cross.

12.2 PHOTOGRAPH 1 - HINDMARSH ROAD AND GRANTLY AVENUE INTERSECTION

View of Hindmarsh Road and Grantly Avenue intersection and level crossing interface

A – Path taken by road vehicle WWT-390

B – RX-1 Level Crossing Sign Assembly

12.3 PHOTOGRAPH 2 - GRANTLEY AVENUE LEVEL CROSSING

View of Grantley Avenue level crossing interface

C – RX-1 Level Crossing Sign Assembly

D – Box Marking (per AS 1742.7 Section 3.6)

E – Give Way Sign

12.4 PHOTOGRAPH 3 – DPM 334 AND ROAD VEHICLE

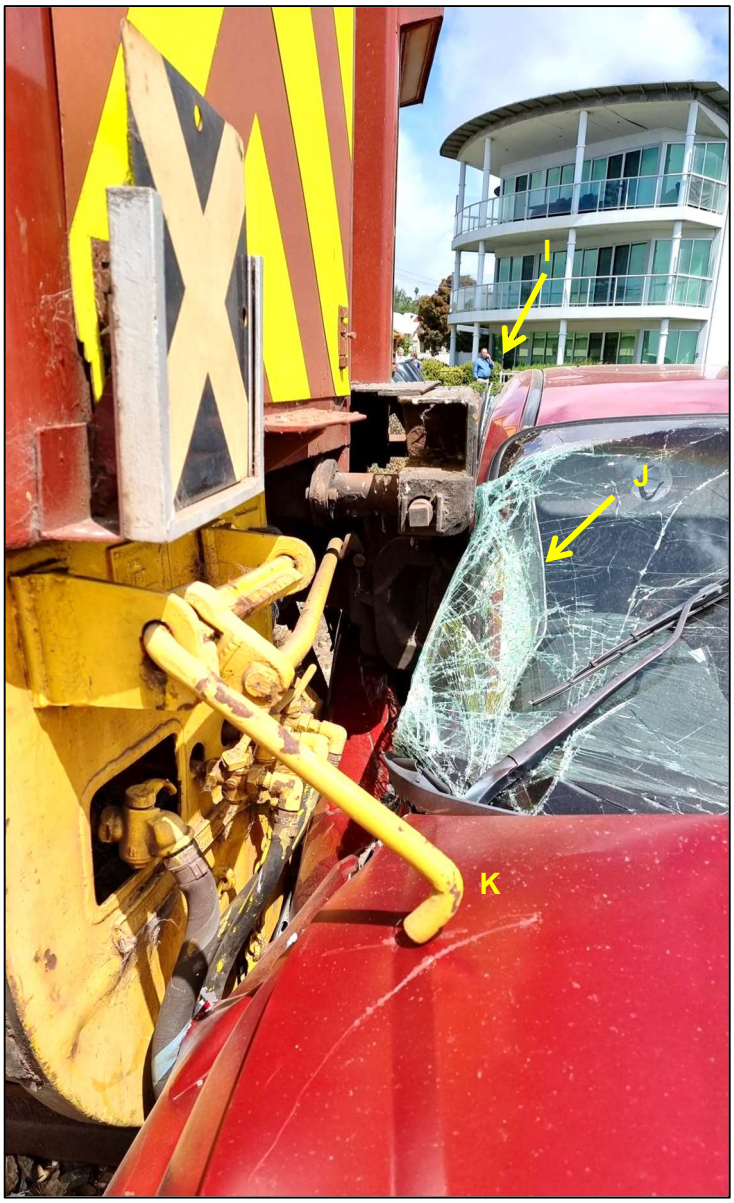
View of DPM 334 and WWT-390 following the collision

F – Air Horn (1 of 2 provided)

G – High-visibility Strobe Light

H – High-visibility "Day-Glow" Panel (1 of 2 provided)

