

Project

New Emergency Generator, NMGH:
Noise Assessment to support Planning App.

Prepared for

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Summary

SRL Technical Services has been commissioned by IOarchitect to validate noise emissions for a new emergency generator at North Manchester General Hospital in Crumpsall. We have calculated the noise emissions from the proposed generator set; which is being designed to achieve a sound pressure level of 75dB(A) at 1m.

No specific noise condition has been set by Manchester City Council. However, we have considerable experience in producing reports of this type for submission to local authorities and have proposed a criteria commonly used for 'Emergency Generators'.

This criteria states: Noise emitted from the emergency plant and generators hereby permitted shall not increase the minimum assessed background noise level (expressed as the lowest 24 hour $L_{A90, 1 \text{ hour}}$) by more than 10dB one metre outside any noise sensitive premises.

The emergency generator is proposed to be operated only for essential testing, except when required by an emergency loss of power. Testing of the emergency generator will be carried out only for up to one hour in a calendar month, and only between the hours 09.00 and 17.00 Monday to Friday, and not at all on public holidays.

Our assessment proposes noise emission limits at the identified nearby noise sensitive receptor locations which align with the Local Planning Authority's requirements. Noise propagation software predictions have been used to calculate noise emissions and confirm appropriate MEP design selection. It has been demonstrated that no additional mitigation is required for the proposed installation and that the planning noise emission limits are achievable.

Edward Davis

A handwritten signature in black ink that reads "Edward Davis".

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1.0 Introduction

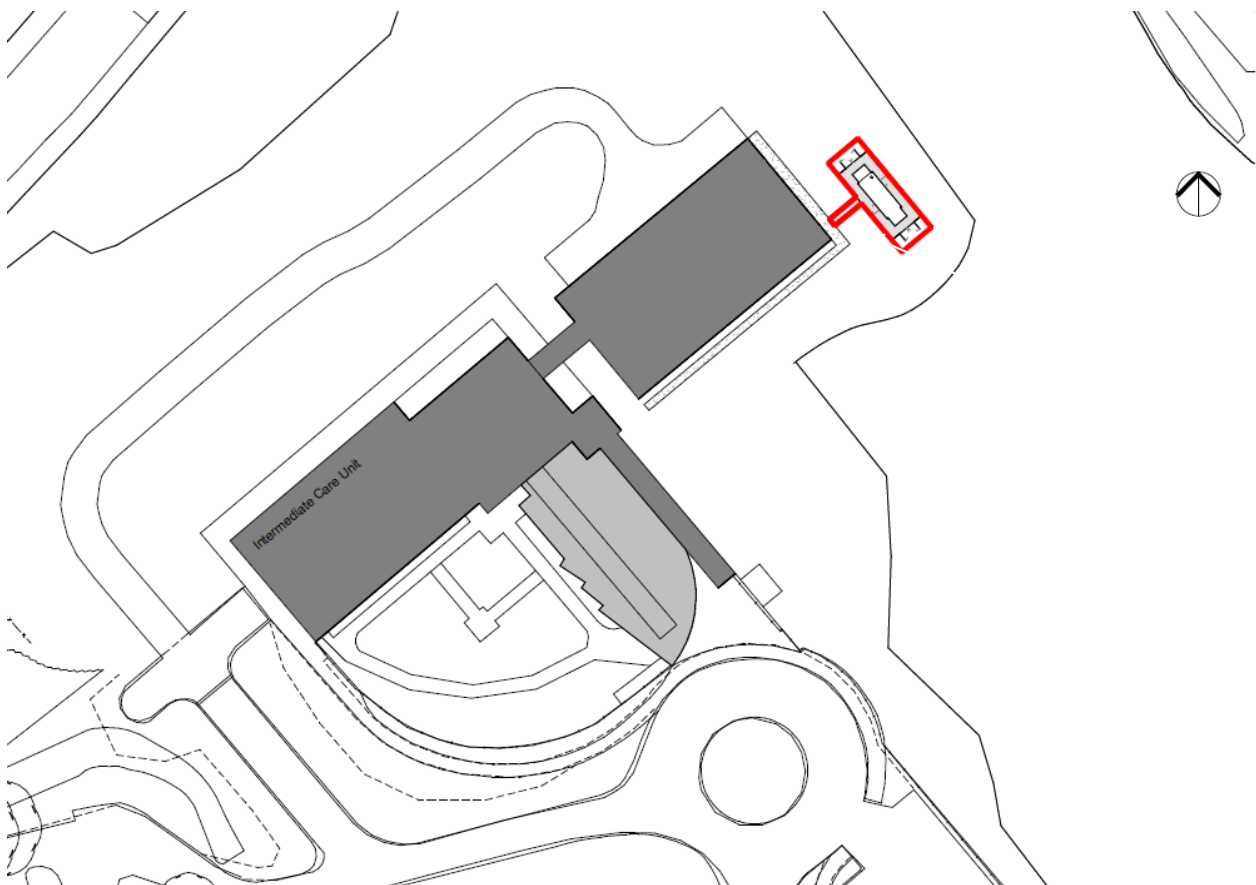
SRL Technical Services has been commissioned by IOarchitect to validate noise emissions for a new emergency generator at North Manchester General Hospital in Crumpsall.

