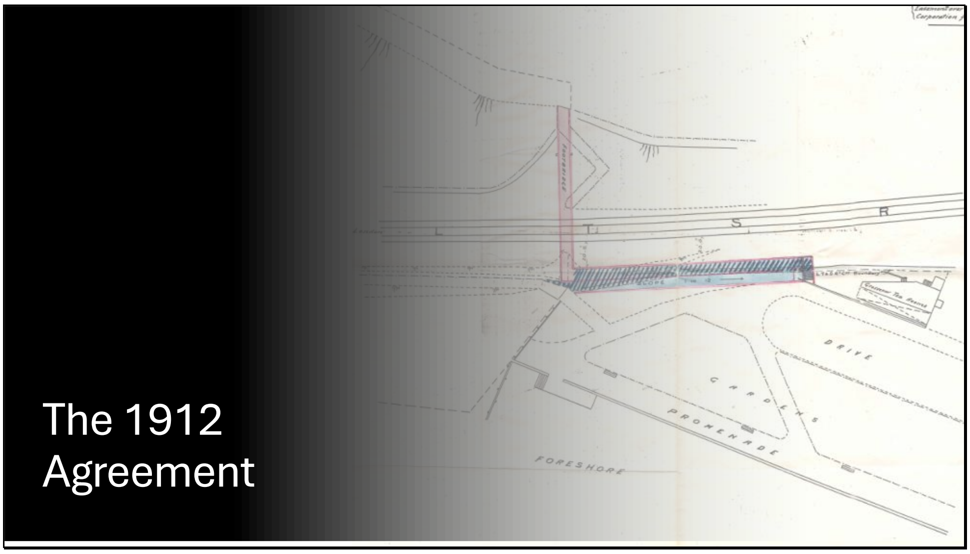
Slide 1

CHALKWELL RAMP

Slide 2

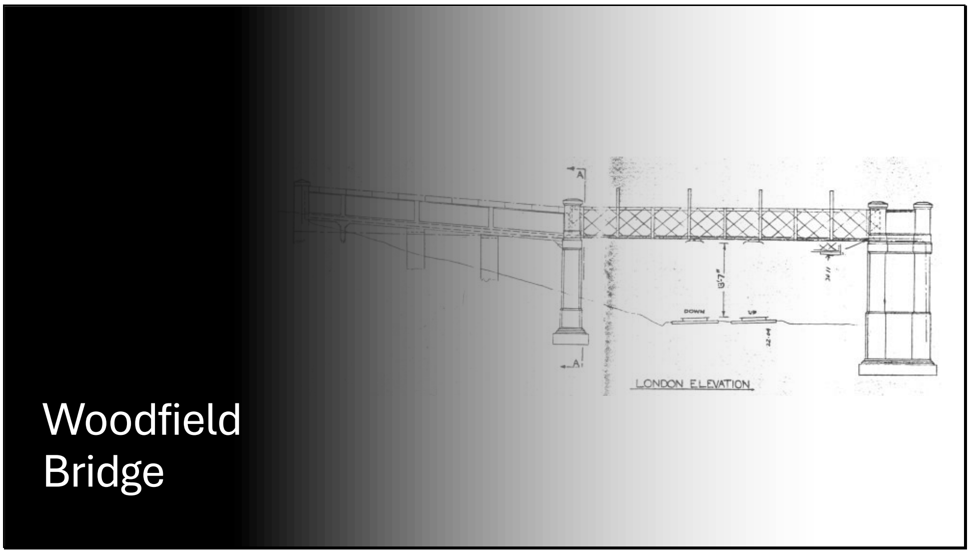


The London Tilbury and Southend Railway constructed the first railway to Southend, which reached Southend Central in 1856. This ran along the coast from Leigh on Sea to the outskirts of what is now Chalkwell, before continuing slightly further inland to reach its original terminus.

As with any mode of linear transport corridor, their construction often involves the crossing of obstructions, such as rivers, footpaths, roads and railways. At the area now occupied by Chalkwell Ramp, a footpath led from inland down to the beach area and with the construction of the railway here, a foot level crossing was installed.

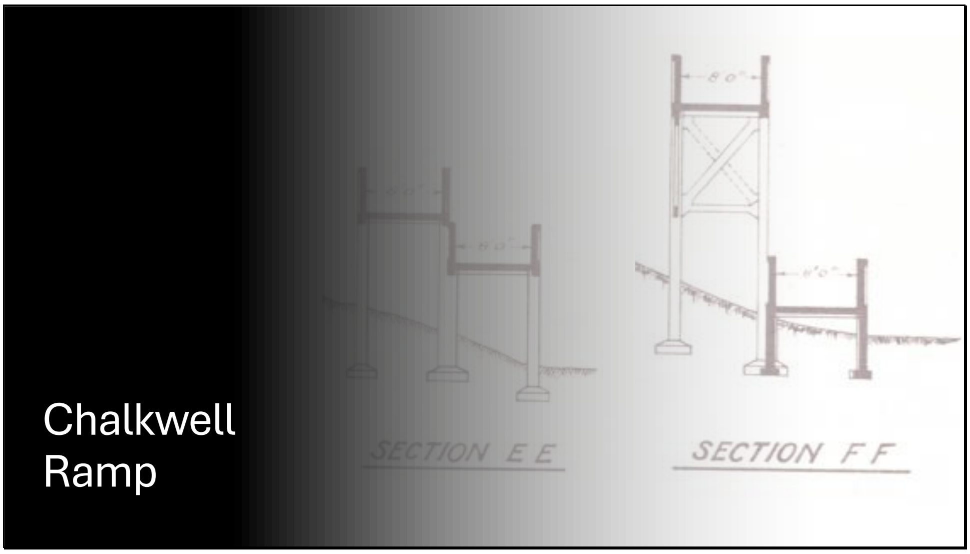
With the expansion of Southend during the latter half of the nineteenth century and development of Chalkwell, it is assumed there was demand for a safer means of crossing the railway, leading in 1912 to an agreement between the London Tilbury and Southend Railway, and the Alderman of the Borough of Southend, for the construction of a new bridge with associated approach ramps.

