

Memorandum



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Project: Gilston Area

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Subject: Gilston Area, Effect of an Earth Bund on Reducing Noise

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INTRODUCTION

The parcels of land that form the larger proposed plot known as the 'Gilston Area' are located close to and to the north of the A414 in Hertfordshire. The road is a busy trunk road, carrying all types of traffic between the A10 and Harlow.

It is understood that an earth bund has been deemed necessary for construction to a similarly located plot of land, also located to the north of the A414, in order to control noise levels at the proposed housing development.

This memo details the findings of noise survey results and subsequent noise modelling to determine whether an earth bund is required in this location, and if so the effects of bunds of different dimensions, with varying distances of housing from the roadside.

SURVEY

A daytime noise survey was carried out on the site on 24th July 2014. This survey consisted of a number of hand-held measurement positions located close to the road, and moving away from the road in to the fields. This method was used to provide data that could be used to calibrate the acoustic model, to best replicate the local noise environment within the area. The site plan below demonstrates the measurement locations.



Figure 1 Noise survey measurement positions

Memorandum



Noise levels at the boundary of the site and the road were measured to be in the region of 65-70 dB(A).

Measurements have not been taken at night. A reasonable assumption when dealing with road traffic as a main noise source is that average noise levels are 5 dB lower than the day during the night time period.

Existing noise levels within the site as a result of the road traffic varied from west to east, due to topographical differences.

CRITERIA

The following sources have been used to derive suitable criteria to assess the effects of an earth bund.

External noise

The World Health Organisation (WHO) has provided external noise level criteria in their Guidelines for Community Noise document, and these are as follows:

- 'Moderate annoyance', daytime and evening (07:00-23:00) 50 dB $L_{Aeq,16hr}$
- 'Serious annoyance', daytime and evening (07:00-23:00) 55 dB $L_{Aeq,16hr}$

The above levels apply to 'outdoor living areas' such as gardens.

It should be noted that the level demonstrated as 'moderate annoyance' can be experienced in external spaces such as parks within a town, or in some areas of a city such as London.

Note also that these levels do not apply to the night period.

The criteria stated in the WHO document are guidelines only, and are not statutory.

Internal noise

Predicted noise levels internal to residential dwellings have been assessed as per the criteria set out in BS8233:2014. They are as follows:

Table 1 Internal noise levels in dwellings, from BS8233:2014

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

BS8233 also states that a façade with an open window (when used for ventilation) provides a sound insulation performance of approximately 15 dB. This can be translated to the following permissible noise levels at 1m external to each room type.

Table 2 External noise levels, adjusted for transmission through an open window

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,16hr}$	45 dB $L_{Aeq,8hr}$

Memorandum

It can be seen that the derived external criteria concur with the external noise criteria taken from the WHO guidelines. Achievement of 50 dB $L_{Aeq,16hr}$ externally during the day therefore will result in WHO guideline noise levels externally and internally to future residential properties. Assuming a 5 dB fall in noise levels at night, and achievement of the daytime criterion is expected to result in acceptable internal noise levels according to the requirement of the standard.

ACOUSTIC MODELLING

An acoustic model has been produced using the measured site data and Ordnance Survey topographical information. The model allows assessment of the efficacy of earth bunds of varying heights in reducing noise from the A414 to appropriate criteria within the area of land that will house future residential properties. The bund in all scenarios has been modelled running parallel to the road, located at a distance of approximately 30m from the road (to the centre of the bund), and following the road's contours.

The model therefore allows derivation of the height of any suggested bund, and the distances from the road that the criteria are achieved.

The graphical output from the modelling is appended to this document, and shows four scenarios as follows:

- Current scenario (no bund);
- Current scenario with 1m high bund;
- Current scenario with 3m high bund;
- Current scenario with 5m high bund.

The output allows visual appraisal of the current situation on site, and the effects of the different bunds.

RESULTS

Aside from the graphical output, results have been derived from the model to demonstrate where the WHO guideline noise levels are met.

For reference, the criterion is:

- Daytime and evening (07:00-23:00) level of 50 dB $L_{Aeq,16hr}$

The marked plan in Figure 2 demonstrates the areas referred to in the results Table 3.