North Manchester General Hospital is a large NHS hospital located in Crumpsall in the north the City of Manchester. It is operated as part of the Pennine Acute Hospitals NHS Trust.

The proposed generator will be located to the far north-east corner of the site, adjacent to the Intermediate Care Unit.

Figure I shows the proposed site location of the emergency generator

Figure I – Proposed Site Plan



Using the data provided to us by ‘General Energy’ report ref: GN8673 - GEN550CC on the proposed emergency generator, we have modelled the proposed generator in proprietary acoustic modelling software *CadnaA* by *Datakustik*. We have used the model to calculate the noise emissions from the generator in accordance with ISO 9613-2:1996 ‘Acoustics -Attenuation of sound during propagation outdoors - Part 2: General method of calculation’.

2.0 Legislation, policy and guidance

2.1 National Planning Policy.

Noise Policy Statement for England (NPSE) advises that noise impacts should be assessed on the basis of adverse and significant adverse effect but does not provide any specific guidance on assessment methods or numerical noise limits. NPSE introduces the concepts summarised in Table I that can be applied when considering the significance of noise impacts, which are applied by the World Health Organization. The document advises that it is not possible to have ‘a single objective noise based measure... that is applicable to all sources of noise in all situations’. NPSE further advises that the sound level at which an adverse effect occurs is likely to be different for different noise sources, for different receptors at different times.

Table I: NPSE observed effect levels

Effect Level	Description
No Observed Effect Level (NOEL)	This is the noise level below which no effect can be detected. In simple terms, below this level of noise, there is no detectable effect on health and quality of life due to the noise being assessed.
Lowest Observed Adverse Effect Level (LOAEL)	This is the level of noise above which adverse effects on health and quality of life can be detected.
Significant Observed Adverse Effect Level (SOAEL)	This is the level of noise above which significant adverse effects on health and quality of life occur.

National Planning Policy Framework National Planning Policy Framework (NPPF 2021) sets out the Government's planning policies and how these are expected to be applied. In relation to noise and vibration, NPPF section 15 paragraphs 174, 185 and 187 are presented below:

‘174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability’

‘185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;
- c. limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

‘187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.’

2.2 Planning Practice Guidance

Online Planning Practice Guidance (PPG) has been published to provide greater details in relation to the relevance of noise to the planning process following the introduction of NPPF and NPSE. This guidance states, under the heading ‘*How to Determine the Noise Impact*’, that the following should be considered by local authorities:

- *‘whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.’*

In line with NPSE, this includes identifying where noise exposure is above or below the significant observed adverse effect level and the lowest observed adverse effect level for a given situation during the operation of the Proposed Development.

Further guidance on each of the various observed effect levels set out in NPSE is provided in the table detailed in the section headed ‘*How to Recognise when Noise could be a concern?*’ which is reproduced below in Table 2.

It is important to note that no specific noise parameters or target noise levels are defined in the text. Under the heading ‘*What factors influence whether noise could be a Concern?*’, the subjective nature of noise is discussed. It is stated that there is no simple relationship between noise levels and the impact on those affected. This depends on how various factors combine in particular situations.

Table 2: PPG Observed Effects.

Perception	Example of outcomes	Increasing effect level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not Intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.		No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect Level	Avoid
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening	Significant Observed Adverse Effect Level	Avoid

	and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.		
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.3 BS 4142:2014 “Methods for rating and assessing industrial and commercial sound”

Suitable criteria for determining the magnitude of the impact from any proposed building services plant are proposed based on the guidance in BS 4142: 2014.

