FAIRHURST

70072

University of York

Heslington East Campus

Foul Water Drainage Strategy

February 2008

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REPORT CONTROL SHEET

JOB NUMBER: 70072

TITLE: Heslington East, University of York
Foul Water Drainage Study

CLIENT: The University of York

STATUS:

Draft	☐
Interim	☐
Final	☑
Supplementary	☐

ORIGINAL DATE: 31st August 2007

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REVIEWED AND APPROVED BY: Ed Connon

REVISION SCHEDULE

Rev. No.	Description of Amendment	Prepared By	Approved By	Date
01	General revisions following meetings with YW on 22nd January and 12th February 2008	EC	EC	12/02/08

UNIVERSITY OF YORK

HESLINGTON EAST CAMPUS

FOUL WATER DRAINAGE STRATEGY

JANUARY 2008

1 INTRODUCTION

1.1 Fairhurst Appointment

1.1.1 W A Fairhurst & Partners (Fairhurst) was commissioned by the University of York (UoY) to undertake a study and to report on foul water drainage disposal from the proposed Heslington East Campus Development. As directed within the brief prepared by the UoY, the aim of the study was to establish outline design principles for foul water drainage disposal recognising the University's emerging drainage strategy as well as the contents of Yorkshire Water's 'Waste Water Strategy – Final Report' dated November 2006 (see Appendix 3).

1.2 Planning Conditions

1.2.1 Condition 20 of the Outline Planning Permission for the new Heslington East Campus granted by the Secretary of State in a letter dated 27th June 2007 states:

"Before any works commence on the construction of any building, details of the proposed means of disposal of foul drainage from the site shall be submitted to and approved in writing by the Local Planning Authority [the City of York Council (CYC)], and subsequently implemented in accordance with the approved details."

1.2.2 Accordingly, this study report will demonstrate that the means of disposal of foul drainage from Heslington East has been established through dialogue between the UoY and Yorkshire Water (YW) and that the development can be properly drained for the protection of the local water environment. Following approval of the outline drainage proposals by the CYC (the Local Planning Authority), a detailed scheme design will be developed and an implementation programme will be agreed with YW.

1.3 Consultations

1.3.1 Early consultations with YW led to the agreement of the 'Waste Water Strategy – Final Report' dated November 2006 (see Appendix 3). Recent discussions with YW have concentrated on the development of scheme proposals comprising off-site sewers and associated works. Off-site sewers will be requisitioned under Section 98/101 of the Water Industry Act 1991.

2 BASELINE CONDITIONS

2.1 Existing Waste Water Infrastructure

2.1.1 The majority of existing properties in the Heslington area are served by a gravity sewerage system operated and maintained by Yorkshire Water. The main 'public' sewer is located in Heslington Lane although, as Heslington Village to the south of Heslington Lane is low lying, waste water from this area is pumped up to Heslington Lane by the Heslington Main Sewage Pumping Station. The gravity system continues west for some 3 km to the Fulford Sewage Pumping Station and from there all flows are pumped a further 3.2 km to YW's Naburn Waste Water Treatment Works.

2.1.2 More recent developments in the Heslington area, such the University West Campus and a housing estate to the south of Heslinton Lane are served by two pumping stations in series, Turners Croft Pumping Station and York University Pumping Station. The latter is a terminal pumping station which discharges directly to Naburn WWTW via some 4.6 km of dedicated rising main.

2.1.3 Yorkshire Water has indicated that whilst the Naburn WWTW currently meets its discharge consent conditions there is no provision in the current Asset Management Plan Period 2005-2010 to fund an increase the capacity of the treatment works. According to the November 2006 Waste Water Strategy Report produced by YW, if capacity is required to accommodate discharge from the new campus then it is likely that the consented flow for treatment at Naburn would have to increase from the current limit of 1238l/s to around 1300l/s. This would require the reconstruction of a transfer pumping station at the treatment works and some 500m of the transfer pipeline.

2.1.4 The November 2006 Waste Water Strategy Report also presented two options for upgrading the existing sewerage infrastructure locally to accommodate foul water discharges from the new campus. Both options involved the construction of a new sewer outfall from the development and upgrading or replacement of the existing University Pumping Station.

3 DEVELOPMENT PROPOSALS

3.1 The New Campus

3.1.1 The Heslington East Campus Site is located 4 km to the south east of York City Centre and to the east of the existing University Campus. The Site is bounded to the north by Field Lane and the A1079 Hull Road, and to the south by Low Lane.

3.1.2 At present the 116 hectare Site is under arable cultivation characterised by large open fields with land drainage ditches and occasional hedgerows and hedgerow trees. The generally topography slopes down from Kimberlow Hill in the north towards Low Lane on the southern site boundary.

3.1.3 The core of the new campus will include academic buildings, accommodation, and community facilities occupying an area of some 65 hectares. The surrounding green space provision will include a lake and wetland area extending over 10.4 hectares (see Site location plan in Appendix 1). The lake and wetlands will form an integral part of the sustainable surface water drainage scheme for Heslington East as well as providing a valuable visual and ecological amenity.

3.2 Development Programme

3.2.1 The Development Masterplan (see Appendix 2) divides the site into a number of development zones within which development of Heslington East will be phased over a 15 to 20 year period). These development zones will be bounded by a service road to the north, a central boulevard and green vistas, and a movement spine and feature lake to the south.

3.2.2 The development zones are associated with specific groups of activities as follows:

1. Cluster 1 – a cluster of three academic departments (Computer Science, Electronics, Theatre, Film and television), and a central hub building that includes a Creative Technologies centre, the York Centre for Complex Systems Analysis and the White Rose Grid Centre. Also within the cluster is a 600 bed residential college.

2. Cluster 2 – The second cluster will include five further academic departments (Law, Management, Economics, Politics and Philosophy), a residential college and associated social spaces.

The configuration of other clusters has yet been determined.

3.2.3 Initial academic development will be focused around the Central Boulevard, and will then progress east and west over the 15 to 20 year development programme to occupy the area of land between the lake and Kimberlow Hill. It is currently envisaged that landscaping provision (including the lake) will be largely completed by year 2012 in tandem with the first period of academic development.

3.3 Foul Water Drainage

3.3.1 Foul water drainage will comprise a series of spine drains and arterial drainage routes collecting and conveying waste water from development clusters within the new campus to the main 'public' sewers maintained and operated by Yorkshire Water (YW). Detailed discussions between YW and the University are continuing in connection with upgrading and extension of the existing sewerage infrastructure and waste water treatment works. Further details of these discussions are presented later in this report. It is anticipated that YW will assume adoption and maintenance responsibility for the off-site sewers and all main sewers within the new campus.