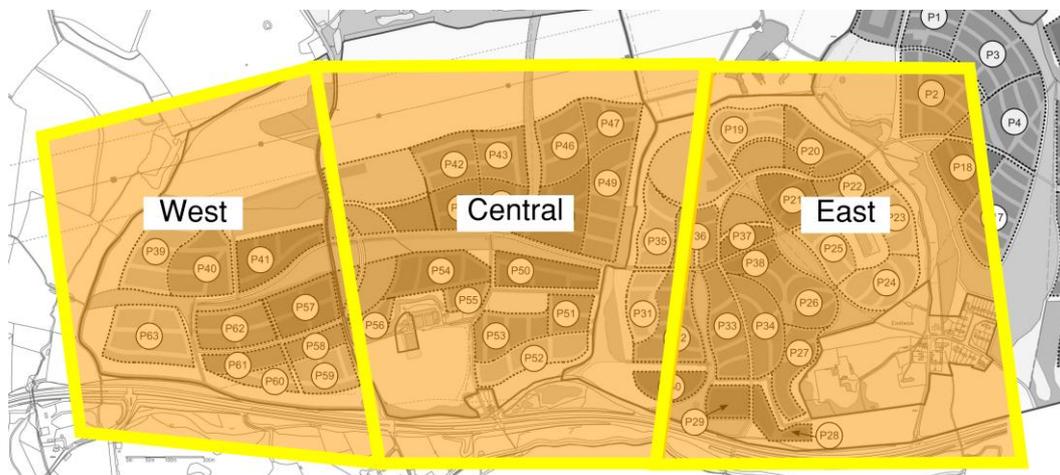


Figure 2 Site 'zones'

Memorandum



Table 3 Approximate distances from the road where 50 dB $L_{Aeq,T}$ is achieved in each scenario

Scenario	Plan zone		
	West	Central	East
Existing	150m	250m	400m
1m Bund	140m	240m	400m
3m Bund	115m	215m	360m
5m Bund	100m	170m	250m

Beyond these distances WHO guideline levels are expected to be met.

The differences between the results for the west and east areas of the site are expected to be due to topographical differences (i.e. ground level at the fields to the west is lower than the road, thus offering more acoustic screening, where to the east the road is at an equal height to the fields).

CAVEATS TO MODELLING AND RESULTS

The noise levels obtained in the survey (and used in the model) may not strictly represent 16 hour values needed for comparison with the criteria. Additional measurements over longer time periods will be required. Should this be the case the values used in this assessment could be considered to be 'maximum average' values.

Additional measurements will have to be undertaken at night to confirm the variability of noise levels between day and night time, and the suitability of the resulting bund determined in this memo.

All noise levels are predicted at ground level and without the presence of buildings. Once housing is entered in to a future model, the effects of reflections and the variation in height to first floor level may combine to produce greater noise levels than have been predicted here. Conversely, when buildings are introduced to the areas closer to the road, there will be additional screening afforded to other plots located further from the road.

The modelling has been carried out on the basis of current topographical information, which may change with development proposals.

The survey and modelling work excludes the effects of aircraft noise which was observed to be a major noise source in the locality. It is recommended that this noise source is assessed separately.

The land take or width of any bund cannot be accurately defined on a purely acoustical basis (the height of any bund is more important acoustically). The land take for any bund will have to be determined by a structural engineer.

CONCLUSIONS

The results of a noise survey have been used to create a model of the Gilston Area, in order to determine the effectiveness of earth bunds of varying heights in reducing road traffic noise to the site from the A414.

An external daytime noise criterion of 50 dB $L_{Aeq,16hr}$ has been derived using World Health Organisation guidelines, and British Standard 8233:2014. This criterion is to be achieved external to future residences located on the site to achieve both external noise levels and internal noise levels with windows open for ventilation. Night time noise levels have been assessed as suitable based on an assumption, and will require further investigation.