The basis of BS 4142: 2014 is a comparison between the background noise level in the vicinity of residential locations and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

- Background Sound Level: $L_{A90,T}$ – defined in the Standard as the ‘A’ weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, and quoted to the nearest whole number of decibels (dB);
- Specific Sound Level: $L_{Aeq,T,r}$ – the equivalent continuous ‘A’ weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T;
- Residual Sound Level: $L_{Aeq,T}$ – the equivalent continuous ‘A’ weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
- Rating Level: $L_{Ar,T,r}$ – the specific sound level plus any adjustment made for the characteristic features of the noise. These features include tonality, impulsivity and intermittence, where a penalties between 2dB and 9dB depending on perceptibility will be applied.

The background level and the rating levels are compared and the standard states that:

“Typically, the greater the difference, the greater the magnitude of impact.”

- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.*
- *The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context.”*

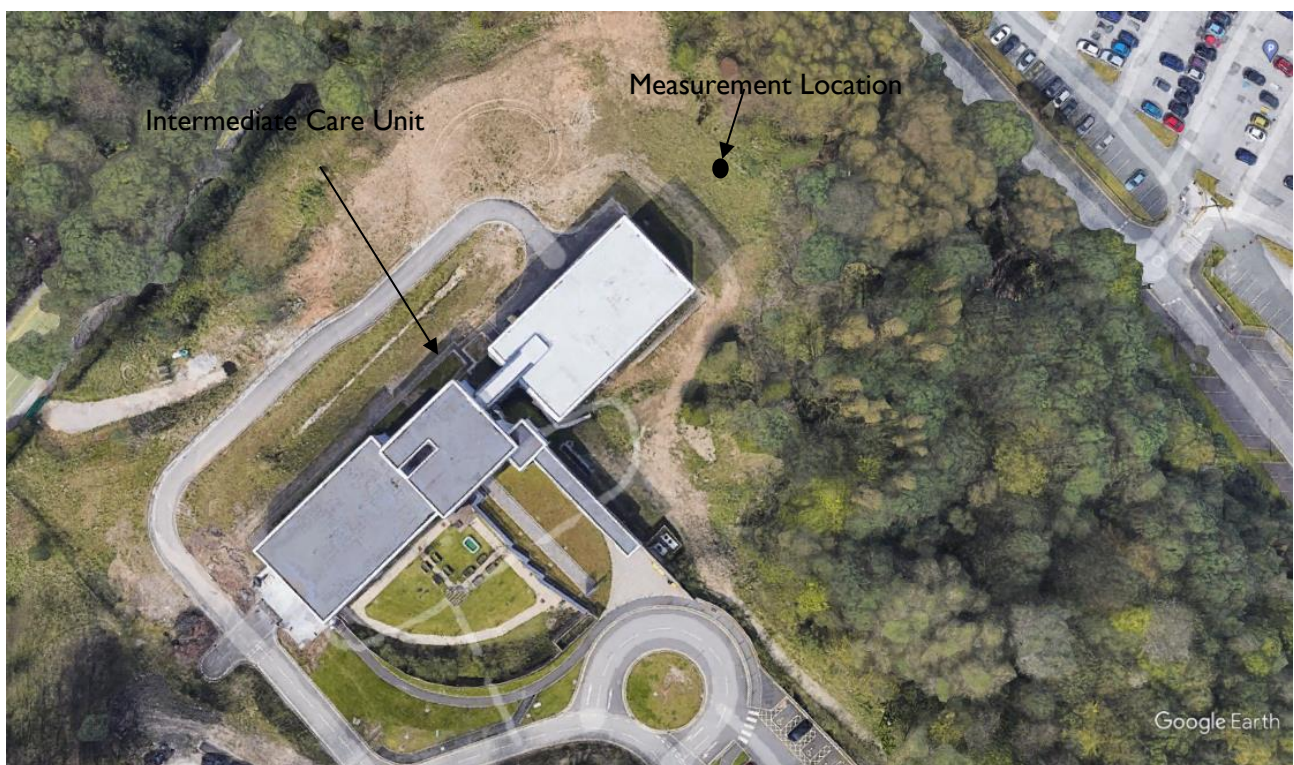
The standard specifies the specific sound level as an L_{Aeq} with a one-hour assessment period during the day (07:00-23:00 hours) and a fifteen-minute assessment period at night (23:00-07:00 hours).