Slide 3



This agreement led to the construction of what was then known as ‘Woodfield Bridge’. This consisted of a new bridge structure across the railway, with a northern approach ramp to the structure from The Ridgeway, and a larger southern ramp leading down from the bridge to Chalkwell Beach. The original bridge deck structure has since been replaced by the deck that remains in place today. The northern and southern ramp structures are original, albeit having been modified in various regards.

Slide 4

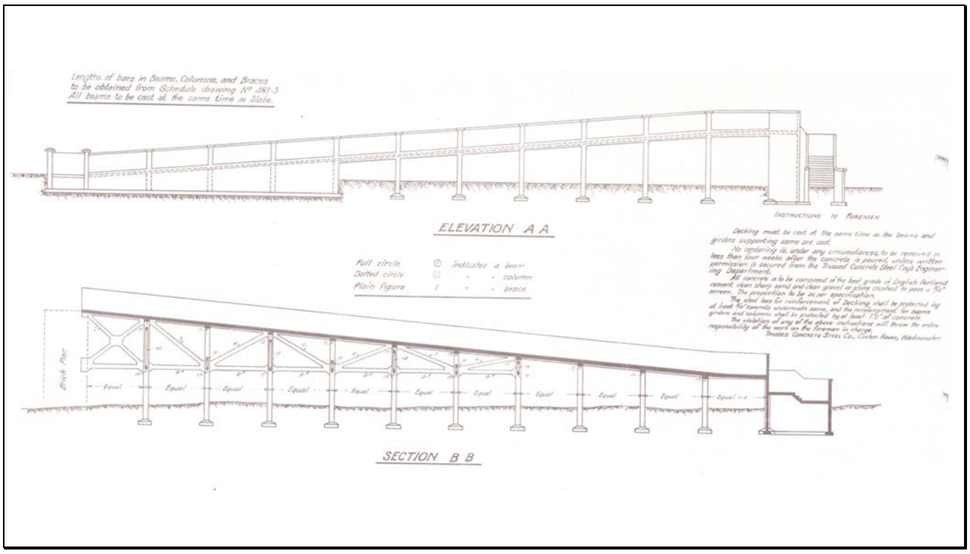


The northern approach ramp, the bridge structure and the large brickwork pier on the south side of the railway, that supports both the bridge deck and upper end of the southern approach ramp, were and are owned by the London Tilbury and Southend Railway (and their successors – now Network Rail). The overall maintenance and operation of these assets is the responsibility of Network Rail, albeit the Council has a duty under the 1912 agreement to maintain the surfacing on both structures. The southern approach ramp is owned by Southend City Council.

A complication is part of the land upon which the southern approach ramp was constructed was and remains railway property. An easement was granted in favour of the Council in the 1912 agreement for maintenance purposes.

We will now focus on the southern approach ramp, the Council owned structure, which we shall henceforth refer to as Chalkwell Ramp.

Slide 5



Record drawings dating from 1910 are available that detail the design of the structure.

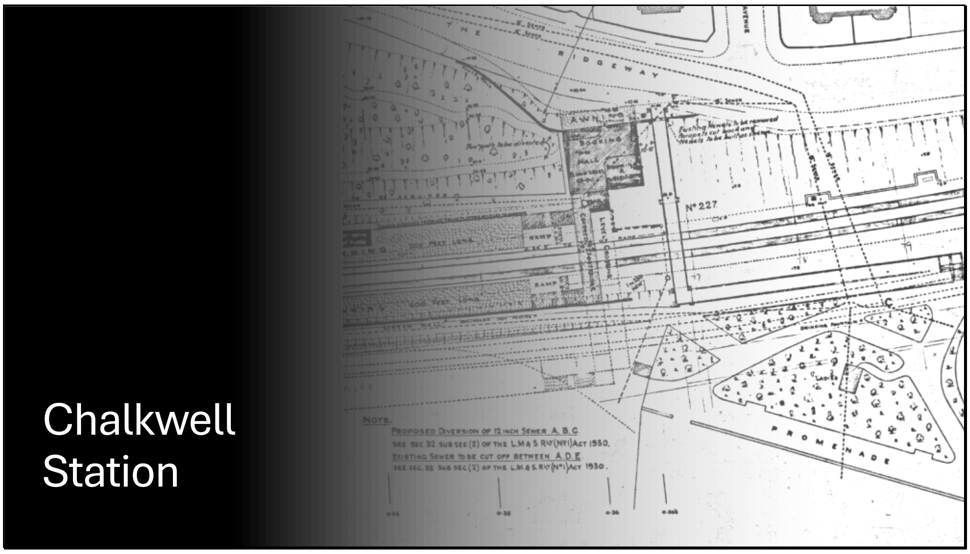
The record drawings show that the structure was constructed using the 'Kahn System of Reinforced Concrete', produced by 'The Trussed Concrete Steel Company Ltd'. This system of reinforcement was developed by Julius Kahn during the early years of the twentieth century, when development of reinforced concrete systems was rapid.