3.3.2 The anticipated number of students, staff and visitors in Cluster 1 and on campus after completion of development is shown below in Table 3.1 – Campus Occupancy.

Table 3.1 – Campus Occupancy

Occupancy type	Number of occupants	
	Cluster 1	Completion
Students (resident)	1200	3300
Students & Staff (non-resident)	1200	4100
Spin-off Activities	-	2500
Total	2400	9900

3.3.3 In terms of Completion or 'Into-Service' Dates, the initial development on the new campus can be presented as shown in Table 3.2 below:

Table 3.2 – Initial Occupancy

Facility	Number of occupants		Into Service Date
	Residents	Day-use*	
600 Bed College	600	35	October 2009
Electronics & Computer Science		1725	July 2010
Hub Building		205	July 2010
Future KT Office Expansion (1)		200	October 2011
Future KT Office Expansion (2)		200	October 2012
600 Bed College 2	600	35	October 2011

* Day-use includes students, staff, and visitors

4 FOUL WATER DRAINAGE STRATEGY

4.1 Infrastructure Design Guidelines (WYG, January 2006)

4.1.1 The following conclusions and recommendations were made within the Design Guidelines prepared for the University by White Young Green (WYG), Consulting Engineers, based largely on consultations with Yorkshire Water:

- The proposed foul drainage system would drain by gravity from the vicinity of any structure, discharging to a main carrier foul sewer which would be constructed within the UTS Movement Spine. It was recommended that allowance for initial and later phases of development should be made during design of the main carrier sewer.

- The Development would require substantial infrastructure to cater for a total peak discharge of 45l/s (3 times average flow), with around 14l/s of this being during the initial period of development. Therefore the main carrier sewer

would be sized to accept a total flow and checked for a flow of 14l/s achieving the required self-cleansing velocity.

- The main carrier sewer would convey foul flows, via gravity, to a terminal pumping station in the south-west corner of the site. The pumping station would be detailed once the off-site connection point has been confirmed. The pumping station would be designed to allow for the disposal of foul flows for different phases of the development. This might require two different sized rising mains and/or different pump sizes to be installed depending on the waste water flows at the time of phasing. The pump station would provide adequate emergency storage and maintenance access.

- The anticipated growth of foul sewerage discharges from a phased development resulted in a peak flow of 45 l/s on completion of the Heslington East Campus development (the building composition and timing of each phase was not detailed within the WYG report).

- Due to insufficient capacity in the public gravity sewers adjacent to the site (due to the fact that a high water table causing infiltration of ground water into the foul network and so overloading the system) any solution would require a discharge directly to Naburn Waste Water Treatment Works.

4.2 Yorkshire Water's 'Waste Water Strategy' Report (November 2006)

4.2.1 Yorkshire Water subsequently carried out an initial assessment of the 'public' sewerage system with a view to accepting foul water discharges from the expansion of the University of York in the Heslington East area. The assessment focused on the following three key areas:

- Spare capacity within the existing public sewerage system including the York University Pumping Station (part of the public sewerage system).

- Feasibility and cost of a foul sewer requisition for the disposal of effluent from Heslington East.

- Reduction in current levels of infiltration to create spare capacity for the Heslington East development.

4.2.2 According to Yorkshire Water, improvements by way of increased treatment capacity at the Naburn WWTW cannot be provided by requisition and as such all associated costs would be recoverable from UoY. However, YW has advised that a contribution will not be required if appropriate provision is included for Heslington East within the Asset Management Plan (AMP5) for the regulatory period 2010 to 2015.

4.2.3 Yorkshire Water also concluded that the gravity sewers and all three pumping stations in the Heslington area have little or no spare capacity and although the existing rising main from the University Pumping Station has some spare capacity the increased velocity and working pressures could result in a failure. On this basis Yorkshire Water proposed two options for upgrading of the existing public sewerage infrastructure to accommodate the Heslington East Development (a copy of Yorkshire Water's 'Waste Water Strategy' Report and plans showing the proposed options is included in Appendix 3).

- **Option 1** – to provide a new pumping station on the development site and upgrade or bypass existing infrastructure as appropriate. This option would require a temporary pumping station with storage for Phase 1 only and some 1800m of 100mm diameter rising main discharging to the existing University Pumping Station as well as an upgrading of the University Pumping Station to include variable speed pumps and controls, including storage. Prior to the discharge of any substantial flows from Phase 2 a new larger pumping station with some additional storage over and above the temporary pumping station and larger rising main would be required for the site. The total cost of this option was estimated at £2,450k (with a potential discount of £800k). The estimated cost for Phase 1 only was £1,750k.

- **Option 2** – to provide a new pumping station for the existing University, gravity sewers connecting to the development site and the existing campus and a new short length of rising main connecting to the existing rising main from the University. This option would require a new master pumping station with variable speed pumps and controls including storage, some 1000m of 300mm

diameter gravity sewer to the application site, some 570m of gravity sewer connecting to the existing University Campus (abandoning the existing pumping station) as well as about 580m of 300mm diameter rising main. The total cost of this option was estimated at £1,900k (with a potential discount of £700k). No cost phasing provision was included with this option.

4.3 Strategy Update – Yorkshire Water Waste Water Strategy Report

4.3.1 An assessment carried out by Fairhurst has examined the engineering viability of the two options presented within Section 7 of the YW Waste Water Strategy Report for upgrading the existing public sewerage infrastructure to accommodate the Heslington East Development. Particular consideration has been given to the viability of crossing under the new lake and the depth of the pipe at the proposed master pumping station.

Two development stages and associated discharge flow rates were considered within the YW study:

- To completion of Cluster 1 only – peak discharge approximately 15l/s
- To completion of entire development – peak discharge approximately 45l/s

4.3.2 For Option 1 a new 'on-site' pumping station could be located immediately to the south of Cluster 1 near the UTS Movement Spine. The rising main would follow the line of the UTS to Field Lane and continue along Field Lane to the existing University Pumping Station.

4.3.3 For Option 2 the approximate length of gravity carrier sewer between Cluster 1 and the new master pumping station is 1800m and 2500m for the entire development. A minimum cover depth of 1.2m (from the top of the pipe barrel to the road surface) has been adopted. The finished road levels, in both cases, have been set at $10.95m_{AOD}$ (minimum slab levels to protect against flooding). A minimum velocity of 0.75m/s at one-third design flow has been adopted to provide a self-cleansing regime within the foul gravity sewers.