12.5 PHOTOGRAPH 4 – IMPACT POINT BETWEEN DPM 334 AND WTT-390



View of impact point between DPM 334 and WTT-390

I – DPM 334 Buffer Plate in contact with car roof

J – DPM 344 Coupler embedded in Driver's side window

K – DPM 344 Coupler Lift-Lever

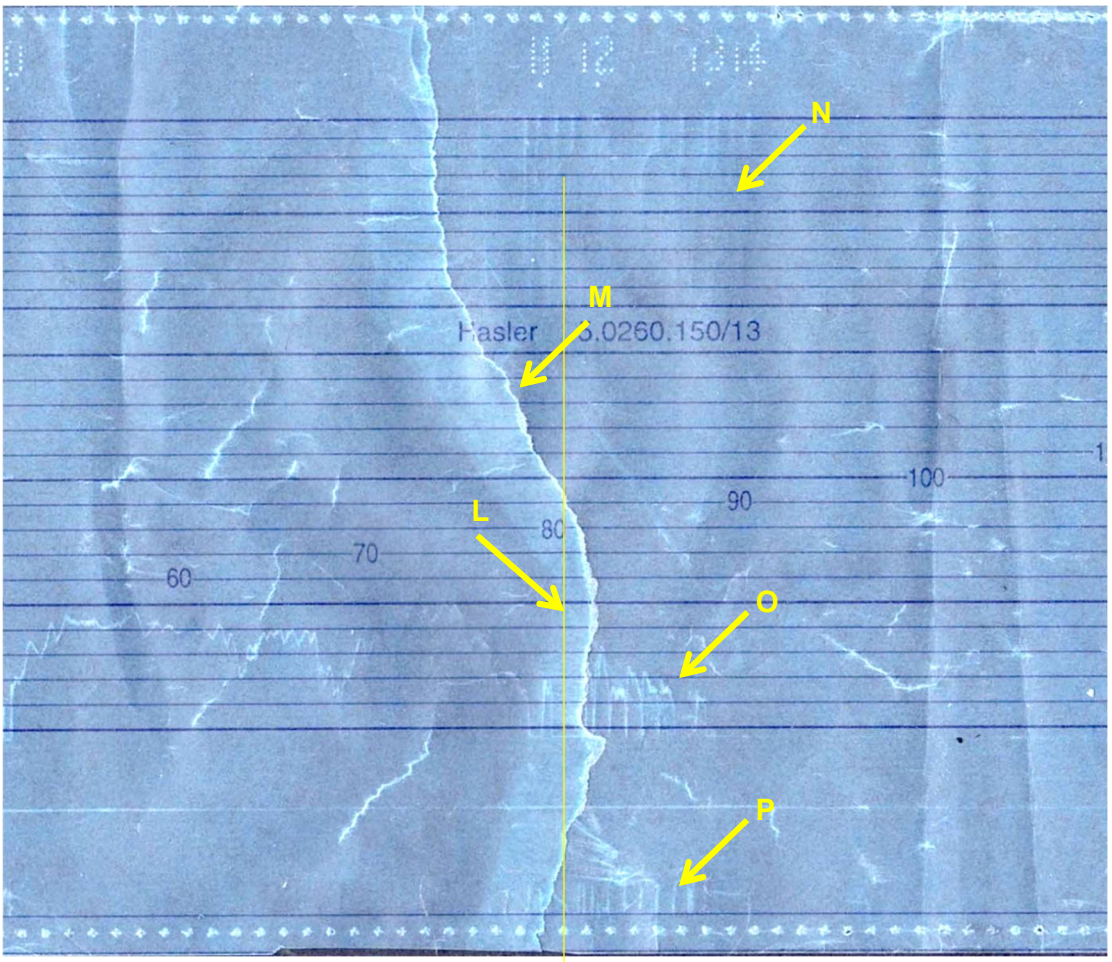
12.7 PHOTOGRAPH 5 – DAMAGE TO ROAD VEHICLE WTT-390

View of damage to road vehicle WWT-390

12.8 PHOTOGRAPH 6 – DAMAGE TO DPM 334

View of damage to DPM 334

12.9 DIAGRAM 2 – EVENT RECORDER CHART FROM DPM 412



Overall View of Event Recorder Chart - Damage to chart is evident

L – Incident datum line (Offset slightly to right)

M – (repaired) torn recorder chart

N – Indistinct time record lines

O – Speed lines

P – Brake Cylinder lines