In effect, the construction of the structure is broadly similar to reinforced concrete structures today, however the detailing of the reinforcement, strength of the concrete and other general characteristics are far inferior to what would be expected by current standards for a structure of this nature.

The record drawings show the structure to be constructed on shallow pad foundations.

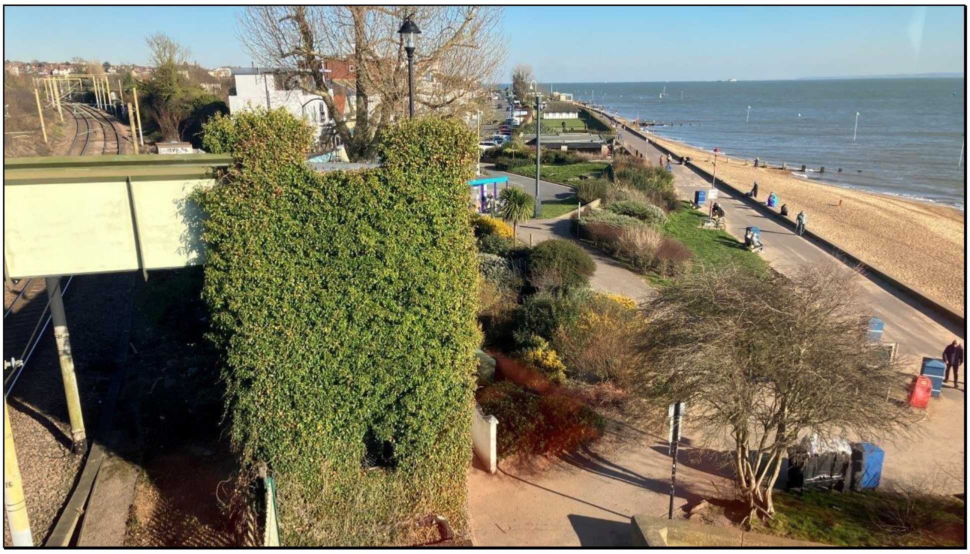
Modifications beyond the original design drawings included the infilling of openings between certain columns on the beachward side of the structure, creating small rooms and kiosks.

Slide 6



As a brief aside, it is worth noting that the construction of Chalkwell station, with its own footbridge, took place in 1933. The station footbridge is the subject of a separate project being undertaken by Network Rail to remove and replace it with a new structure, with lifts. Both the incumbent and replacement structure are located within the station demise and not accessible to the wider public, other than station users.

Slide 7



So based on the record drawings being dated 1910, and the agreement dated 1912, it would seem the structure was constructed around that time, making it over 110 years old. Most highways bridges designed today, to a far higher standard, tend to be detailed for a 120-year design life.

As with any built asset, deterioration with time is inevitable, with the rate of this affected by environmental conditions, choice of materials, construction techniques, maintenance and usage.

We have already touched on the nature of the ramp's construction. Its environment is relatively aggressive. The structure is uncovered and does not have any drainage. De-icing salts are likely to have been applied to the structure over time, either directly, or indirectly from foot trafficking from The Ridgeway. Its coastal location and the often prevailing south-westerly winds over The Thames result in salty spray on the structure.

Slide 8

Reinforced concrete deterioration is a progressive degradation process that can significantly impact the structural integrity and service life of concrete structures. This deterioration can be caused by various factors, including corrosion of reinforcement, chemical attacks, and physical phenomena like freeze-thaw cycles.

Carbonation is where atmospheric carbon dioxide reacts with calcium hydroxide in the concrete, lowering the pH and weakening the protective layer around the steel reinforcement. This leads to the corrosion of the steel, which expands and causes cracking and spalling of the concrete, and a loss of strength. The onset of carbonation is determined in part by the quality of then concrete and the depth of cover to the reinforcement. The concrete quality/strength, and depth of cover to reinforcement, in Chalkwell Ramp, is well below that which would be expected today in a structure of this nature.

Chloride attack involves exposure to chloride ions from seawater, de-icing salts, or other sources, which can accelerate the corrosion of steel. Chloride ions penetrate the concrete, breaking down the protective oxide layer on the steel. This can lead to pitting corrosion of reinforcement, without expansive corrosion products forming, meaning that there is risk of heavily corroded reinforcement, without obvious outward signs.

Slide 9

The Council previously engaged a concrete testing specialist to undertake a thorough and comprehensive suite of concrete investigations across the structure.

Interpreting the conclusions from this report, The testing covered common phenomena that cause the deterioration of reinforced concrete. The summary above showed that in all respects, the phenomena had reached levels beyond which corrosion of the reinforced concrete was likely to occur, generally by significant values. It is therefore highly likely that at that time, the hidden reinforcement was already subject to the onset of corrosion, which in the intervening period, will have worsened.

These are the oldest records the Council has on file regarding the condition of the structure, however based on the data provided in the report, it is clear that defects related to the reinforced concrete deterioration will likely have already been present for some time.