4.3.4 For Cluster 1 the invert level of the gravity carrier sewer, immediately to the south of the lake, has been calculated as $4.46m_{AOD}$ and for the entire development $6.20m_{AOD}$.

Assuming a lake bed level of 7.85mAOD (at the deepest point of the lake) it is concluded that the pipes could cross under the bed of the lake. However, the depth of a gravity carrier sewer at the new master pumping station would be in excess of 10m suggesting that Option 2 in the YW Strategy Report is not viable due to the excessive depth of both the pipe and the proposed pumping station.

4.3.5 This assessment thus concluded that Option 1 as described in the YW Strategy Report should be treated as the preferred solution. Works would comprise a new on-site 'terminal' pumping station and a new rising main to the existing University Pumping Station as described in the Strategy Report. Although the existing University Pumping Station will require upgrading to accommodate the additional flows discussions with Yorkshire Water will continue to determine if this work can be deferred until later in the development programme.

4.4 Strategy Update – Flow Assessment

4.4.1 A review of foul water flows likely to be generated from the new campus during the initial period of development and on completion was carried out by Fairhurst at the request of the University of York. Results are as shown in Tables 4.1 and 4.2 below:

Table 4.1 – Predicted '2012' Flows*

	Occupancy	Per-capita* (l/day)	Daily volume (m3/day)
Students (resident)	1200	200	240
Additional Students & Staff (non-resident)	1200	90	108
Total			348

* Based on above Table 3.2 – Initial Occupancy and 'standard' *per capita* discharge figures of 200 l/day for resident population and 90 l/day for non-resident population

Table 4.2 – Predicted Flows 'On-Completion'

	Occupancy	Per-capita* (l/day)	Daily volume (m3/day)
Students (resident)	3300	200	660
Students (non-resident)	2100	90	189
Staff (non-resident)	2000	90	180
Spin-off Activities†	2500	90	225
Total			1254

* Following recent discussions with Yorkshire Water (12/02/08) it is understood that reduced *per capita* discharge figures of 150 l/day for residents and 40 l/day for non-residents may be used to assess off-site infrastructure requirements

† Including embedded research companies

4.4.2 Based on the planned occupancy figures given in Table 4.1 above the '2012' average daily flow for design purposes is thus 348m3/day (4.03 l/s). The *per capita* discharge of 90 l/day for non-resident students, staff, and visitors includes an allowance for 'on-site' canteen and catering facilities.

4.4.3 On completion of the Heslington East campus the average flow increases to 1254m3/d (14.51 l/s) based on 3300 students (resident) and 6600 non-resident staff, students and visitors (including 'spin-off' embedded research companies located on-campus).

4.4.4 Recent discussions with Yorkshire Water suggest that lower *per capita* discharge figures of 150 l/day for residents and 40 l/day for non-residents may be more appropriate for a University Campus type development such as Heslington East. However, adopting a straight line growth in foul discharges over a development programme from 2009 to 2025 assuming 200 l/day (residents) and 90 l/day (non-residents) and a peaking factor of '3' for design purposes (see later comments on peaking factor) results in the predicted flows presented in Table 4.3 below:

Table 4.3 – Predicted Growth in Flows*

	Daily volume [m3]	Peak flow [l/s] (3 x avg flow)
2009	123	4.27
2010	234	8.13
2011	330	11.46
2012	348	12.09
2013	418	14.51
2014	487	16.93
2015	557	19.35
2016	627	21.77
2017	696	24.19
2018	766	26.61
2019	836	29.03
2020	905	31.45
2021	975	33.87
2022	1045	36.29
2023	1114	38.71
2024	1184	41.13
2025	1254	43.54

* Based on 200 l/day resident and 90 l/day *per capita* discharge figures - following recent discussions with Yorkshire Water (12/02/08) it is understood that reduced *per capita* discharge figures of 150 l/day for residents and 40 l/day for non-residents may be considered more appropriate for the Heslington East development.

4.4.5 Yorkshire Water's Waste Water Strategy – Final Report dated November 2006 assumes that the peak flow from the development will be 3-times the calculated average flow. This would be an appropriate 'peaking' factor for use in the design of the off-site foul sewers. However, the capacity of the existing University Pumping Station should be assessed using average flows provided that the flow balancing tank has sufficient capacity to deal with diurnal flow variations.

4.4.6 The January 2006 Infrastructure Services Design Guide by WYG predicted a peak foul flow of 60l/s for the completed campus. This compares with the peak flow of 45l/s given in the November 2006 Yorkshire Water report and the above 2025 figure of 43.54l/s. The WYG peak flow figure was based on a 4-times flow multiplier. and although the Strategy Report does not state how YW arrived at these figures they appear to have been based on the same 'average flow' figures used in the WYG Infrastructure Report.

4.4.7 A calculation prepared in 2005 by WYG headed "Occupancy Figures for Phase 1 Foul Flows" gives a peak flow figure of 18.8l/s @ 4x average flow based on a total 1st phase occupancy of 5000. This equates to 14.1l/s @ 3x avg flow (compared with 14l/s in the YW report). A site total occupancy of 9900 (residential and visiting) is given on the same calculation sheet: Students - 5400, Staff - 2000, Visitors, etc (including embedded research companies) - 2500.

4.5 Comparison with Existing Campus Flows

4.5.1 Applying *per capita* discharge figures (200l/day for residents and 90l/day for non-residents) to the existing campus[1] results in an average daily flow of 1509 m3 (17.47 l/s) based on 3000 students (resident), 7600 students (non-resident), and 2500 staff (non-resident). And again with a lower *per capita* discharge of 50 l/d (no canteen facilities) the average daily flow reduces to 1105m3/day (12.79 l/s). For comparison, the recorded annual foul discharge from the existing campus is 270,000m3 which equates to an average daily flow of only 740m3/day (8.56 l/s).

4.5.2 These figures would suggest either that the existing campus occupancy numbers are being over-estimated or that the 'standard' *per capita* discharge figures are not valid for the Heslington University Campus. Since this could have a significant effect on the assessment of foul sewerage infrastructure requirements for Heslington East, further analysis should be undertaken in conjunction with Yorkshire Water.

[1] These figures relate to the Heslington West campus north of Heslington Lane only, i.e. excluding Halifax College and Science Park.

4.5.3 Yorkshire Water has recently advised that lower *per capita* discharge figures of 150 l/day for residents and 40 l/day for non-residents may be used to assess off-site infrastructure requirements for Heslington East. This is based on YW's own experience of similar establishments.

4.6 Funding

4.6.1 A summary of previous discussions between the University and Yorkshire Water relating to the funding and future adoption of off-site sewerage infrastructure is provided in Appendix 4.

4.6.2 The University has since commissioned a detailed study by Yorkshire Water to develop and cost the outline options identified within the November 2006 YW Waste Water Strategy Report for Cluster 1 and later development. Following completion of the latest study, which is programmed for delivery in May of this year, agreements will be negotiated with a view to the provision of a transfer sewer and any associated sewerage infrastructure upgrading by October 2009. Off-site sewer works will be requisitioned under Section 98/101 of the Water Industry Act 1991.

5 Conclusions and Recommendations

5.1 Summary of Current Position and Actions Required

5.1.1 Consultations with Yorkshire Water have concluded that whilst the existing 'public' sewerage infrastructure in the Heslington area and at Naburn Treatment Works has limited spare capacity to accommodate further development, upgrading works can be undertaken to cater for foul water flows generated by the Heslington East Campus Development.

5.1.2 A University funded study currently being undertaken by Yorkshire Water is developing more detailed proposals for improvement and/or reconstruction of the existing University Pumping Station as well as for the provision of a new transfer sewer from the Heslington East Campus based on the foul sewage disposal options previously identified. This will lead to the requisition of off-site sewers and associated works under Section 98/101 of the Water Industry Act 1991.

5.1.3 The following activities are being taken to assist with the early conclusion of agreements between the University of York and Yorkshire Water:

1) Occupancy figures for the existing campus are being collated from existing records - flow monitoring (measuring flows leaving the site) may be undertaken to validate *per capita* daily discharge rates.

2) Water meter readings (and sub-meter readings if available) for the existing campus together with any available 'hours run' data from the existing foul pumping station will be used to correlate the supply / demand data with occupancy figures for the existing campus ideally differentiating between residents, staff, and visitors. Validated *per capita* daily discharge rates and peaking factors can then be used to derive peak flows for design purposes.

3) Dialogue with YW will continue in order to confirm capacity requirements for off-site infrastructure and associated funding - anticipated occupancy figures and phasing for Heslington East campus over 15 year development programme will also be confirmed.

4) Design criteria and specifications for Cluster 1 foul drainage will be established in conjunction with BDP/Arup including anticipated discharge rates and terminal pipework position and levels.

APPENDIX 1

Site Location Plan

FIGURE 3.1.2

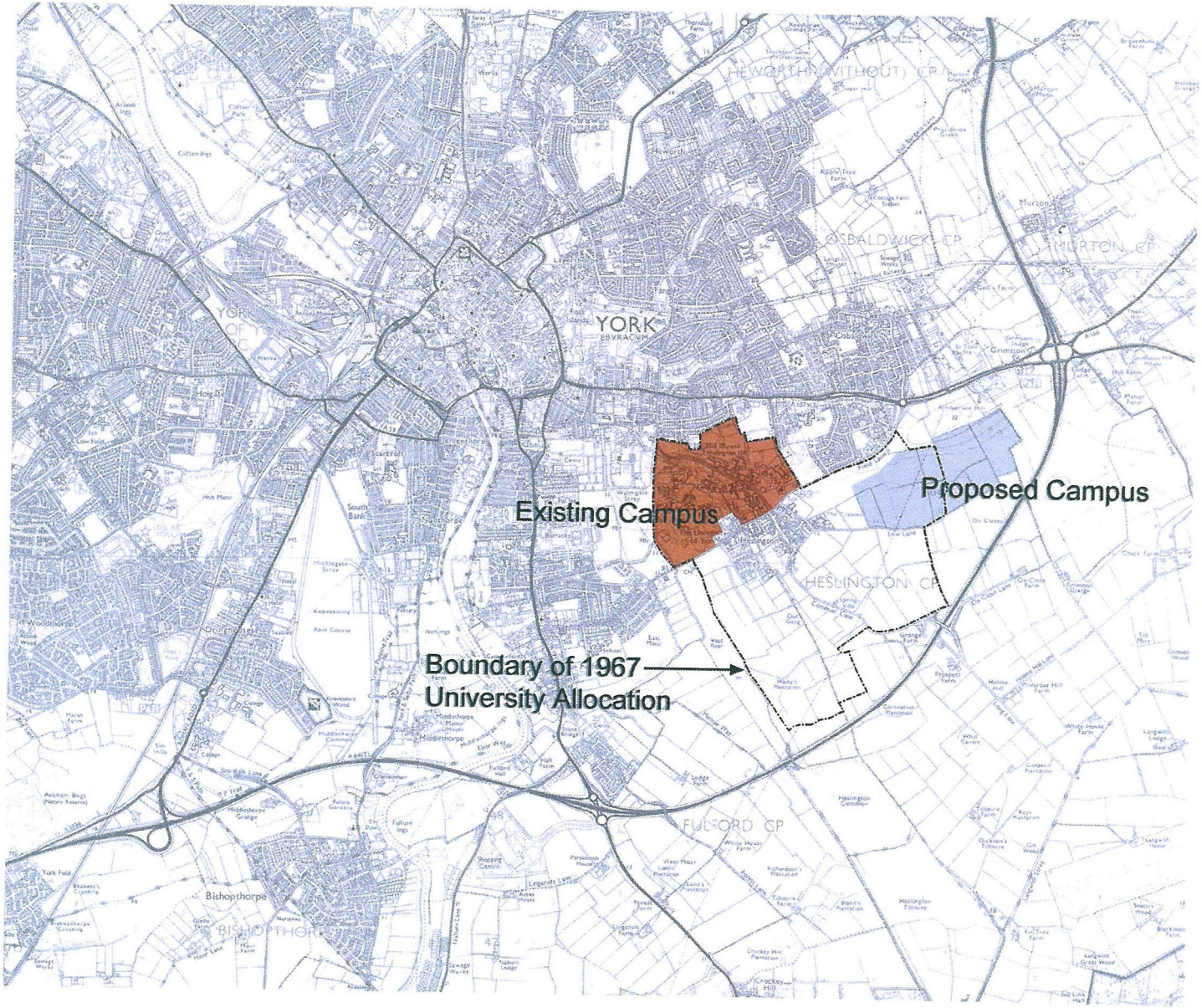
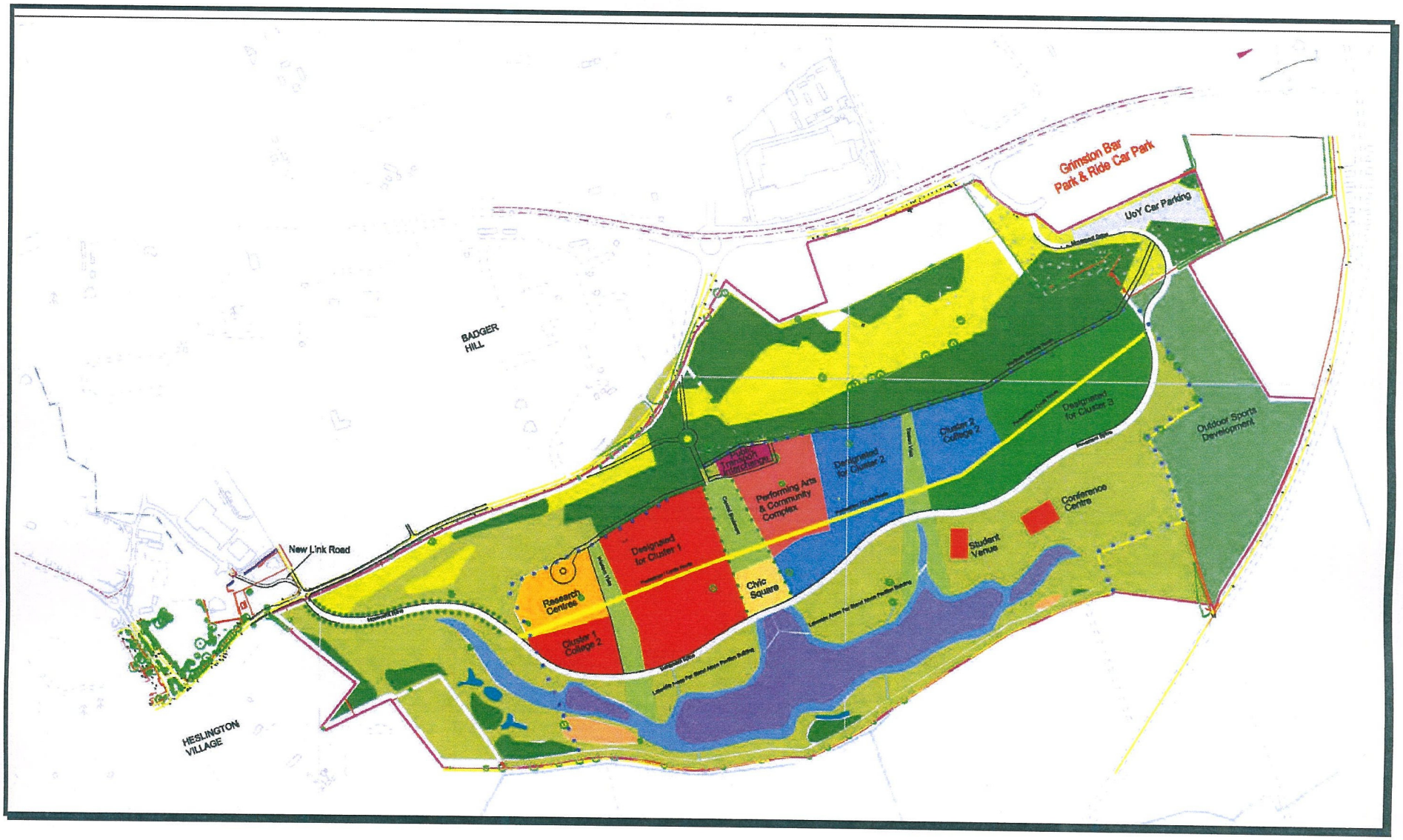


Figure 3.1.2 Location Plan

APPENDIX 2

Development Masterplan



Masterplan & Strategic Development Brief - Overall Master Plan (Sept 2007)

APPENDIX 3

Yorkshire Water's
Waste Water Strategy Report and Plans

[redacted]

YorkshireWater

YORKSHIRE WATER SERVICES

York University, Heslington

Waste Water Strategy

Order Number : 104709

FINAL REPORT

Contact:
Martin Cowley
Solution Engineer
Tel: [redacted]

Prepared by:
Nigel Lockwood
Tel [redacted]

References
Draft Report Issue Date: February 2006
Final Report Issue Date: November 2006

1.0 The Application

White Young Green, Consulting Engineers, acting on behalf of The University of York, have by letter dated 12th July 2005 to Yorkshire Water Service's New Development Planning Team, requested an assessment of the public sewerage system with a view to accepting flows from the expansion of The University of York in the Heslington East area.

Specifically the request focussed on the following requirements:

- An assessment of any spare capacity within the existing public sewerage system.
- The feasibility and cost of a foul sewer requisition for the disposal of effluent from the development site.
- An assessment of the existing York University pumping station (being part of the public sewerage system) and consideration of the utilisation of any spare capacity and/or increasing the station's capacity including storage.
- Consideration of the temporary routing of phase 1 of the development through the existing sewerage system.
- Consideration of a programme to reduce the current levels of infiltration in the public sewerage system to create spare capacity for the development.

2.0 Planning Considerations

Yorkshire Water Services (YWS) is not a statutory consultee for planning applications in respect of any formal application under the Town and Country Planning Act 1990 that is made to the Planning Authority. Therefore, YWS does not approve or reject planning applications which can only be done by the Planning Authority.

However, the disposal of waste water from any development is a "material consideration" for the Planning Authority and when YWS is consulted the New Development Team will seek to protect the public sewerage system and where necessary, maintain the status quo in terms of the overall flow in the public sewerage system by means of Planning Condition(s).

The Waste Water Planning requirements for the Heslington development are as follows:

1. There is insufficient capacity in the public sewerage system adjacent to the site and consequently any solution would involve a discharge direct to Naburn Waste Water Treatment Works.

2. Any such discharge that is direct to Naburn Waste Water Treatment Works may involve some improvements at the works and the costs of a feasibility study and the actual improvement works would be borne by the developer.

3.0 The Existing Waste Water Infrastructure

The majority and older area of Heslington is served by a gravity sewer system, the main sewer being in Heslington Lane, although the old Heslington Village to the south of Heslington Lane is low lying and consequently flows and pumped back up to Heslington Lane by the Heslington Main Sewage Pumping Station. This gravity system continues for some 3 kilometres to the New Fulford Sewage Pumping Station from which all flows are pumped a further 3.2 kilometres to the Naburn Waste Water Treatment Works at Bishopthorpe.

The more recent developments in the Heslington area, such as the University and housing to the south of the University are served by two pumping stations in series, Turners Croft Sewage Pumping Station and York University Sewage Pumping Station, the latter being a terminal pumping station which discharges direct to Naburn Waste Water Treatment Works via some 4.6 kilometres of rising main.

4.0 The Development Site and Demand Profile

The development by York University of some 40 hectares of greenfield land to the south of Heslington Lane and to the east of Heslington Village will include new teaching accommodation, student residential accommodation, sport and leisure/social facilities, a conference centre, high tech related employment and catering/retail areas.

It is proposed that the development will be in 4 phases commencing in 2007 with a 15 year development horizon.

The phasing for the foul sewerage discharges from the site is as follows:

	Daily Volume (cubic metres)	Peak Flow in litres/second (3 x average flow)	Indicative Development Period
Phase 1	405	14.0	2007 to 2010
Phase 2	350	12.0	2012 to 2015
Phase 3	520	18.0	2016 to 2020
Phase 4	30	1.0	2020 to 2022

Development sites of this magnitude pose particular challenges for the sewerage engineer. The site generally will require substantial infrastructure to cater for total peak discharge of 45 litres/second and the relative levels of the site will inevitably lead to a requirement for sewage pumping which could possibly be over long distances. The particular challenge is to provide new infrastructure that is capable of coping with both long term and short term flows without creating septicity problems and without the need to provide temporary works in the short term.

The topography of the development site is such that there is a natural fall of about 4.0 metres from east to west. Therefore in terms of the on-site infrastructure, a gradient for a main sewer of 1 in 400 could be achieved overall with a terminal pumping station at the western end of the site.

5.0 The Existing Sewerage System

A consultants report concerning the 3 sewage pumping stations in the Heslington area indicates that all the stations are full to capacity The report also considered the capacity of the existing rising main from the University Pumping Station and concluded that there was some spare capacity in this main which would involve increasing the velocity/working pressure in the main and hence the risk of failure.

The Sewerage Planners have indicated that there is no spare capacity in the gravity sewers in the Heslington area.

6.0 Naburn Waste Water Treatment Works

The Nabum WwTW currently meets its consent conditions and there is no provision in the current Asset Management Plan (AMP4) Period 2005-2010 to increase the capacity at the treatment works. However, if capacity is to be provided at the works to accommodate this development then it is likely that the consented flow for treatment would have to increase from 1238 litres/second to around 1300 litres/second and this would require a complete rebuild within the works of the transfer pumping station and some 500 metres of the transfer pipeline.

7.0 Options for Sewerage Infrastructure

7.1 Provide a new Pumping Station on the development site and upgrade or bypass existing infrastructure as appropriate.

This option would require (a) a "temporary" pumping station with storage for phase 1 only and some 1800 metres of 100mm diameter rising to the existing University Sewage Pumping Station, estimate £500k and (b) reconstruction of the University Pumping Station with variable velocity pumps and "intelligent" controls including storage, estimate £750k and (c) prior to the discharge of any substantial flows from phase 2, say 2014, a new larger pumping station with some additional storage over and above the "temporary" pumping station and larger rising main would be required for the site, estimate £1,200k.

Therefore, the minimum requirement for phase 1 would be £1,750k, assuming that both rising mains would be laid at the same time in a single trench. Septicity would still be a risk with this option through phases 1 to 3.

The total cost of this option is therefore, £2,450k. – the potential discount if this infrastructure is subject to a sewer requisition is £800k.

7.2 Provide a new Pumping Station for the University to the south east corner of the University Sports Ground, gravity sewers connecting to the development site and the existing campus and a new short length of rising main across the Golf Course connecting the existing rising main from the University.

This option would require (a) a new master pumping station with variable velocity pumps and "intelligent" controls including storage, estimate £750k and (b) some 1,000 metres of 300mm dia. gravity sewer to the development site, estimate £450k and (c) some 570 metres of gravity sewer connecting to the existing University campus and abandoning the existing pumping station, estimate £350k and (d) some 580 metres of 300mm dia. rising main, estimate £350k. However because the proposed pumping station would be dealing with existing flows from the outset there would be no increased risk of septicity.

The total cost of this option is therefore, £1,900k – the potential discount if this infrastructure is subject to a sewer requisition is £700k.

8.0 Improvements Naburn Waste Water Treatment Works

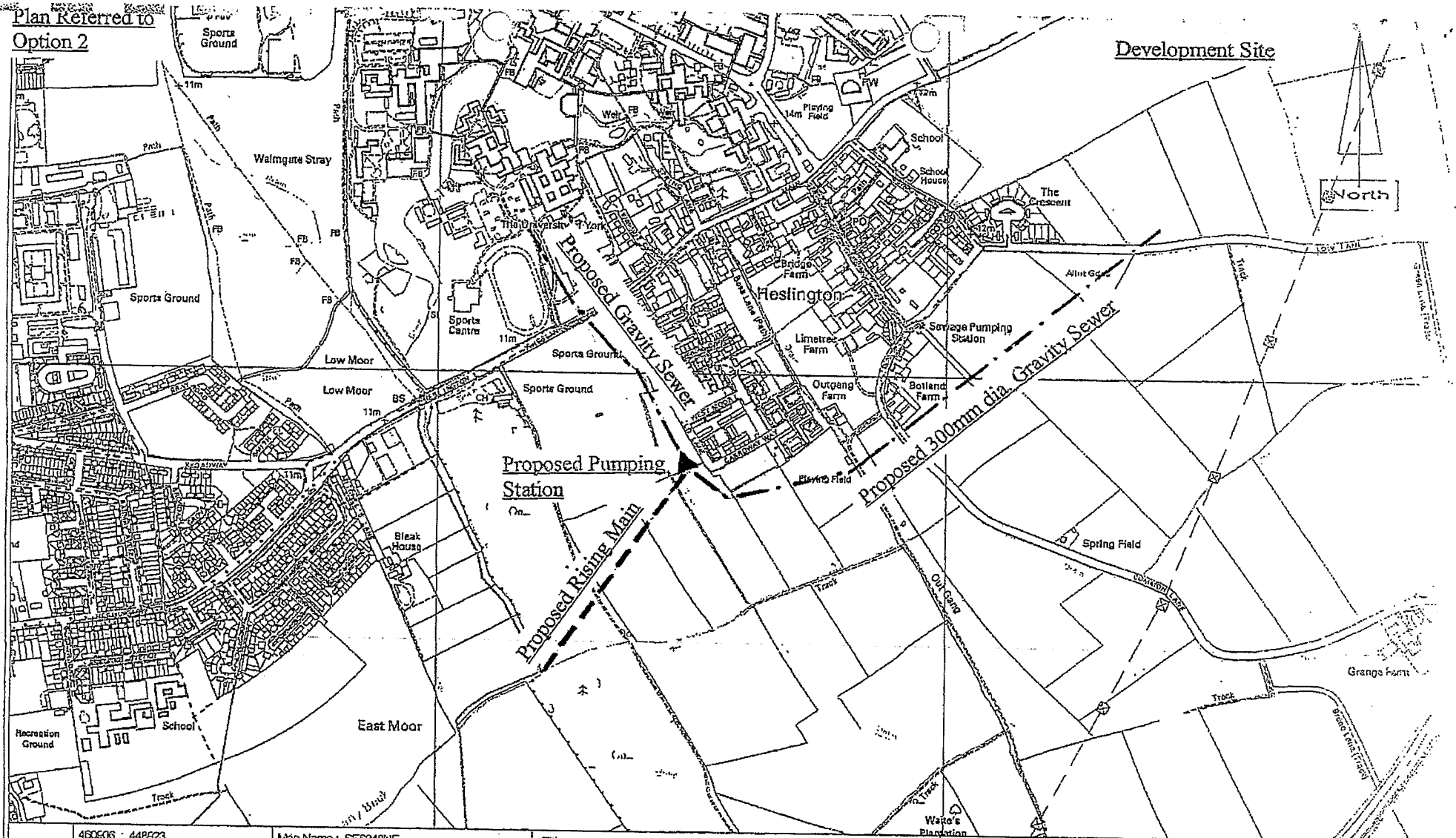
Provide transfer pumping station and some 500 metres of 900mm dia. ductile iron transfer pipeline, estimate £900k. It should be noted that improvements by way of increased capacity at Waste Water Treatment Works are not requisitionable under the Act and therefore costs will be 100% recoverable from the developer.

