

Fact Sheet

Sarawia Street - level crossing operation

Governance

What are the responsibilities of the organisations involved in level crossings?

KiwiRail is responsible for running and maintaining the rail network. Auckland Council, through its Council Controlled Organisation Auckland Transport, specifies the train service levels and the interaction of the roading and pedestrian networks with rail.

Who sets the rules for the operation of level crossings?

KiwiRail is responsible for operating and maintaining the rail network and the management of the level crossing alarms. KiwiRail's level crossing protection is based on those used in North America and our adaptations of American standards are agreed between KiwiRail and the NZ Transport Agency who is the regulator of rail safety and standards in New Zealand.

KiwiRail takes every practicable step to provide for the safety of rail users and members of the public that need to cross railway tracks. The laws which describe our safety duties are very clear that:

- (1) *A rail participant must take all practicable steps on its part to ensure that none of the rail activities for which it is responsible causes, or is likely to cause, the death of, or serious injury to, individuals.*
- (2) *No rail personnel of a rail participant may do or omit to do anything in respect of a rail vehicle, railway infrastructure, or railway premises if he or she knows or ought reasonably to know that act or omission will cause, or will be likely to cause, the death of, or serious injury to, individuals.*

Introduction to signalling

What are signals and how do they work?

Because trains are guided by fixed rails, they cannot swerve, and because they are very heavy, they take a long time to stop. To control rail traffic safely and prevent trains from colliding with each other; with vehicles; and with people crossing the tracks, controls are in place to ensure there is always enough distance between trains to allow them to stop.

Train timetables are developed to allow enough time for signals to operate correctly without impeding train performance. The time between trains is called the headway.

Railway signals are an important part of train control systems. In order to maintain a safe distance between trains, railway tracks are divided into blocks and only one train at a time is allowed into each block. The signals alongside the track tell train drivers if they are allowed to proceed into the next block:

- Green** – route is clear to proceed
- Yellow** – warning that the next signal will be red and the train will need to stop
- Red** – route is not clear ahead and train must stop

The signals in Auckland are set automatically using automatic train detection. Axle counters along the track detect where trains are and transmit this information to the signalling system which in turn controls the relevant signals.

What happens when more frequent train services are introduced?

The busier a train network, the shorter the headway (interval between train services running on the same track in the same direction). However, there must always be a minimum headway to ensure that safe stopping distances are maintained. The signal spacing does not change; it just means there is less time between trains approaching a particular signal. This can never be less than the minimum headway required to maintain safety.

How are barriers and alarms triggered at a level crossing?

Level crossings have train detection installed on the tracks far away from the crossing to ensure a train travelling at the maximum allowable speed will not arrive at the crossing until the barrier arms are completely down.

Level crossing warning times are designed for the trains with the fastest approach speed. Although most trains come close to these design speeds, some will be slower due to performance issues, driving habits, passenger loading etc. The mixed rolling stock fleet operating in the Auckland suburban area also makes consistent alarm activation times difficult.

What happens when there is a station next to a level crossing?

When there is a station near a level crossing the situation becomes more complicated as there will be stopping trains – ie commuter trains, and through trains - freight and express trains. To ensure the alarms are not activated for prolonged periods, the signalling is set up to anticipate these different types of trains. The timetable is programmed into the signalling system so it automatically detects which trains will stop, and makes an allowance for the time the train spends at the platform before triggering the level crossing barriers and alarms.

There are also a few stations near level crossings in Auckland, including Newmarket, where the nearby level crossing alarms for stopping trains are set manually, because of special conditions at those stations or near the level crossing.

This is done by a train controller at the National Train Control Centre in Wellington in response to receiving confirmation from the train manager on board the train, who pushes a 'train ready to depart' button on the platform.

(Train controllers in Wellington have screens which show them where all the trains are on the network in Auckland).

Sarawia St level crossing – the issues

Why does the crossing need to be closed and an alternative access-way provided?