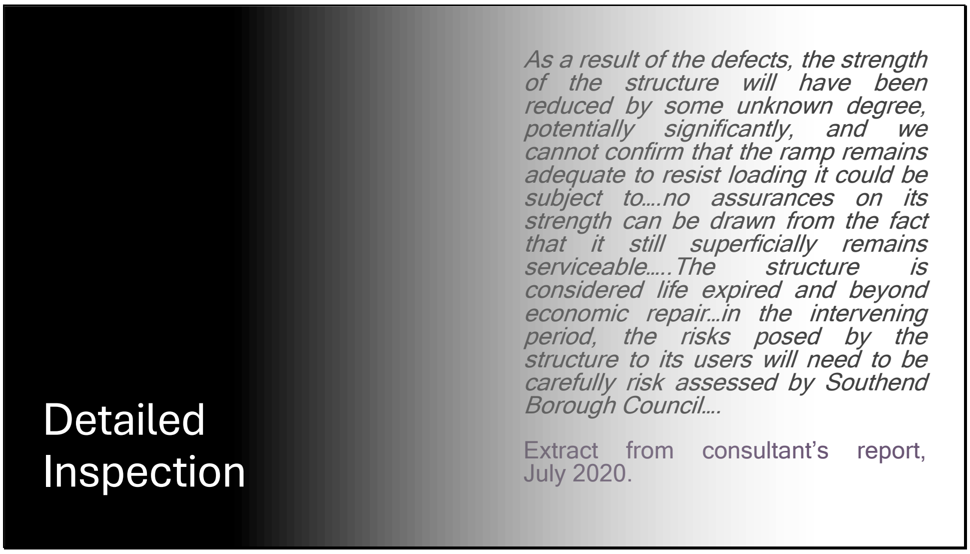
Slide 10

The structure is shown by the record drawings to have been constructed off shallow foundations, presumably bearing onto the clay strata that has been proven to underlie this site through separate investigation. Clay as a cohesive material is susceptible to volume change, which is determined by its water content, itself affected by seasonal factors and the presence of vegetation.

The ground levels around the structure also appear to have been built up somewhat relative to when the structure was constructed, increasing the lateral forces acting on certain parts of the structure.

The structure shows various signs of being affected by ground movement, with structural movement and distortion noted in various planes. It is thought some of this movement happened relatively early in the structure's life, as some distortion can be seen in early photos of the structure.

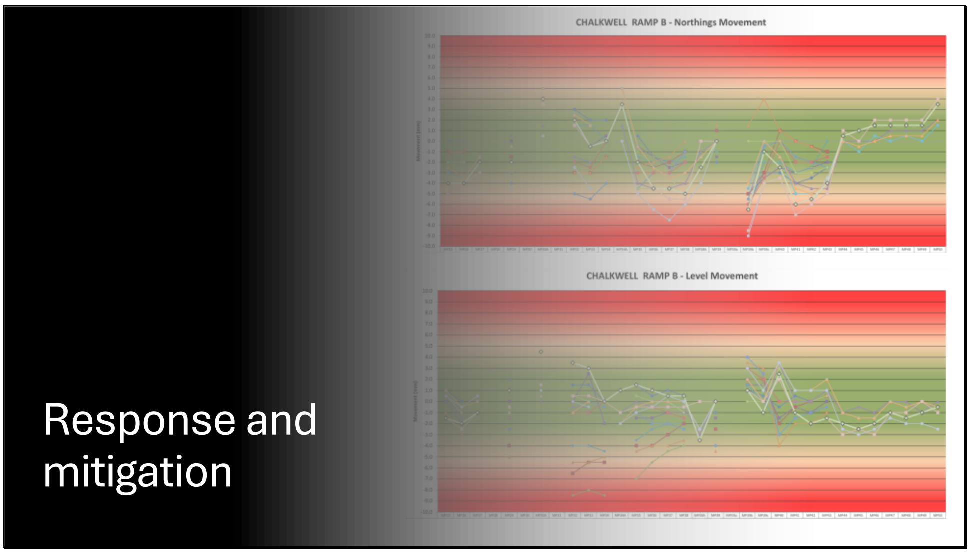
Slide 11



The structure was subject to a detailed inspection in the summer of 2020, which included access onto Network Rail property. Whilst there is an easement in place for the Council to access the structure, this still has to be arranged through Network Rail's Asset Protection Service, which involves various assurance activities, all taking some time.

It was concluded in this report that the structure in overall terms was in a very poor condition and effectively life expired, with there being a need to manage the risk posed by it until such a time as it could be replaced.