3.0 Survey methodology

Unattended noise measurements were undertaken during daytime and night-time periods at North Manchester General Hospital to assess the baseline noise levels of the site. Measurements were undertaken between Friday 11th November and 15th November 2022. As there were no secure locations to measure close to noise sensitive receptors, measurement location was chosen to reflect a worst-case scenario where there were minimal influences from traffic sources as sensitive receptors are on a busy road network which would have elevated the baseline L_{A90}

Figure 2 shows the measurement location. The noise logger was positioned approximately 20m from the far north-east corner of the site, adjacent to the Intermediate Care Unit.

Figure 2 Measurement location.



3.1 Equipment

Detail of the instrumentation utilised during the noise surveys is tabulated in table 3 below:

Table 3. instrumentation

Description	Make	Model	Serial number
Type I Sound level meter (unattended)	Rion	NL-52	00754129
Sound level calibrator	Rion	NC-74	34657234

Calibration checks were performed on site, immediately prior to, and following, the survey. No significant drift was noted ($\pm 0.5\text{dB}$).

All measurement equipment owned and operated by SRL Technical Services has annual calibration checks carried out by external companies traceable to national standards. Copies of all calibration records are kept and can be provided upon request.

3.2 Weather conditions

Meteorological conditions throughout the monitoring period are noted to have remained relatively stable for the time of year, with only modest wind speeds and little precipitation.

4.0 Measured noise levels

Various noise measurement parameters were logged including the L_{Aeq} and the L_{A90} .

L_{Aeq} represents the equivalent continuous A-weighted sound pressure level. It is the single number that represents the total sound energy measured over that period (T).

L_{A90} represents the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Commonly referred to as the background noise level, over a one-hour period, the L_{A90} will be the noise level exceeded for 54 minutes.

All unattended monitoring data is tabulated in Appendix A.

Table 4: Average ambient sound levels

Period	$L_{Aeq,1h}$
Daytime (0700-2300)	51dB
Night-time (2300-0700)	38dB

Table 5: Minimum prevailing background sound levels

Period	$L_{A90,1h}$
Daytime (0700-2300)	39dB
Night-time (2300-0700)	38dB

5.0 Proposed plant noise limits.

Noise associated with emergency plant is to be assessed following the BS 4142 methodology. The noise limit for the development is for the rating level ($L_{A,r,T,r}$) to not exceed the minimum background noise level (expressed as the lowest 24 hour $L_{A90, 1 \text{ hour}}$) by more than 10dB one metre outside any noise sensitive premises.

Representative minimum background sound levels have been determined for the closest identified noise sensitive receptors (Table 5). The locations of the identified receptors are shown in Figure 3. There is potential for the emergency generator to operate 24 hours a day. The following plant noise limits apply externally at the façade of the identified noise sensitive receptors:

Table 6: Plant noise emission limits, assessed at the identified noise sensitive receptor.

Period	Rating Level
Daytime (0700-2300)	49dB
Night-time (2300-0700)	48dB

The above noise limits are given as rating levels. Corrections appropriate to the character of the sound should be applied when calculating this from the specific sound level, as defined in BS 4142.

6.0 Assessment and mitigation.

6.1 Acoustic model

Using the model, we have predicted the noise levels emitted by the generator set at a height of 4m above ground level for identified sensitive receptors.

An acoustic model including the proposed new fixed plant noise source and local area has been created using the CadnaA software package. The software utilises the principles of ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation [International Organization for Standardization, 1996] to calculate acoustic propagation of sound sources.

The model has been used to predict operational noise levels incident on the façades of the identified nearby noise sensitive receptors.

Figure 3: Receptor locations



6.2 Assessment

The calculated noise emissions and assessment at the receptor locations are summarised in the Table 7 below:

Table 7: Assessment at receptor locations.