There are three reasons why the crossing should be removed:

1. Its impact on train operations.
2. The impact it has on neighbouring residents.
3. The increased safety risk because of the high number of trains crossing it.

There are lots of level crossings in Auckland - what makes Sarawia St special?

Newmarket branch line (Newmarket to Britomart) is the busiest section of rail track in Auckland and the Sarawia St level crossing has more trains passing over it than any other in the country. There are 270 trains carrying 16,000 people over the crossing every week day. Around 160 trains cross it during the day-time (7am to 6pm) and a further 110 trains during the night-time.

Because it is close to the intersection of the western and southern lines there are a number of approaches to it, including the three platforms at Newmarket station. This means timings for trains over the crossing are quite variable, making consistent and short alarm operation at the crossing not possible.

Furthermore, the crossing sits on a very steep part of the rail network, which impacts on the speed of trains heading up the hill from Britomart. This gradient also introduces potential safety risks for trains heading down it which has meant some additional safety measures have been made to the timetable (increased headway) and signalling to manage this risk.

There are also very poor sightlines for both rail and road users at the crossing. In particular, the view to the north from the west side of the tracks at Sarawia St is obstructed by a curve. Hence people ignoring the alarms, which are there because of the lack of visibility of approaching trains, are putting themselves at considerable risk.

How does the crossing impact on the train operations?

The crossing currently impacts train operations more than other level crossings on the network because of the necessary signalling measures needed to manage the high number of trains, the topography and the proximity of Newmarket station.

Restrictions have been applied to the signals at the Newmarket platforms so they cannot be set to allow a train to leave the station until the signals at the crossing have been activated to allow a train through there as well – ie the alarms have started operating.

This is due to the very steep down grade and the associated risk of a train passing a red signal and entering the crossing without the alarms operating. This impacts on the headway (interval between train services running on the same track in the same direction) through this section of the corridor with a train unable to depart Newmarket until the train ahead has almost reached the Parnell station site.

There is also a safety requirement once crossing alarms are cancelled, that the alarms will not reactivate for 15 seconds. This allows a “minimum open time” for a car or person to safely cross the crossing without the barriers coming down on them. This “minimum open time” means sometimes trains can be required to stop when coming up from Parnell on the steep grade, with a very slow restart, or stay stopped at the Newmarket platform, preventing another train from berthing.

How does it impact on neighbouring residents?

The exceptional level of rail traffic means the level crossing alarms will be operating (barriers down, bells ringing) for up to a total of three hours out of every 24 hours. During the normal two hour morning peak (7am to 9am), there are 38 trains crossing Sarawia St level crossing and the barrier arms are down for 37 minutes (30%). During this time the barriers are down on 33 separate occasions on average. A similar position has been calculated for the pm peak.

How long are barriers down for?

The barrier arms are usually down for around one minute for a single train, however because this crossing is so busy the barriers are frequently held down to allow more than one train to cross.

With trains running to timetable the longest delays are between two and three minutes long. However, there will be times when the delays are longer than this, which could be caused by disruption and consequent catch-up on other parts of the network.

Why are there so many differences in the length of time the barriers are down?

The high number of trains and the variable approach paths mean there will be a lot of variation even during normal train operation. Delays on the network mean changes to normal train patterns and the need to move several trains through this section as quickly as possible also contribute to that.

Fluctuations in the time the barrier arms are down can also be caused by slow passenger loading at Newmarket station, issues on the network near Sarawia St and slow train speeds up the hill from Parnell.

If it is not possible to have the barriers fully raised for at least 15 seconds between subsequent train movements across the crossing the alarms will remain activated until both trains are clear of the level crossing.

How do you manage that human factor of train controllers activating the alarms too early?

Train controllers follow procedural guidelines and are held accountable for safety and service management. Train controllers set the signals for the level crossing upon receiving confirmation from the train manager. However on some occasions, especially during peak times, or when there are delays on the network and if she/he has a large number of operations to process, the train controller may activate the crossing alarm early in order to facilitate train movements.