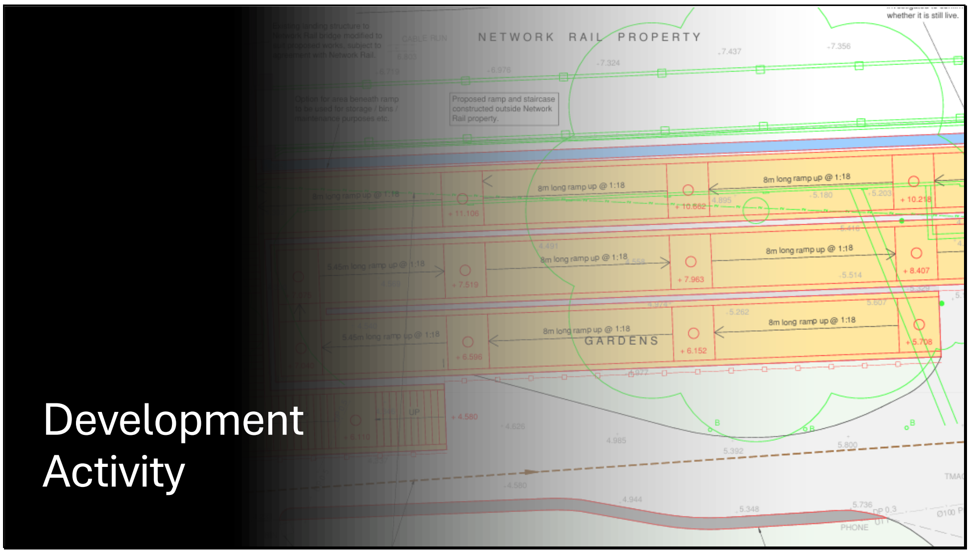
Slide 12



In initial response, the Council began implemented various measures, including:

- The installation of hoarding on railway property, to permit ease of ongoing access for maintenance and inspection activity.
- Increasing the inspection frequency of the structure to monthly, such that changes in the condition of the structure could be recorded.
- Target monitoring of the structure, to understand how it moves, whether movement is ongoing and capture any diverging trends. Two examples of the data output from this monitoring are shown on the screen, with the difference from the centre of each table representing the movement since the base readings were taken.

Slide 13



In parallel with risk mitigation activates, development and investigation work begun as the initial stages of exploring options for replacement structures and potentially temporary structures.

Various conceptual options were produced and detailed ground investigations were undertaken to inform the foundation design of future structures.

Slide 14

The increased frequency of inspection work detected a gradual ongoing deterioration in the condition of the structure, from an already very poor baseline when these commenced. Key issue identified included:

- The further proliferation of fracturing of the reinforced concrete structure.
- Spalling of significant segments of loose concrete over public areas, posing a significant risk to members of the public.
- Instability and severe fracturing of infill walling on the seaward side of the structure.
- Ongoing structural movement, with certain targets demonstrating diverging movement relative to general trends, coincident in areas where other significant defects were present.

Further mitigation has been installed as these defects have either propagated, or emerged, including:

- The installation of hoarding on the seaward side of the structure.
- Additional local propping being installed.
- Removal of loose concrete from height.
- Regular maintenance of the hoarding.

We'll now share some images of the types of issues present to the structure, some of which are hidden from public view.

Slide 15

This view shows an area from which a substantial segment of loose concrete at height was removed from a parapet. Note the severely corroded reinforced exposed by the missing concrete.

Slide 16

This view shows the almost complete separation of one length of ramp from its supporting column. The large fracture allow the ingress of water, exacerbating deterioration and corrosion of reinforcement here.

Slide 17

Here we have one of the main supporting columns showing advanced signs of deterioration and effectively experiencing the onset of failure, with heavy concrete loss, buckling of corroded reinforcement and complete loss of link reinforcement.

Slide 18

The central area of this view shows a supporting column, with the areas either side being walls retaining railway property, at higher level beyond. Note how these walls have ‘punched’ past the face of the column and the generally very poor condition of the concrete per se.

Slide 19

Example view of further loose concrete at height removed from parapets and the unstable defective infill walling beneath the seaward side of the ramp.

Slide 20

Very poor condition in general within enclosed rooms beneath the ramp, with longstanding temporary works effectively no longer possible to safely maintain and themselves nearing life expiry.

Slide 21

With the increased levels of deterioration from the already severe level seen during the 2020 detailed inspection, it was decided to explore options for providing comprehensive propping to the entire structure throughout. The purpose of such a scheme would be to mitigate ongoing risk permitting the structure to remain open in the short-term, pending the development of a replacement structure.

Various options were explored including infilling the voids beneath the lower (seaward) ramp and extensive propping from railway property to the upper (landward) ramp. In practice, such a scheme, whilst not impossible, would represent a significant investment of capital, be very difficult to construct and with difficulties in gaining railway access and would take some time to implement – with no further mitigation of the risk in the intervening period.

The effort required to implement such a solution, on railway property, would almost certainty take more time to implement than the construction of a replacement structure entirely off railway property. With the necessary engineering assurance approvals and railway access, probably at least one year, and not mitigating risk during such a period was considered an unacceptable risk to the public.

Whilst not impossible, it was considered spending time, effort and resource, on further temporary stabilising works, would not be in the public's best interest and instead developing a fully accessible replacement ought to be prioritised.

Slide 22

The Council is firmly committed to restoring public access across the railway at this location. However, it must be understood that the site is rather unique in the combination of challenges present. Some key features include:

- The presence of the railway, with 25kV overhead electrification, serving as Southend's principal rail corridor into London. In tandem with the presence of the railway per se is the station footbridge renewal project, which is due to commence later in 2025, in the immediate vicinity of Chalkwell Ramp. Both projects are important to the residents of Southend and efforts must be made so as one does not adversely impact the other.
- The presence of the Prittle Brook Diversion Tunnel immediately to the east of the existing structure.
- The presence of Anglian Water sewers within the vicinity of the structure.
- The sea wall layout around the footprint of the structure.
- The close proximity of public areas, the beach, the gardens at the foot of the ramp and of course, the Benfleet and Southend Marshes Site of Special Scientific Interest (SSSI).