Memorandum

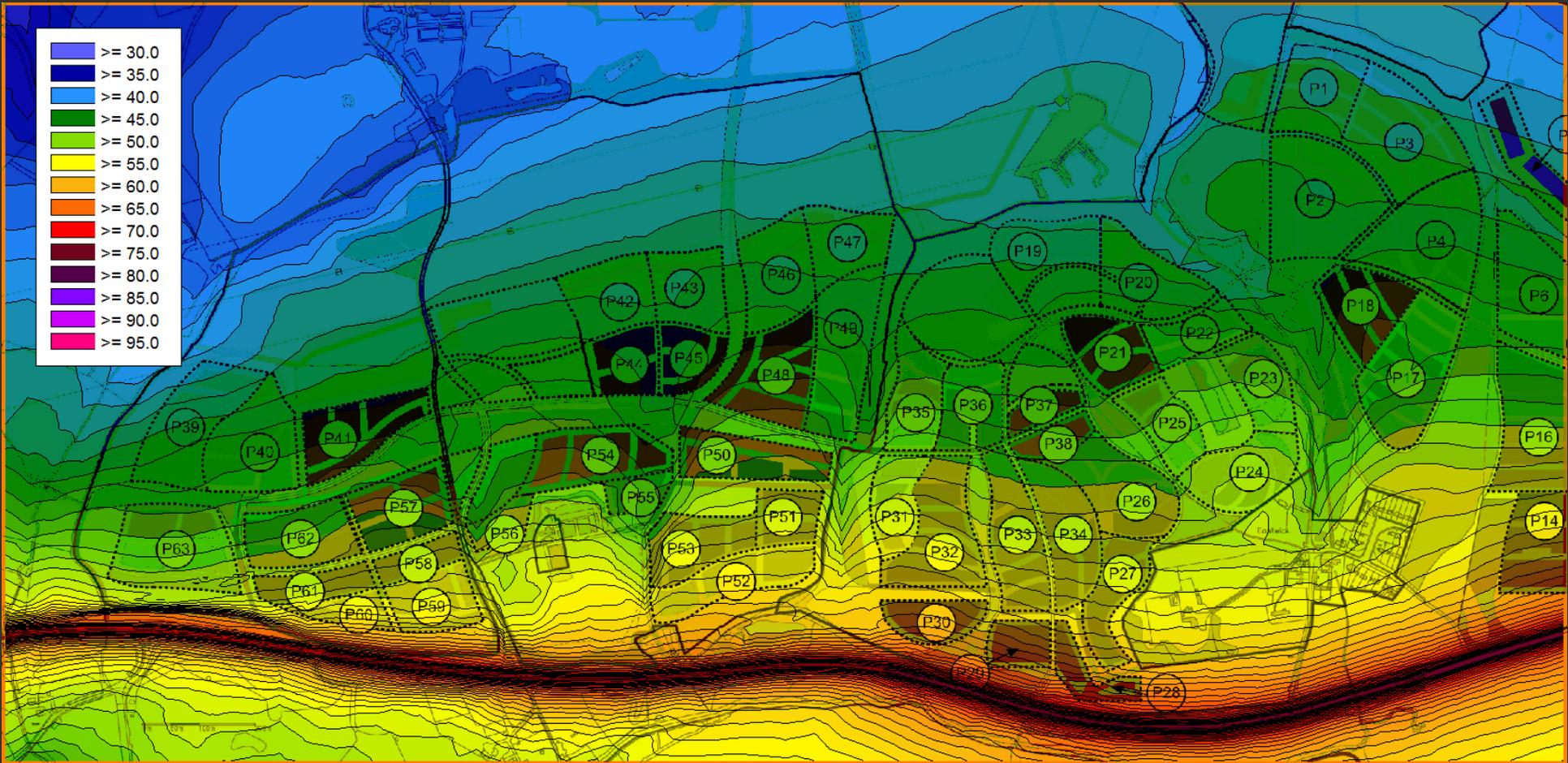
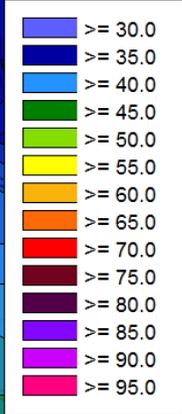


Results determine that the 'best acoustic option' in the reduction of road traffic noise is the use of a 5m high earth bund to the south of the site. There are however limits in the placement of residential dwellings (in terms of the distance from the road), and these have been specified.

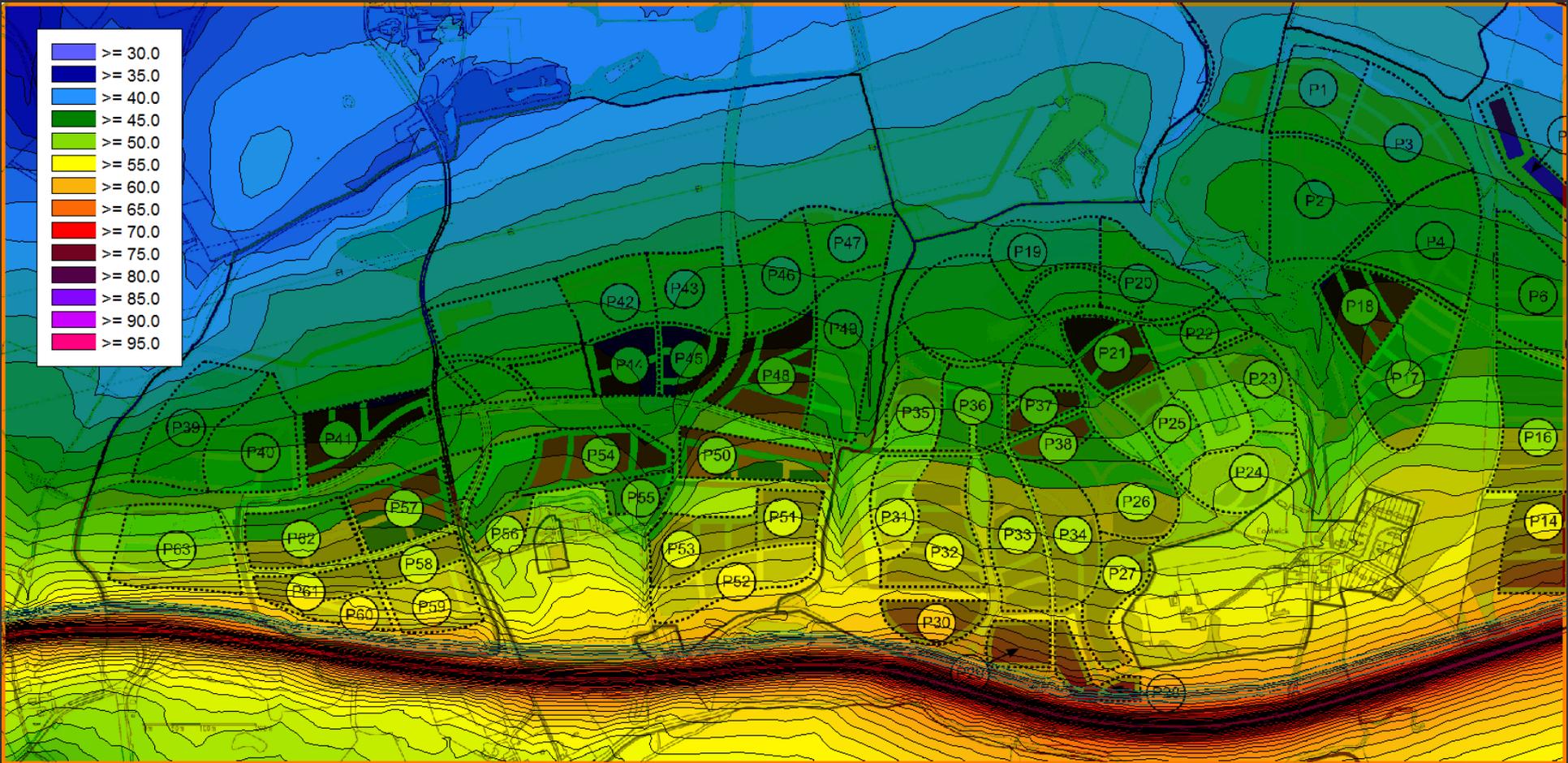
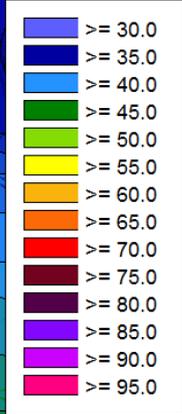
Development is not precluded at distances closer to the road than those set out in Table 3, rather additional measures should be employed such as suitable orientation of properties and methods of ventilation other than openable windows.

Note that the bund has been modelled running parallel to the road, at a constant distance from the road of approximately 30m (to the centre of the bund).

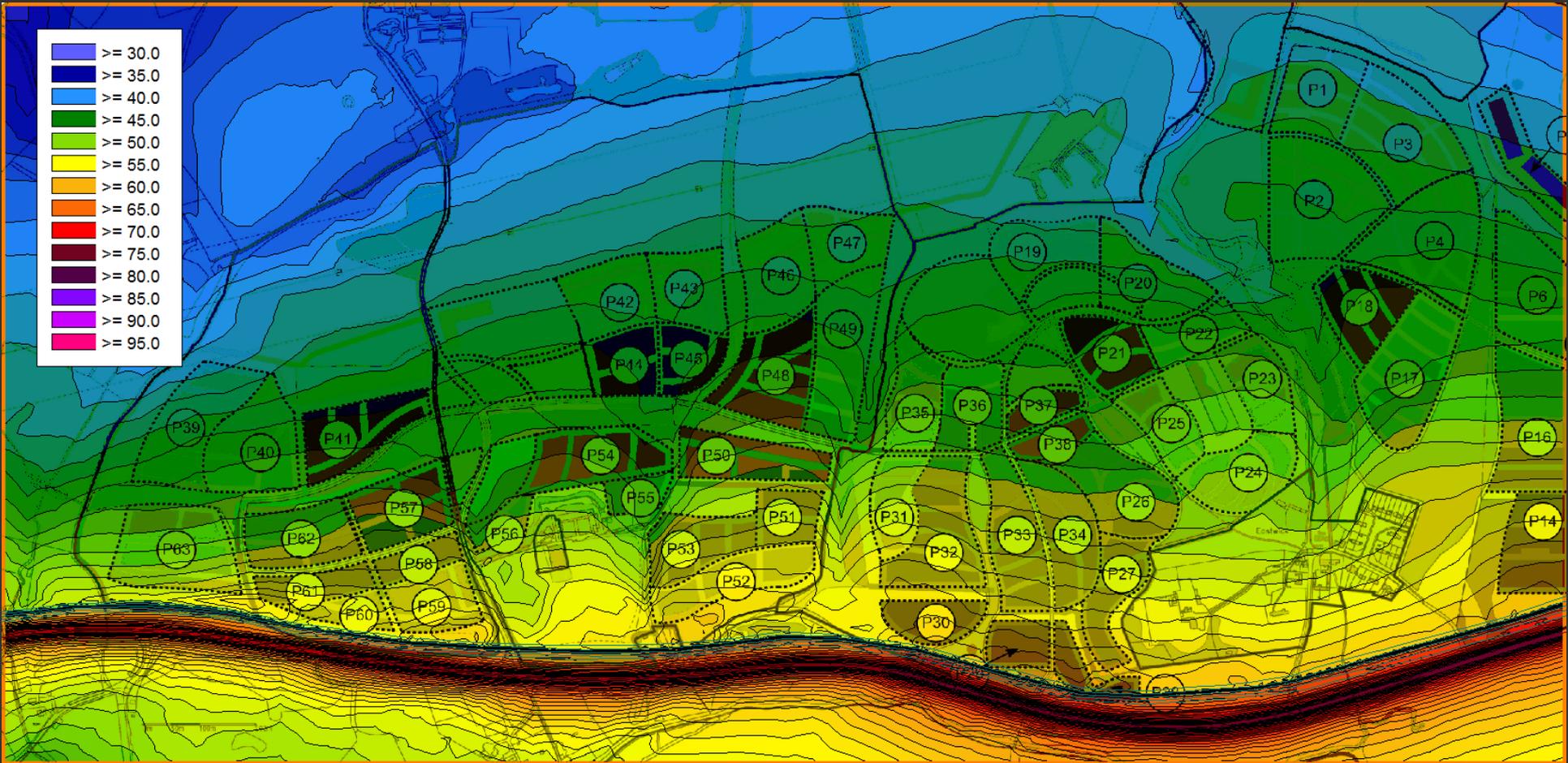
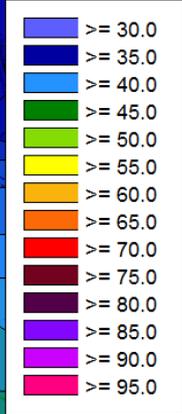
The width or land take of the bund will have to be determined by a structural engineer.