Noise issues at the crossing

Why can't you turn the bells off?

The bells are the primary warning for pedestrians and cyclists. Overseas studies have shown that pedestrians spend much of their time looking at the ground and the bells are what cause them to look up for trains. The widespread use of iPods etc may soon require additional or alternative means of attracting the attention of road and foot traffic.

Why do the bells keep ringing after the train has passed?

For a single train movement the alarms will deactivate within five seconds off the back of a train clearing the level crossing and the barrier arms will begin rising. Bells will normally continue to ring until all barrier arms are in the vertical position (up). However a special design has been approved for Sarawia St which will stop the bells ringing as soon as the alarms deactivate and the barrier arms begin rising.

If another train is approaching the crossing and the barriers would not have time to rise and be up for at least 15 seconds, the alarms will continue to operate and the barriers remain down, until that train is clear of the level crossing.

Can you make the bells quieter?

At Sarawia St the bells are already set at 'quiet bells' around 75 – 80 decibels instead of standard 90 - 105 decibels.

What about turning the bells off at night?

Although a small percentage of level crossings in the country have in the past been fitted with time clocks to allow the bells to be turned off between the hours of 10.30pm and 7.00am, this practice is no longer considered to be a satisfactory option where there is any significant pedestrian traffic.

A fatal pedestrian collision in January 2002 at Morningside Drive highlighted the risk associated with switching level crossing bells off at night. It became apparent following this collision that the optional practice of switching level crossing bells off at night in this country does not comply with generally accepted international safety standards. Instead we are opting to install 'quiet bells' as discussed above.

Impact of the level crossing on future rail development

What happens when the new electric trains come into service?

With the proposed increase in train services as part of the introduction of electric multiple units, the barriers will remain in the closed position for 48 minutes (40%) during the two hour am peak and will have 45 trains crossing.

Safety Issues at Sarawia St

Is this crossing dangerous for pedestrians and motorists?

If pedestrians and motorists follow the safety signage and alarms at the crossing, it is safe. However, our experience is that this does not always happen.

The risk of an incident at this crossing is primarily because of the high number of trains crossing it each day together with the steep road gradient and poor sight lines. Because of the extended times the barriers can be held down for the reasons explained above, people take risks by ignoring the alarms and barriers. This is made even more dangerous now that bi-directional running has been implemented and can result in trains coming up the hill on the track nearest to the Sarawia St side of the crossing where there is even less visibility.

Why can't pedestrian gates be installed?

The sloping approach paths and lack of footpaths would make the installation of such gates impractical. Where gates are installed at footpaths alongside a road crossing, sufficient lengths of fence must also be installed along the road kerb in advance of the crossing to enforce the use of the gates, otherwise pedestrians may simply walk along the road to bypass the gates.

Even if automatic pedestrian gates are installed, such as at Kingdon St, there must be an "escape route" via a manually operated gate. This means pedestrians may still choose to cross the tracks when the automatic gates are shut.

What about full width barrier arms?

KiwiRail has considered this option but full width barrier arms could cause vehicles to become trapped between the two as the barrier arms come down – given the issues with sight lines at the crossing this option has been discounted as potentially unsafe.

Could a pedestrian be kept crossing at this location if it was closed to motorists?

If a pedestrian-only protected crossing is installed (ie the road crossing is closed) it will still have all the same noise and train operation issues associated with the existing road level crossing.

What is the collision history of this crossing?

In the 36 years since half-arm barriers were installed at the crossing there has been only one collision at the crossing. This was a non-injury collision when a train clipped the rear tail light of a car in December 2003.

In the last 5 years there have been eight recorded incidents at the crossing:

- Near miss with pedestrian in October 2011.
- Vehicles driving around barrier arms in May 2010, February 2009 and October 2008.
- Barrier arms broken in August 2012, and June 2008.
- Excessive alarm operation in February 2009 and January 2009.

Although the history of incidents is relatively low because of the low traffic numbers, the very high train frequency and the poor sight lines make this crossing an important one to remove from the network.