It goes without saying that complying with design standards and providing a fully accessible structure fit for the 21st century, with public consultation, is paramount.

Slide 23

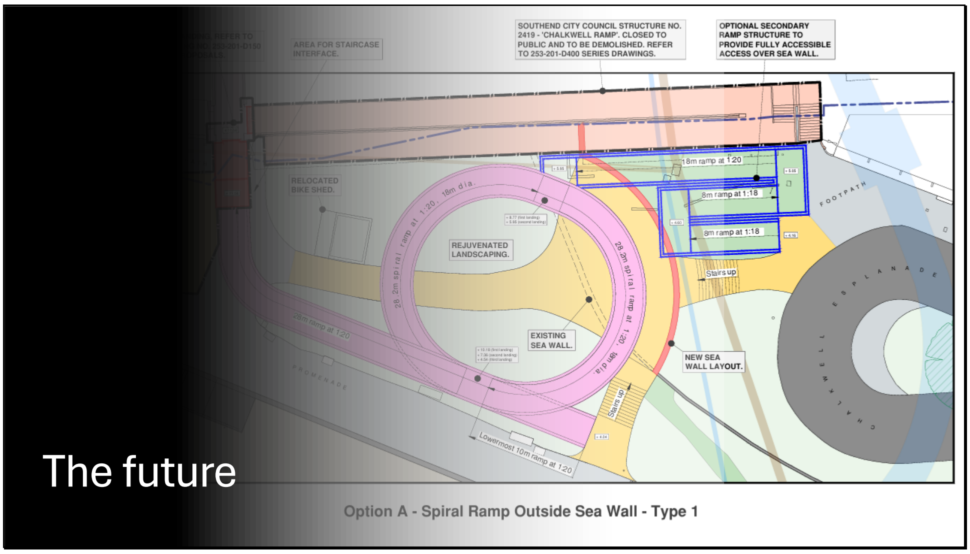
The Council have been working hard with the contractors who are about to start work on the adjacent Chalkwell Station AfA Scheme. As they are undertaking their own demolition works, it makes sense for these to happen in tandem and delivered by one contractor.

However, work such as demolition requires extensive track possession (i.e no trains running) for obvious reasons. The first available weekend track possession is in September 2025, and we are working to try and enable the ramp to be demolished at this time.

Working with the contractor, we are also looking at the possibility of returning some form of access by October 2025.

Again however, there are a lost of caveats to this before we can confirm, including Network Rail permissions, planning permissions, licencing to work on the foreshore, internal/cabinet approvals and available funding.

Slide 24



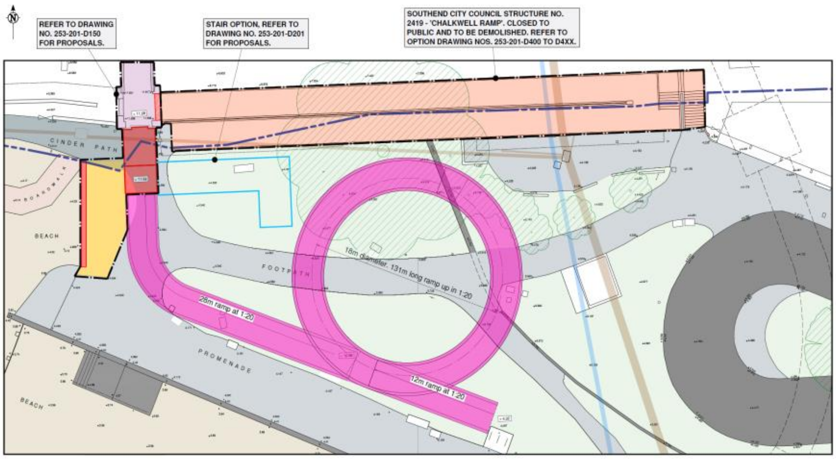
Arguably the greatest challenge of all will be developing a project that has minimal impact on the railway, as this will reduce the need for Network Rail involvement and extensive, but necessary, engineering assurance activities – which will inevitably take some time.

Minimising the need for railway possession access (which is when trains are prevented from running) and electrical isolation, will be of great benefit to the project. Routine possessions and isolations are usually limited to a few hours every night, which do not provide a suitable window for major works. Instead, 'disruptive' possessions and isolations have to be booked, which tend to be limited to a few weekends per year on the Southend Central route. There is a long lead in period for such possessions, particularly for third parties to the railway, such as the Council.

Further optioneering has commenced with a view to providing a new structure located entirely on Council owned land, with minimal impact on railway activities. Whilst Network Rail involvement will be unavoidable in respect of the provision of a new structure, minimising the potential impact to Network Rail will minimise their involvement and should allow for relatively expediated timescales in delivering the replacement structure.