However, the timing of the development might well be such that a Planning Application will be submitted prior to January 2009, this being the date of the draft determination of the bid by YWS to OFWAT for the regulatory period 2010 to 2015 (AMP5). If that is the case, then the population forecasts for the development will be included in that bid for dealing with increased loads at Naburn WwTW and subject to that element of the bid being successful, no contribution would be required from the developer.

Appendices

1. Plan for Option 1
2. Plan for Option 2

Plan Referred to
Option 2



460606 : 448523

Map Name : SE64NE

Title

Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
Mr N Lockwood
Contact Tel : 01924 888068

Notes

Partial Key

Foul Sewer = F
Combined Sewer = C
Surface Water Sewer = SW
Trade Sewer = TD
Partially Separate = PS

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connection

Date Req : 31/10/2006, 15:07:05

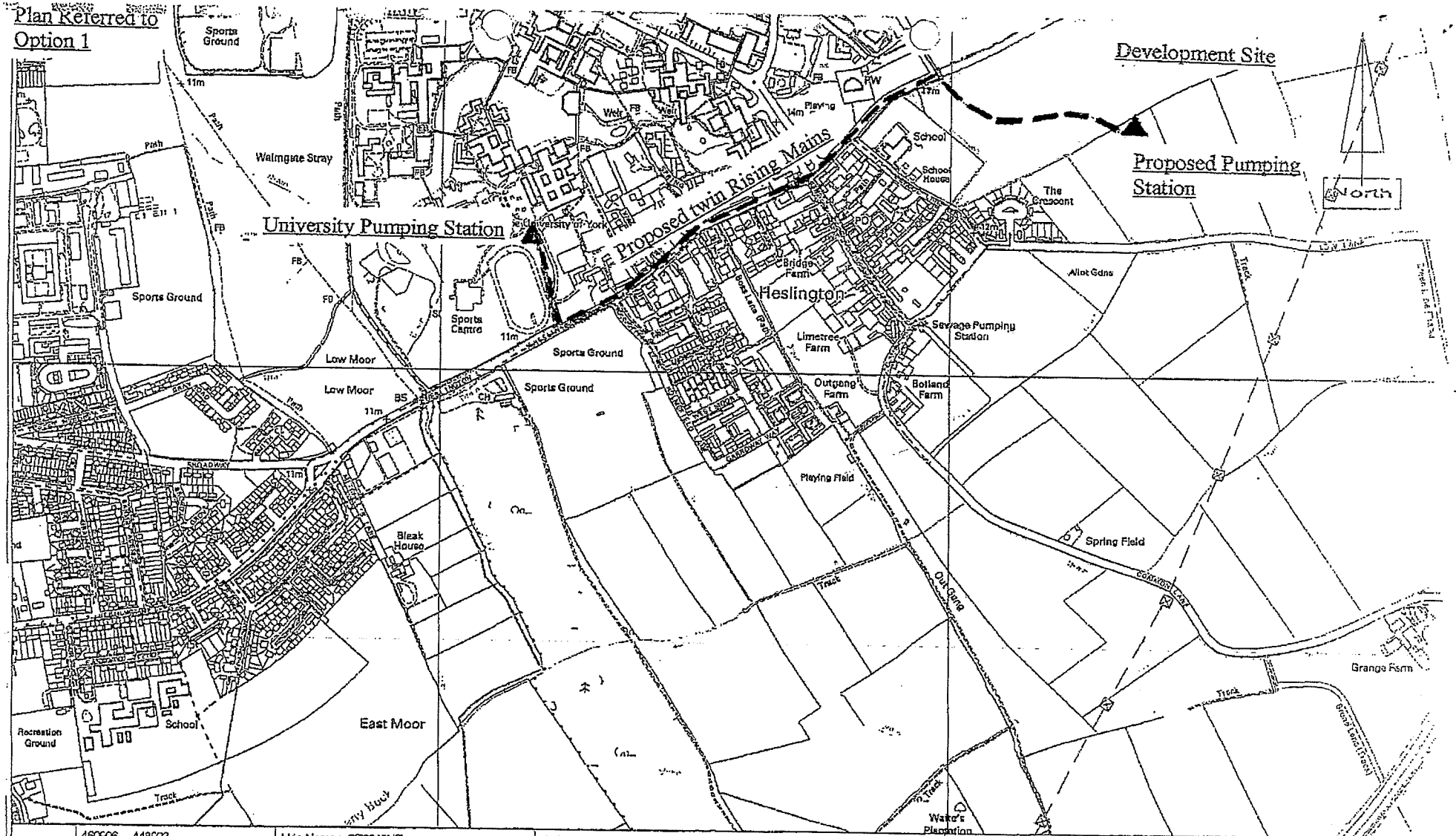
Date Gen : 31/10/2006, 15:07:17

Source : Sewer Network Enquiry

UPN: Undefined

Originator: N Lockwood, Waste Water - Asset Delivery, 01924 888068

Plan Referred to
Option 1



460906 448923	Map Name : SE6048NE	Title	Partial Key
YorkshireWater	Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : Mr N Lockwood Contact Tel : 01924 888068	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
		(Only) Based upon Ordnance Survey map data with the permission of the Controller of Her Majesty's Stationery Office, (c) Crown Copyright. Licence No. WU298561	Date Req : 31/10/2006, 15:07:06
			Source Sewer Network Enquiry

This plan is furnished as a general guide only and the accuracy as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connection

Date Gen. 31/10/2006, 15:07:17

UPN: Undefined Originator: N Lockwood, Waste Water - Asset Delivery, 01924 888068

APPENDIX 4 – FUNDING

The following text has been reproduced directly from a report produced by Corderoy Contract Services Limited for the University of York. It summarises the current position regarding discussions with Yorkshire Water relating to funding for the upgrading of the existing public sewerage infrastructure to accommodate the Heslington East Development.

1. *We have held meetings with YW in respect of sewer outflow in an attempt to further develop and understand the options put forward in their report of November 2006.*

2. *Also after some discussion WYG have stated they feel the projected capacity of 60l/s for the whole campus is correct although it should be noted the YW have carried out their report on the basis of 45l/s overall. YW have not been prepared to readdress this and rewrite their report at present so we have used the figures in the original report as the basis for our review. We also await information from the University detailing the current regular and peak flows from the existing campus as a check against the projected demand.*

3. *YW's report outlines Option 1 which is based on the provision of a pumping station on the new campus which pumps, via two rising mains, to the existing University Pumping Station. This is upgraded to provide capacity so that it can pump the new and existing outfall down the existing main to Naburn.*

4. *Option 2 provides for the abandonment of the existing University Pumping station and the construction of a new Pumping Station to the south east corner of the University Sports Ground. The current and new outfall would be served via gravity sewers and then the outfall from the new Pumping station would be pumped, via new and existing rising mains, to Naburn WWTW.*

5. *We have explored both options with YW and they have confirmed that the discount allowances included in the YW Report of November 2006 are based upon an incorrect assumption and as such the discount allowances made in the report could be significantly wrong. They have agreed to review these discounts but have not yet*

provided their response. The decision as to which is the best option is subject to this response as well as other factors.

6. *One factor which may affect the decision is the University's view as to the timing of funding. Clearly it could be preferable to spend as little as possible in the short term even if this would cost more in the long term. An example of this is Option 1. The overall cost are as detailed under the full option and, ignoring the possible discount, these are higher than Option 2. Also shown are the minimum Phase 1 costs. Whilst the figures produced by YW do not demonstrate this, it would clearly be more cost effective overall to carry out the new second main to the new campus at the same time as the first as it could be in the same trench thus saving on civils work. That being the case the University may not want to spend an additional £500,000 at that stage and may prefer to delay it until later in the programme. The minimum option is based on that assumption.*

	Full Option	*Phase 1 "Minimum" Option*
Temporary Pumping Station for Phase One and 1800m rising main to connect to existing University Pumping Station	*£500,000*	*£500,000*
Reconstruct University Pumping Station	*£750,000*	*£750,000*
Additional rising main from new campus to service further phases	*£500,000*	*excl*
Full size new Pumping Station to new Campus to service most of Phase two onwards	*£700,000*	*excl*
Total Cost	*£2,450,000*	*£1,250,000*

7. *On the other hand option 2 provides a broadly all or nothing approach as the major works needs to be completed at the start. The only element that is not expended at the start in full relates to the pump size in the Pumping Station which, over time and as capacity increases, will have to be increased in size. YW confirmed they have*

allowed for that in their costs but are unable to break them down to show what the allowance is. The costs are broken down as follows and there is no minimum option.

	Full Option
New Master Pumping Station	£750,000
Gravity sewer from new campus to P/S	£450,000
Gravity sewer from existing campus to P/S and abandon existing P/S	£350,000
Rising Main connection new P/S to existing Main	£350,000
Total Cost	£1,900,000

8. *The issue relating to the discount is further complicated as, depending on how the connection is requested, it may be that the discount doesn't apply. YW have confirmed that if the University does not have some separate billing from the new campus to YW for the outfall then YW would be unable to apply the discount as it does not apply to what they call "lateral" connections, that is where there is only one customer on the end. The University needs to ensure that it has separate billing from at least two different organizations within a phased connection to YW, even if they are both owned by the University but are separate legal entities. YW has confirmed that if this latter arrangement is the case then they will be able to offer the discount.*

9. *YW have confirmed that their timetable for provision of works would be as follows - Initial Estimate/Feasibility 2 months, Review 1 month, Discussion and agreement of Legal Agreement and YW scheme approval 2 months, YW and University signing of agreement 2 months, Lead in period 3 months, on site works 4 months. Overall 14 months from start to finish for whatever option is taken.*

10. *A further issue relates to the potential cost of reinforcement of the Naburn WWTW which, as detailed in the YW report, could be fully charged to the University but is currently not allowed in the estimates. We have discussed this with Stephanie Walden, who is in the Capital Development section of YW and is dealing with the next round*

of investment for Ofwat Approval. She has confirmed that if the University have outline planning permission then YW would include the projected demand in their proposals to Ofwat and would hope that, as part of the investment that they agree for 2010 to 2015, Ofwat would agree for YW to fund the investment required to upgrade the local sewerage treatment works to take the capacity from the University. That being said Ofwat will make this decision as such YW can offer no guarantees. Also YW cannot, at present, confirm when the work would be. YW should know, by 2009, whether the required works have been accepted by Ofwat.

11. *Thus before a decision can be made as to the best option to take forward further information is required as follows:-*

- *The revised discount figures need to be provided by YW.*
- *The University needs to confirm that it can arrange separate billing of the campus in such a way that will be acceptable to YW and thus allow for the discount to be taken.*
- *The University needs to decide (once the full cost differential is known) on its preferred investment strategy.*
- *As part of the ongoing discussions with YW the University needs to review the WWTW funding situation.*