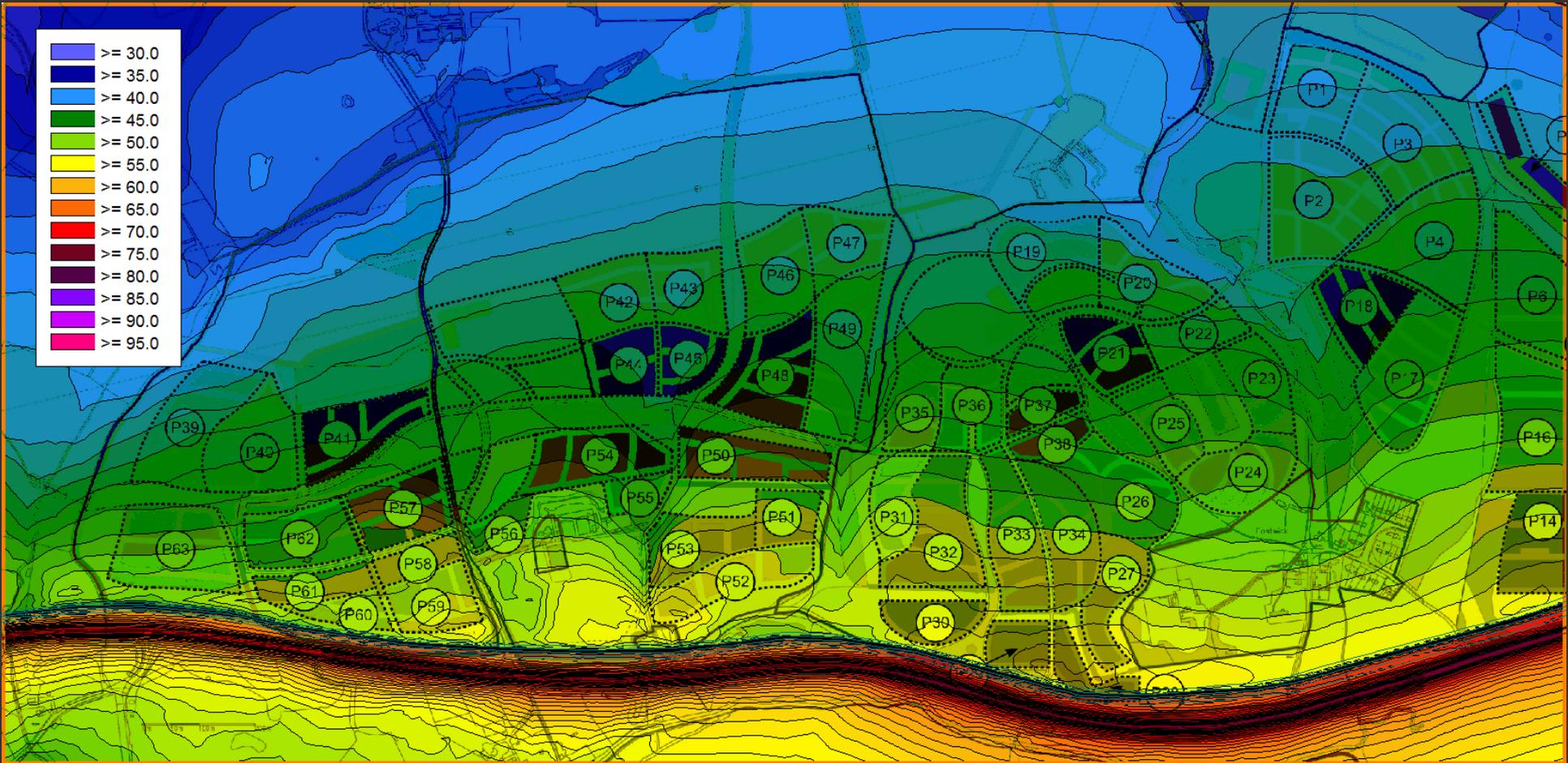
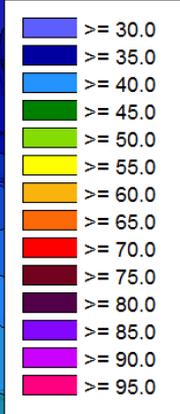
Current scenario, no bund



I'm high bund



3m high bund



5m high bund