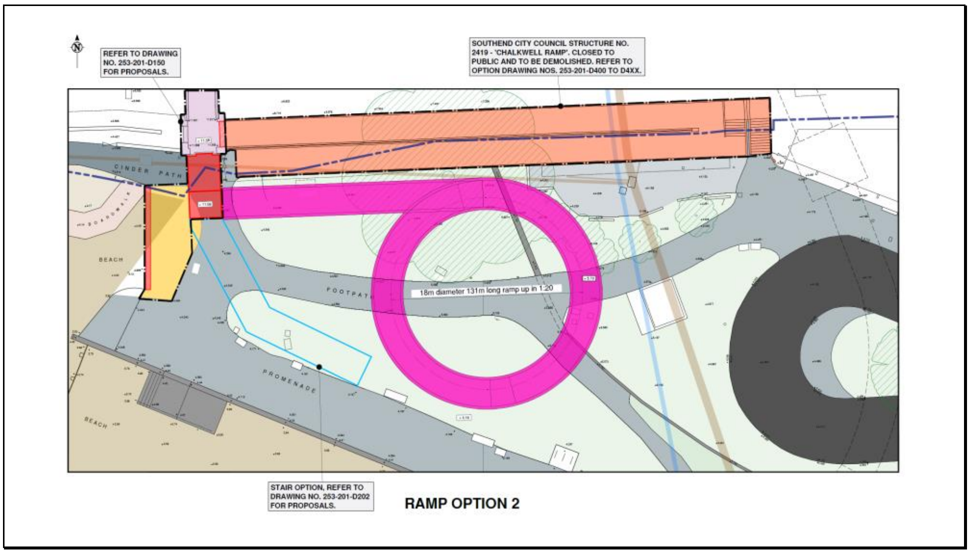
In addition, the optioneering has focussed on providing new structures that do not rely on the demolition of the existing structure having first taken place.

Slide 25



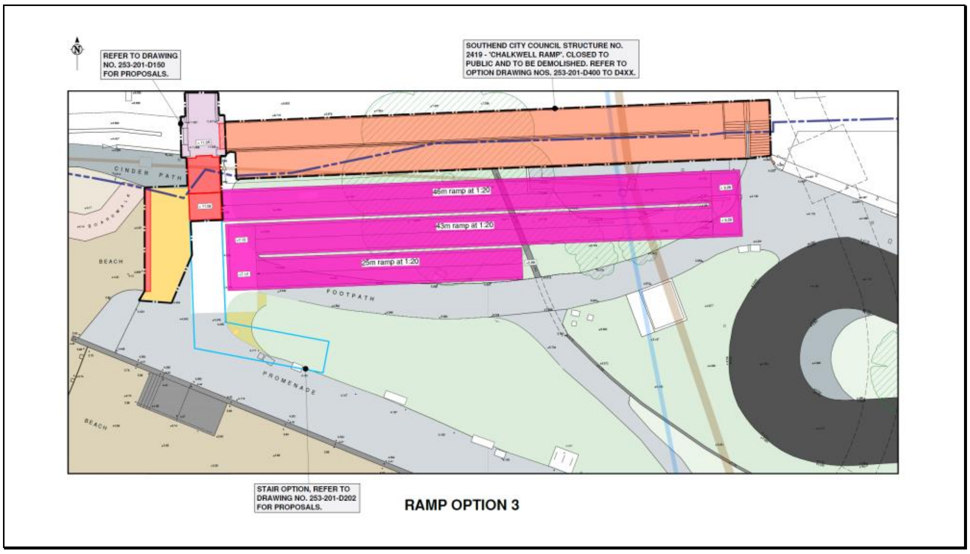
RAMP OPTION 1

Slide 26



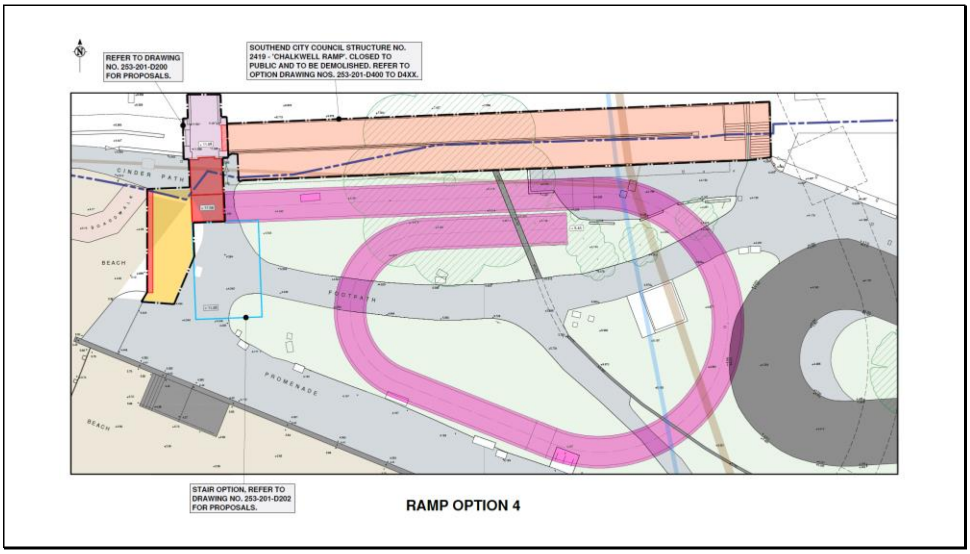
REFER TO DRAWING NO. 253-201-D150 FOR PROPOSALS.
SOUTHEND CITY COUNCIL STRUCTURE NO. 2419 - 'CHALKWELL RAMP'. CLOSED TO PUBLIC AND TO BE DEMOLISHED. REFER TO OPTION DRAWING NOS. 253-201-D400 TO D4XX.
CINDER PATH
BEACH
FOOTPATH
18m diameter 131m long ramp up in 1:20
PROMENADE
BEACH
STAIR OPTION, REFER TO DRAWING NO. 253-201-D202 FOR PROPOSALS.
RAMP OPTION 2