Receiver	Assessment period	Plant noise emission limits	Rating noise level at receiver	Assessment
R01 - 7 Imperial Wy, Manchester M9 8FE	Daytime (0700-2300)	49dB	32dB $L_{Ar,1 \text{ hour}}$	Predicted rating level satisfies noise emission limits
	Night-time (2300-0700)	48dB		
R02 - 185 Cleveland Rd, Manchester M8 4GX	Daytime (0700-2300)	49dB	25dB $L_{Ar,1 \text{ hour}}$	Predicted rating level satisfies noise emission limits
	Night-time (2300-0700)	48dB		
R03 - 153 Cleveland Rd, Manchester M8 4QZ	Daytime (0700-2300)	49dB	26dB $L_{Ar,1 \text{ hour}}$	Predicted rating level satisfies noise emission limits
	Night-time (2300-0700)	48dB		
R04 - 105 Parkhill Ave, Manchester M8 4QZ	Daytime (0700-2300)	49dB	24dB $L_{Ar,1 \text{ hour}}$	Predicted rating level satisfies noise emission limits
	Night-time (2300-0700)	48dB		
R05 - 102 Parkhill Ave, Manchester M8 4GY	Daytime (0700-2300)	49dB	26dB $L_{Ar,1 \text{ hour}}$	Predicted rating level satisfies noise emission limits
	Night-time (2300-0700)	48dB		
R06 - 151 Delaunays Rd, Manchester M8 4GY	Daytime (0700-2300)	49dB	26dB $L_{Ar,1 \text{ hour}}$	Predicted rating level satisfies noise emission limits
	Night-time (2300-0700)	48dB		

Note, if the specific sound source contains identifiable acoustic characteristics (for example tonality, impulsivity intermittency, etc.) then it is necessary to account for the required BS 4142 acoustic character feature corrections, as necessary for the sound source. Noise associated with the proposed installation is likely to include acoustic features: a correction of +2 dB has been included for just perceptible tonality has been included.

The assessments indicate that noise emissions would satisfy the proposed plant noise emission limits, described in Table 3. No further mitigation would be required provided the provisional equipment selection is representative of the actual installation.

7.0 Conclusion.

SRL Technical Services have been appointed to provide acoustic consultancy services in relation to the proposed emergency generator to be installed at North Manchester General Hospital in Crumpsall. A noise assessment of the proposed emergency plant has been undertaken. Based on the results of acoustic survey work at the hospital site, operational noise emission limits have been proposed at the identified nearby noise sensitive receptor locations. These align with the proposed planning criteria.

Noise propagation software predictions have been used to calculate noise emissions and confirm the appropriateness of the generator design selection. It has been demonstrated that no additional mitigation is required for the installation and that the proposed planning noise emission limits are achievable. This document has been prepared to be submitted alongside the planning application for the proposed installation.

Appendix A – Noise Data Used in Assessment

Date	Start Time	L _{Aeq, 1hr}	L _{A90,1hr}
11/11/2022	15:26	52	47
	16:26	49	47
	17:26	49	46
	18:26	49	44
	19:26	52	45
	20:26	51	43
	21:26	47	41
	22:26	44	40
	23:26	46	39
12/11/2022	00:26	43	39
	01:26	42	38
	02:26	41	38
	03:26	41	38
	04:26	42	38
	05:26	44	39
	06:26	47	42
	07:26	49	43
	08:26	48	42
	09:26	47	43
	10:26	47	43
	11:26	48	44
	12:26	53	44
	13:26	49	44
	14:26	49	44
	15:26	50	45
	16:26	50	47
	17:26	51	47
	18:26	52	47
	19:26	56	48
	20:26	60	46
	21:26	49	42
	22:26	48	41
	23:26	47	41
13/11/2022	00:26	46	40
	01:26	45	39

	02:26	44	39
	03:26	42	39
	04:26	42	39
	05:26	45	40
	06:26	49	42
	07:26	51	46
	08:26	49	45
	09:26	50	44
	10:26	49	43
	11:26	53	45
	12:26	50	46
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	17:26	51	48
	18:26	51	47
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	20:26	51	46
	21:26	49	44
	22:26	48	44
	23:26	46	43
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	01:26	43	39
	02:26	43	39
	03:26	42	39
	04:26	43	39
	05:26	47	42
	06:26	51	46
	07:26	53	50
	08:26	52	49
	09:26	50	46
	10:26	49	45
	11:26	49	45
	12:26	49	45
	13:26	50	46
	14:26	50	47
	15:26	51	48

	16:26	52	49
	17:26	51	48
	18:26	50	45
	19:26	51	46
	20:26	49	43
	21:26	47	41
	22:26	45	39
	23:26	45	39
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	01:26	41	39
	02:26	41	38
	03:26	43	39
	04:26	45	40
	05:26	49	44
	06:26	52	49
	07:26	55	53
	08:26	55	52
	09:26	54	52
	10:26	54	51
	11:26	55	50

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