Network Rail

King's Cross Concourse

King's Cross - Western Concourse Energy Appraisal

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Network Rail

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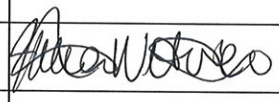
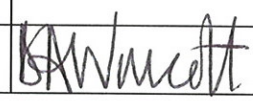
		Signature			
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Contents

Executive Summary

NR should consider connecting into the proposed King's Cross Central district heating scheme if a significant reduction in CO_2 footprint for the two sites can be obtained and the operational risks are acceptable.

Due to the uncertainly relating to the provision of a district heating scheme associated with KX Central development NR would need to install boilers as part of the concourse scheme.

Whilst the decision is being made regarding the availability of a district heating scheme the design of the KX Western Concourse can incorporate provisions for connections at some time in the future.

1 GENERAL

As part of the ongoing discussions concerning the planning application for the Western Concourse Development comprising the concourse, retail provision and western range office Arup have been commissioned to reappraise the provision of heating, cooling and power to the development.

2 PREDICTED MAXIMUM DEMAND

The loads quoted below have been derived from Stage D Report reference 197 and identify the following maximum demands.

Building/Area		**Power KW**	**Heat KW**	**Cooling KW**	**Standby Power KW**
Concourse NR RETAIL RESTAURANT PUB	(area) 5525 2271 471 415	1800	2050	1900	489.6
Western Range	3827				
KX Station	-	579	0	0	Fed from Eastern Range development
Suburban Station	-	77	0	0	
Eastern Range*	3100	608	650	450	

*Details are derived from ongoing Grip 5 design activities.

For the purposes of this report Eastern Range loads have been excluded from this energy appraisal however if a CHP energy source was readily available and acceptable to NR then it would be sensible to include this load within the final analysis, although the feasibility of this would need to be assessed.

3 ASSUMPTIONS

At this stage of the proposed development the details of the CHP system intended to be provided on the King's Cross Central site is not known and as such the following assumptions have been applied.

- Heat is readily available to suit NR maximum load
- Heating flow and return temperatures are 110˚C and 70˚C respectively
- The redevelopment of King's Cross Central occurs within 5 years of the NR Concourse Development
- Chilled water is not available from KX Central to serve the NR Concourse Development
- Standby power may be available from KX Central to secure the emergency power needs for the NR Concourse Development
- Standby power to the Suburban Train shed and the Mainline Train shed is derived from the Eastern Range Development
- The existing service trench through the share service yard is full
- The KX Concourse base loads are
    - HEAT 100KW
    - COOLING 100KW
    - ELECTRICAL 200KW
- The KX Concourse principle operating hours are 05.00hrs to 01.00hrs 7 days a week
- The KX Concourse development would receive listed building consent.

4 ENERGY DEMAND

The predicted annual energy consumption identified below has been derived using the data contained in Arup Energy Statement Reference 197 and application of various assumptions detailed in Section 3.

System Description	Predicted CO_2 generated byKXC to serve NR	Predicted CO_2 generated on NR site	Predicted CO_2 generated on both sites to serve NR
	KX Central	**KX Concourse**	**Combined Sites**
	CO_2/year tonne	**CO_2/year tonne**	**CO_2/year tonne**
Baseline (Benchmark) Grid +Gas	**0**	**1470**	**1470**
Baseline with energy savings applied Grid + Gas	**0**	**1075**	**1075**
Baseline with energy savings applied Grid + Biomass	**0**	**944**	**944**
District Heating Baseline with energy savings applied Grid + Biomass	**26**	**919**	**946**
Baseload CHP plus Grid + Gas (serving Central) with NR Grid + Gas	**0**	**1075**	**1075**
Baseload CHP (NR+ Central) plus Grid + Gas (serving heat to Central and NR) with NR Grid	**90**	**919**	**1009**
Baseload CHP plus Grid + Biomass (serving Central) with NR Grid + Gas	**0**	**1075**	**1075**
Baseload CHP (NR+ Central) plus Grid + Biomass (serving heat to Central and NR) with NR Grid	**77**	**919**	**997**

Notes

1) The predicted CO_2 emissions have been based on assumptions contained in Section 3 and energy usage outlined in Arup Energy Statement.

2) The results are for comparison purposes and will be subject to confirmation from the KX Central developer relating to equipment selctions.

3) The emission factors are based on Part L codes.

5 ENERGY APPRAISAL

Based on the calculation tabulated in section 4 the following observation can be ascertained.

- The use of a remote heat source should be considered if the energy source generates energy at a lower CO_2 intensity
- As biomass fuelled boilers cannot reasonably be sited within the NR development if KX Central provide biomass heating then it would prove beneficial to receive heat from this source in terms of the reduced carbon emissions from the combined developments

6 CONNECTIVITY

Unfortunately the precise location of the KX Central energy centre is not known and as such, it is assumed that it will be sited adjacent to the proposed share service yard.

From the maximum demand schedule contained in Section 2 we have calculated the following pipe size connections for various systems and operating parameters.

Service	**Pipe/Cable Size**	**Installation Space**	**ACCESS REQUIRED**
Medium Temperature Hot Water	150 dia	1000mm x 500mm	TOP or BELOW
Low Temperature Hot Water (Optional)	200 dia	1100mm x 550mm	TOP or BELOW
Chilled Water (Optional)	250 dia	1200mm x 600mm	TOP or BELOW
Power	FEEDER BUS BAR 300 x 250	600mm x 350mm	TOP & SIDES

Due to the services congestion in the shared service yard it is anticipated that both the pipe work and power connections will need to be routed outside this area.

From an initial review an overhead gantry sited above the roof of the suburban train shed has been identified as a possible route although this would be subject to NR approval from the asset engineers. Although spatial allowances for chilled water has been detailed it is not known whether surplus cooling would be available. As such we have excluded this provision in the overall energy appraisal.

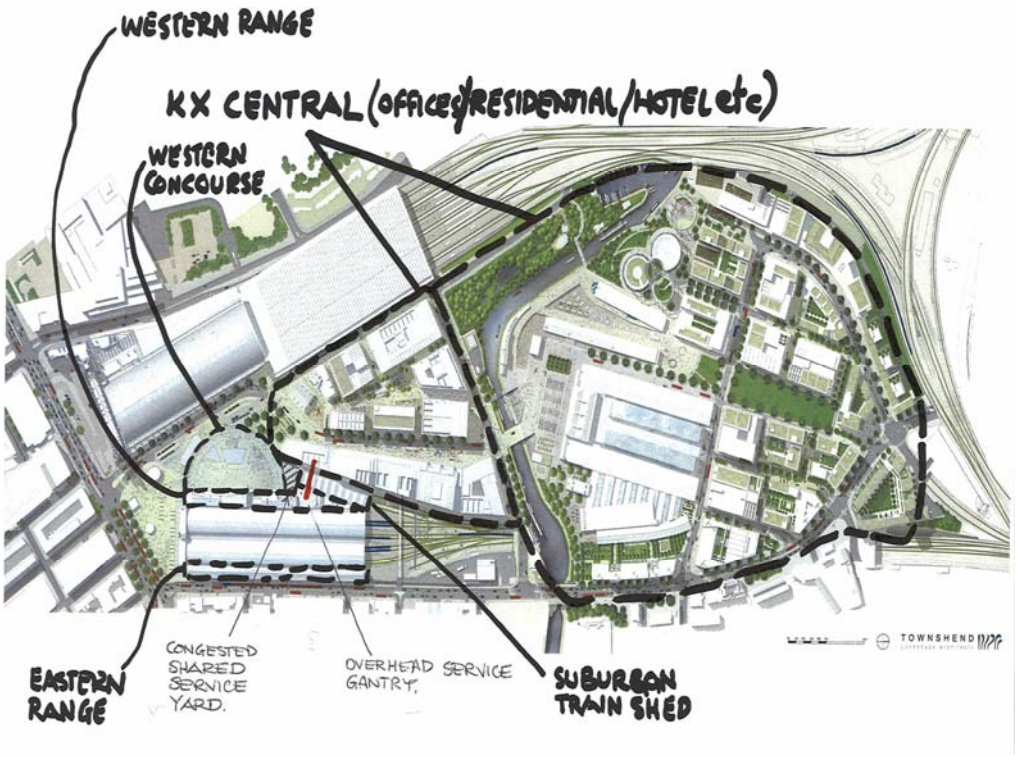

Figure 1 Site Plan

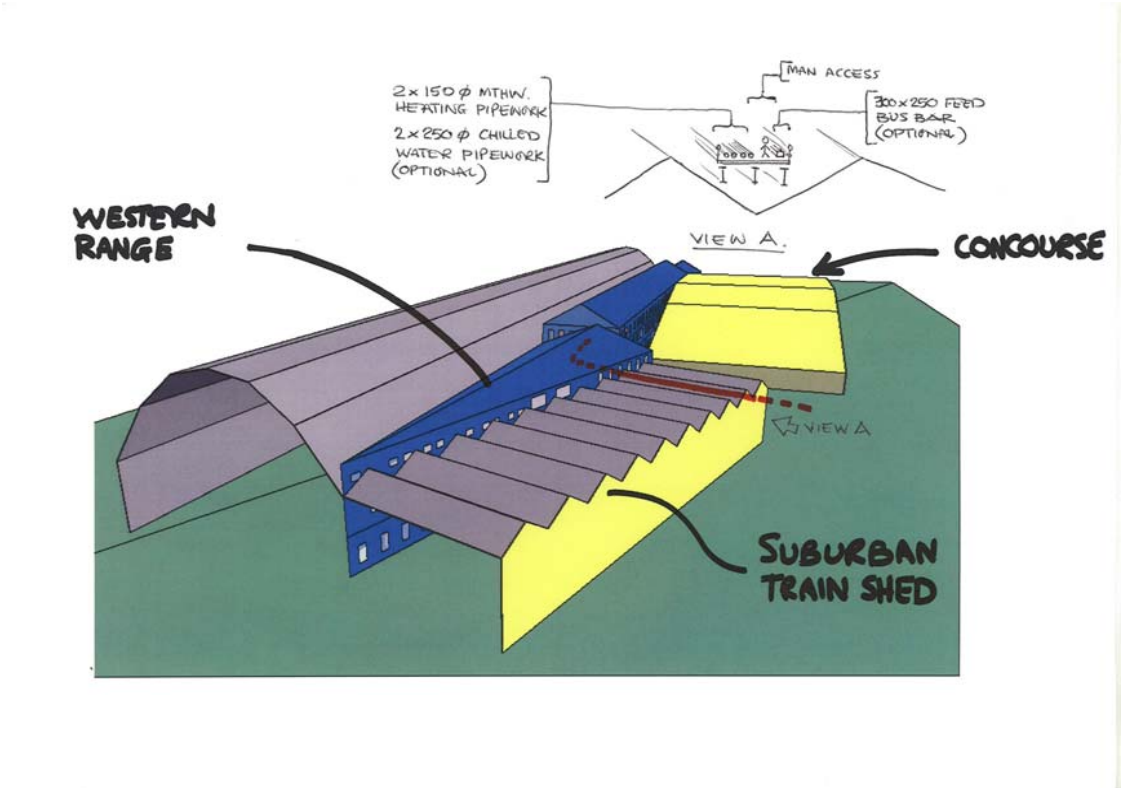

Figure 2 Routing Isometrics

7 PLANT ROOM REQUIREMENTS

Applying the maximum heat loads identified in Section 2 with a MTHW district heating feed from KX Central we would estimate that a dedicated plant room of approximately 70 to 90m² would be required to accommodate heat exchanges and associated controls equipment. Space and location requirements will be assessed at subsequent design stages.

8 OBSERVATIONS

Boilers would need to be fitted into the KX Concourse development to allow the station and concourse to operate immediately. The design life of the boilers is 20/25 years and therefore connection to KXC before they were life expired would not be cost effective.

9 CONCLUSION

NR should consider connecting into the proposed King's Cross Central district heating scheme if a significant reduction in CO_2 footprint for the two sites can be obtained and the operational risks are acceptable