Slide 27



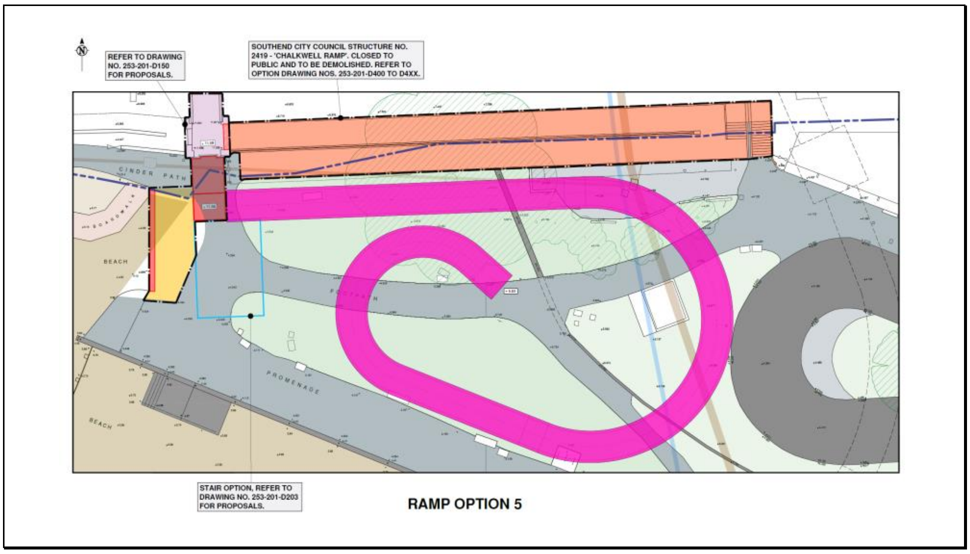
N
REFER TO DRAWING NO. 253-201-D150 FOR PROPOSALS.
SOUTHEND CITY COUNCIL STRUCTURE NO. 2419 - 'CHALKWELL RAMP'. CLOSED TO PUBLIC AND TO BE DEMOLISHED. REFER TO OPTION DRAWING NOS. 253-201-D400 TO D4XX.
CINDER PATH
BEACH
46m ramp at 1:20
43m ramp at 1:20
25m ramp at 1:20
FOOTPATH
PROMENADE
BEACH
STAIR OPTION, REFER TO DRAWING NO. 253-201-D202 FOR PROPOSALS.
RAMP OPTION 3

Slide 28

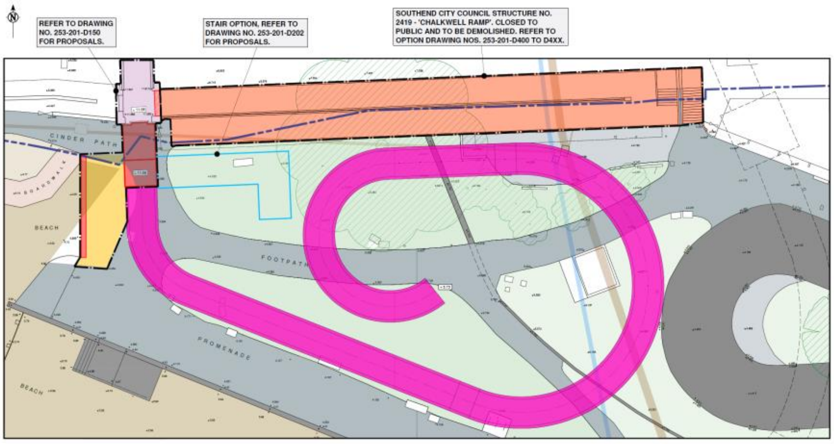


REFER TO DRAWING NO. 253-201-D200 FOR PROPOSALS.
SOUTHEND CITY COUNCIL STRUCTURE NO. 2419 - 'CHALKWELL RAMP'. CLOSED TO PUBLIC AND TO BE DEMOLISHED. REFER TO OPTION DRAWING NOS. 253-201-D400 TO D4XX.
CINDER PATH
BEACH
FOOTPATH
PROMENADE
BEACH
STAIR OPTION, REFER TO DRAWING NO. 253-201-D202 FOR PROPOSALS.
RAMP OPTION 4

Slide 29


REFER TO DRAWING NO. 253-201-D150 FOR PROPOSALS.
SOUTHEND CITY COUNCIL STRUCTURE NO. 2419 - 'CHALKWELL RAMP'. CLOSED TO PUBLIC AND TO BE DEMOLISHED. REFER TO OPTION DRAWING NOS. 253-201-D400 TO D4XX.
CINDER PATH
BEACH
PROMENADE
BEACH
STAIR OPTION, REFER TO DRAWING NO. 253-201-D203 FOR PROPOSALS.
RAMP OPTION 5

Slide 30



RAMP OPTION 6

Slide 31

Have your say: Please tick your preferred option

(This may be more than one)

Option	Please tick
Option 1	
Option 2	
Option 3	
Option 4	
Option 5	
Option 6	
None of the above	

Comments: