Job No. 61264

October 2014

Ministry of Education
187 Flat Bush School Rd, Flat Bush
Site Infrastructure Study

WOODS

DOCUMENT CONTROL RECORD

Client	Ministry of Education
Project	Site Infrastructure Study
Document	Site Report

ISSUE AND REVISION RECORD

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1. BACKGROUND

This document is a site study into the infrastructure services for the site at 187 Flat Bush School Rd, Flat Bush, Auckland. The Ministry proposes to redevelop the site from a rural holding to a primary school and early childhood centre, with associated playing fields, carparks and school facilities.

At this time there is no concept plan for the site, however an existing primary school layout has been used until a final design is produced. This has been used for the purposes of carrying out calculations for stormwater, water and wastewater volumes. As this is a concept plan only, the infrastructure calculations appended in this report are subject to change dependent on the final school design.

The scope of work to be reported on is:

1. Site visit to the site.
2. Council reports on water, stormwater, and wastewater services, flooding for the site and an assessment of these services applicable to the combined sites.
3. As-Built drawings from Telecom, Chorus, Watercare, Vector Power and Vector Gas for the proposed site and an assessment of their capacity for the site.
4. Stormwater modelling.
5. Sanitary sewer loadings
6. Water demands

The identified site was visited to look at the location of the physical infrastructure and the site topography as well as impediments to building and earthworks. Public Infrastructure was checked against the Auckland Council GIS plans, downloaded from their website, and plans by the other infrastructure providers.

Preliminary stormwater modelling has been carried out for the subject site. The results of the modelling are in Section 4 of this report.

Sanitary sewer calculations have been carried out to determine the pre and post development flows for the development. There is an increase in post development flows from the proposed school site. The analysis has been used to determine the size of the line to be installed on the site to service the school and its associated facilities. Refer to Appendix C

Traffic management and geotechnical investigation is not part of this report and has been commented on by other consultants.

2. SITE DESCRIPTION

The site is located on the south side of Flat Bush School Rd, close to the intersection of Flat Bush School Rd and Murphys Rd, and comprises the following title;

- _____187 – Part Lot 2 DP48950, 48.346ha

It should be noted that this is not the total area to be designated. A plan, produced by Candor[3], attached in Appendix D, shows the proposed boundaries for the site and associated roading. The actual site area is 32510m^2 in gross and 30698m^2 nett.

Topography

The site is undulating from north to south and falls from the proposed side boundaries to a heavily vegetated stream. The site is in pasture with mature deciduous trees along the stream margins. There are existing houses and outbuildings on the site to the rear of the proposed school site. Access to the site is

through a gate and metalled access off Flat Bush School Rd. The fall across the site is approximately 5.0m from a contour of RL45 to a low point of RL40m and is from the rear to the front of the property. The existing topography appears to be generally unmodified.

The proposed school development will endeavour to follow the developed topography. There will be cut to provide the platforms for the school buildings. It is expected that where the building platforms are cut, the cut material will be used as fill on the site for forming building platforms and filling in the existing stream. A preliminary earthworks model has been provided by Candor[3] and shows the site filled to provide a contour from a high of RL46.5 to a low of RL41.0. The fall is across the site from the southwest to the northeast.

A preliminary scheme plan provided by Kay and Keys Architects, shows the school located in the south east corner of the site, generally falling outside the MANA profile line. A detailed earthworks model will be provided when a final design layout for the school is received from the Ministry of Education. This model will also provide the cut fill volumes and every endeavour will be made to provide a balance.

3. STORMWATER

There is no stormwater network servicing the site at present. Existing hydrology on site shows a stream passing through the site and another stream adjacent to the site. The stream passing through the site has been classified as "other streams that may be modified" as per the Flat Bush Catchment Management Implementation Plan (CMIP). To the east of the site, a fully protected stream flows north.

There is a proposal to lay a new stormwater line in the berm of Flat Bush School Rd and halfway down the eastern boundary of the site. This line will provide stormwater discharge from Flat Bush School Rd as well as from the school site. To date this line has not been sized for the proposed residential development or for the proposed school and there is at present no timeline as to when this line will be laid.

The stormwater approach is to follow Auckland Councils Stormwater Unit's current NDC requirements which is summarised as:

- The use of ponds for flood mitigation is no longer required,
- Stormwater treatment to be provided depending on whether proposed land use is considered a High Contaminant Generating Activity (HCGA) using Water Sensitive Design (WSD), and
- Stream health to be protected in terms of stream erosion.

A memorandum outlining the preliminary stormwater management plan with calculations is attached in Appendix A. The following stormwater management elements are proposed to be included for the school:

- Roof runoff will be captured via rain tanks for the purpose of re-using and attenuating peak flows
- Runoff from hardstand surfaces such as carparks will discharge to bioretention devices such as rain gardens or treatment swales.
- Permeable pavement to be used where possible, permeable paving seen as hydraulically neutral and therefore will not require additional mitigation

- All overflows and treatment swale discharge will be directed towards a dry basin which will provide detention for the 95th percentile event.
- Incorporate the use of other methods for stormwater reuse to achieve water sensitive design

This stormwater management plan ensures the following conditions are satisfied

- The location and sizing of the onsite stormwater detention/retention and/or connection to Auckland Council's public stormwater network;
- Management of the overland flow path;
- Management of any flooding hazards at the time of development.
- Incorporate the use of stormwater reuse to achieve water sensitive design

4 SANITARY SEWER

The existing site is not serviced by sanitary sewer at present. The plans provided by Candor[3] show a proposed sewer line along the Flat bush School Rd boundary, although there is no size on this at present. This system will eventually connect to a new 450Ø line on the north side of Flat Bush School Rd. Indications are that this line will be installed in late 2015. Given the direction of fall across the site, as discussed in *Topography*, we would expect that all sanitary sewer lines on the site would be able to gravity discharge to this proposed line.

We have used a figure of 200l/p/d to design the wastewater flows from the site, based on the reduced usage of a school. The school would not subject the proposed system to peak flows as the school hours fall outside the normal peak morning and evening hours for wastewater discharge. The proposed limit on the school role is 550 school children, 50 preschool children and approximately 20 staff. These figures have been given to us by the Ministry of Education. Initially the school may cater for a role of 200 children and gradually increase over a number of years to the full role, as the area develops.

A copy of the GIS showing this network is attached in Appendix D. We have calculated the post development flows from the site based on a developed school role as outlined above. We have used the factors in the WSL Code of Practice, in particular para 5.3.5.1 (a), (b) and Table 5.1. A copy of these calculations is contained in Appendix C.

There is a significant increase in wastewater flows from the school site as a result of the construction of the proposed school on the sites. The Peak Wet Weather Flow from the school site is 10.764l/s. Based on a 1% grade, k-1.50, velocity of 1.08m/s, a 150Ø uPVC pipe will adequately service the site as the actual pipe capacity is 22l/s.

Based on the above, we believe that the proposed infrastructure will be capable of carrying the increased capacity for this proposal.

5 WATER SUPPLY – FIRE FIGHTING

The subject site is not presently serviced by a reticulated water supply and at present Watercare have indicated that there is no plan to lay water service in this section of Flat Bush School Rd. A new 250NB PE main has been laid across Flat Bush School Rd, at the intersection of Murphys Rd. Refer to the plans in Appendix D. The line has been fitted with a sluice valve and blank cap, for future connection. This

means that for the school development, a new 250NB line would need to be laid from the existing termination point along Flat bush School Rd to the school site. This is approximately 250m in length. The line would also need to have branch tees installed, fire hydrants, sluice valves and blank caps to allow for future extension of the line to further developments to the east and south.

We have consulted with Candor[3], who have advised us that at this time the layout for the water reticulation is only at high level design and detailed design for the area is yet to be undertaken. Dependent on development in the area, it may be necessary to connect to the existing line, as noted above. We suggest that consultation with the designers should take place sooner rather than later to ensure that the design flows for the site are factored into the final design for the block development.

We would use a figure of 200l/p/d to design the water flows from the site based on the reduced usage of a school. This figure is very conservative as the usage would be predominantly for ablutions, drinking water for children and teachers and cleaning of the school after hours. The school would not subject the proposed system to peak flows, as the school hours fall outside the normal peak morning and evening hours for water use. The proposed limit on the school role is 550 school children, 50 preschool children and approximately 20 staff. The initial role is likely to be approximately 200 children and the school would grow as demand increases. These figures have been given to us by the Ministry of Education.

Dependent on the final building layout and the installation of hydrants in the berm, there may be a requirement for a 100mm stub main to be brought into the school site for firefighting use. This would entail hydrants being laid in the school grounds for brigade use.

We expect that the existing infrastructure will be adequate to service the school. This will be confirmed when we have a concept design for the school and can run an EPAnet model for the school layout complete with building water demands.

6 POWER AND GAS

There is no power provided to the site at present. High tension overhead power lines, 6.6/11kV and 400V, are located on the north side of Flat Bush School Rd at present. Two transformers are located to the west of Murphys Rd, on Flat Bush School Rd and provides power to the area. Refer to the attached plans in Appendix D

Dependent on the final load to the school a new 400V 3Ø supply cable may be taken from the existing overhead supply and reticulated to the school.

An initial indication from the provider is that there is sufficient capacity to service the site.

There is no gas service to Flat Bush School Rd at present, although there is a high pressure gas main in Murphys Rd to the west. We have contacted Vector Gas to enquire whether gas supply will be provided to Flat Bush School Rd. There are no plans at present for a gas service in Flat Bush School Rd, however the indication from Vector Gas is that as residential areas are developed, that gas service will follow. We expect that there would be adequate service if the school requires it. Alternatively the use of LPG bottled gas may be an option if reticulated supply cannot be accessed. Refer to the attached plans in Appendix D

7 TELECOMMUNICATIONS

As built plans reviewed, and a site visit, indicate that telecommunication is provided at the boundary of the site. A 50 pair cable is laid 3.3m from the front boundary, 600mm deep. Final allowance for telecommunications (and Ultra-Fast Broadband) will also be subject to the land uses resulting within the development. We anticipate a common service trench will be required to extend within the site to provide the necessary connections.

Initial indications from the providers are that there is sufficient capacity to service the site. There is no fibre service in the area at present, and no proposal for laying it, although this will be laid as the area surrounding the school is developed.

Vodafone have also supplied plans indicating that they have a fibre optic service running along the west side of Murphys Rd. there are no plans at present to bring this service into Flat Bush School Rd.

A copy of these plans is attached in Appendix D.

8 CONSTRUCTION MANANGEMENT PLAN

A construction management plan cannot be written for the sites at present, until there is a developed design for the school. The plan will provide the earthworks and erosion and sediment control methodologies for undertaking the work on the site. All works that would be undertaken would be in line with the general and special conditions laid down in the Resource Consent conditions. We will provide a CMP during the Resource Consent process.

9 CONCLUSION

The site is suitable for the intended use of a school. The services that are in place, or are going to be installed in the future, to support the site have adequate capacity for the intended purpose.

Stormwater
With respect to stormwater, when using the proposed stormwater management plan with parameters and assumptions detailed in the stormwater memo, the total outflows from the developed site are no greater than that of the pre development flows. Water quality is also improved through the use of stormwater management devices providing a positive benefit resulting from the site redevelopment.

Sanitary Sewer
The proposed sanitary sewer system will have sufficient capacity to cope with the increased flows for the proposed school and future residential developments surrounding the site. The school will discharge to a new sanitary sewer system that will be laid in the berm fronting the school site.

Water
There is water infrastructure laid in the berm at the intersection of Murphys Rd and Flat Bush School Rd. this line will need to be extended to the school site. It is expected that there will be sufficient capacity in the new system along Flat bush School Rd to service this development.

Utilities
Power and telecommunications services are laid along Flat Bush School Rd. New connections will be provided from these services to the school development. Old services, particularly power, which are no longer used and may be a hazard will be removed from the site, allowing a modern infrastructure to be installed.

Gas service is not laid at present, but may be provided at a future date. There is currently no plan for gas service in Flat Bush School Rd, although this may change as the sites surrounding the school site are developed. LPG is an alternative in the interim if no reticulated gas is provided.

Telecom service is already provided in the berm directly outside the school site and is available for use.

Memorandum

Date:	27/01/16	File:	61264
		Pages:	14 (including this page)
To:	Catherine Reaburn		
From:	Pranil Wadan;		
Re:	187 Flat Bush School Road Amended Stormwater Management Plan (Preliminary)		

Summary

This memo describes a preliminary stormwater management plan for the proposed Ministry of Education (MoE) school development at 187 Flat Bush School Road, Auckland. At the time of writing, the school layout is yet to be confirmed. The stormwater runoff calculations are therefore based on an existing primary school layout until the final design has been confirmed.

1. Stormwater Management Design Criteria

The stormwater management options presented in this memorandum have been presented according to the Stormwater Unit's current NDC requirements around water quality and flood mitigation in the Flat Bush area. This approach is summarised as follows:

- The use of ponds for flood mitigation is no longer required,
- Stormwater treatment to be provided depending on whether proposed land use is considered a High Contaminant Generating Activity (HCGA) using Water Sensitive Design (WSD), and
- Stream health to be protected in terms of stream erosion.

The stormwater management plan includes the use of inert roofing material, with retention to be provided at source (see Toolbox Options included within the memorandum) and dry basin providing attenuation of flow for the 95th percentile event only.

It should be noted that the runoff volumes calculated in this preliminary options memorandum are likely to change once the site layout has been finalised.

2. Stormwater Management Plan & Catchment Description

2.1 Existing Catchment

The existing site falls within the 'Flat Bush Residential 1' zone under the East Tamaki Catchment Management Plan. Access to the site is via a gravel drive off Flat Bush School Road. The land use is currently pasture with no impervious areas. The soil on site comprises pumiceous mud/sand and gravel. The topography falls from the south to the north towards a fully protected stream that passes close to the eastern property boundary. There is also a lowland ephemeral stream which passes through the site.

2.2 Proposed Changes to Catchment

The proposal is to develop a portion of the site into an early childhood centre and primary school with associated playing fields, carparks and school facilities. As a result the impervious cover on the developed portion of the site will significantly increase. This will change the catchment characteristic from a rural holding to an educational facility.

As a school layout is yet to be determined the following areas (based on a typical school layout) have been assumed to form the stormwater management plan

- Roof area of approximately 5000m^2
- Hardstand area of approximately 8300m^2
- Pervious area of approximately 19000m^2

2.3 Stormwater Management Plan

At present, there is no public stormwater network servicing the site. Following discussion with Auckland Council representatives, alternate measures for the management of stormwater runoff from the developed site have been considered. The stormwater management strategy on site involves discharging to the fully protected stream that passes near the eastern site boundary.

Low Impact Design (LID) elements have been considered in order to treat and attenuate runoff prior to discharging to the fully developed stream. The stormwater management options presented below are in accordance with the revised NDC requirements and discussions with representatives from the Auckland Council Stormwater Unit. These are as follow:

- First 5.5mm (after accounting for exfiltration and evapotranspiration) of runoff from impervious surfaces to satisfy the retention component. This includes the following:
    - First 5.5mm of roof runoff will be captured for reuse (roofing material will not be made from contaminant material), and
    - First 5.5 mm of runoff from roads and hardstand areas to be retained in retention raingardens. These devices will have shallow rooting plants so as to prevent the device from being too deep.

- Stormwater runoff for the hardstand areas for the whole site will be attenuated in a centralized dry basin for the 95th percentile event rainfall depth (30.5mm after accounting for losses due to exfiltration and evapotranspiration). All flows in excess of the 95th percentile detention volume will be released into the neighbouring stream.

It should be noted that the raintanks for the roofed areas can be sized for detention purposes as well as retention (via re use), however for the purpose of this memo, only the retention component has been accounted for on the assumption that detention will be undertaken in the dry basin. The full detention/retention component will be further explored during the detailed design stage.

Runoff from hardstand surfaces will be treated via the strategic placement of raingardens in car park areas. Runoff from remaining hardstand areas such as footpaths etc. will discharge to treatment swales designed for treatment and retention will be provided.

The stormwater management elements have been summarized as a schematic in shown in Figure 1.

The stormwater management plan is summarised in Figure 1.

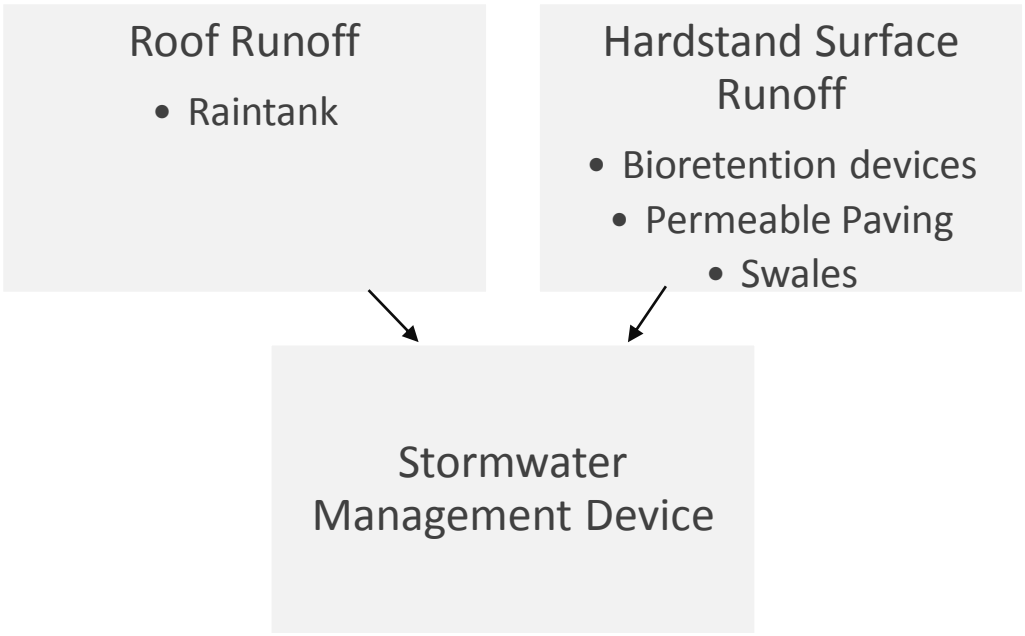


Figure 1: Stormwater Management Plan

3. Stormwater Modelling

Preliminary desktop calculations have been used to determine runoff for the pre and post development scenarios and for the preliminary sizing for the proposed stormwater management device.

Runoff volumes were determined in HEC-HMS, with the model set up as follows in Figure 2.

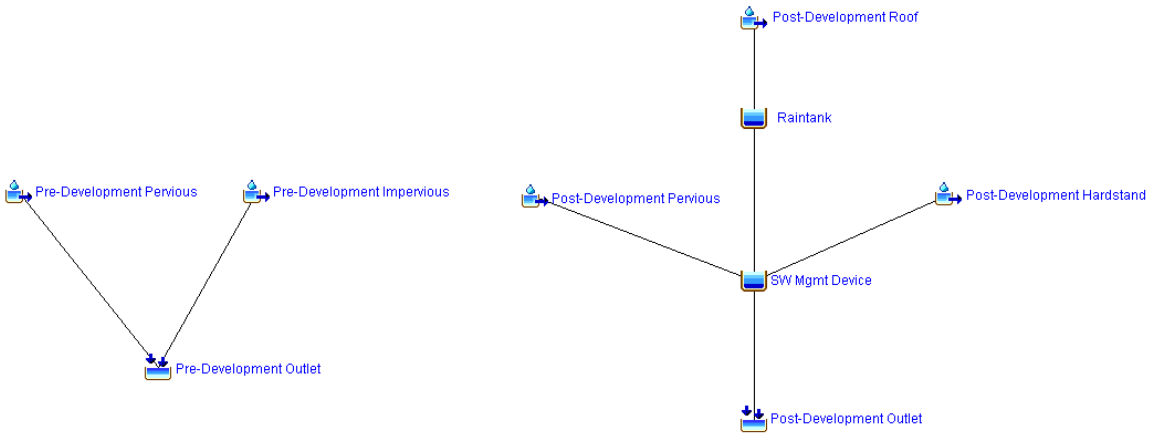


Figure 2: Stormwater Model Setup

The model includes a rain tank receiving roof runoff with an estimated volume of 30m^3. The rain tank will be placed in series with the stormwater management device (dry detention basin) and will serve the dual purpose of flow attenuation and water reuse.

In order to provide a conservative estimate of flows reaching the stormwater management device, the reuse and attenuation functions have not been included in the modelling. Instead, all flows in excess of 30m^3 drains to the stormwater management device.

The stormwater management device receiving runoff from the hardstand areas and rain tank overflows has been modelled as a reservoir in order to estimate the volume to be attenuated in the 95th percentile event.

The attenuation measures are in accordance with Auckland Regional Council's Technical Publications TP10 (2003), TP108 (1999) and were modelled accordingly in HEC HMS.

4.1 Parameters used in Stormwater Modelling

Rainfall: The 24 hour rainfall depth used to determine flows in the 95th Percentile storm event is 30.5mm, inclusive of the retention depth of 5.5mm. The rainfall profile follows the unit hydrograph as per TP108.

Catchment Areas: As discussed in Section 2.2, the areas used in the modelling are based on a typical school layout.

Catchment Parameters: The proposed school has been based on assumed areas for the roof, hardstand and landscaped areas. This allowed for a roof area of 5083m^2 and hardstand surface area of 8350m^2, taking the impervious cover of the site to 41%.

The underlying soil type is unknown and for the purposes of this report has been assumed to be soil type C, as classified in TP108. This will be confirmed during detailed design of the school.

Table 1: Existing and Proposed Layout Areas

	Roof Area (ha)	Hardstand Area (ha)	Pervious Area (ha)	Total Area (ha)
Existing	-	-	3.25	3.25
Proposed	0.5083	0.8350	1.9077	3.25

SCS Parameters: The runoff from this event was calculated using the SCS Hydrology Method as set out in TP108. A SCS Lag time of 6.67 minutes (minimum) was used. A curve number of 74 was used to mimic the existing ground conditions on site with an initial abstraction of 5mm. This curve number is based on Table 3.3 from TP108. This is to be refined upon a geotechnical investigation. A curve number of 98 was used for impervious cover.

Table 2: Catchment Characteristics

	Pre-Developed	Post-Developed
Total Area (ha)	3.25	3.25
Pervious Area (ha)	3.25	1.984
Impervious Area (ha)	0	1.266
Channelization Factor (C)	0.8	0.6
Catchment Length L (km)	0.16	0.16
Catchment Slope Sc (%)	2.3%	2.3%*

*Assumed. Slope to be confirmed at detailed design stage

Table 3: CN and Ia values used

Cover Description	**(CN)**
Impervious Cover	98
Pervious Group	74
Initial Abstraction	**Ia(mm)**
Impervious	0
Pervious	5

Table 4: Tc calculations

	Pre - Development	Post - Development
Runoff Factor = CN/(200-CN)	0.60	0.71
tc =0.14 C x $L^{0.66}$ x $[CN/(200-CN)]^{-0.55}$x$Sc^{-0.30}$ (hrs)	*0.166	*0.166
SCS L**ag for HEC-HMS "tp" =2/3 tc (mins**)	*6.66	*6.66

** Adopted time of concentration and SCS Lag based on minimum Tc of 10mins*

4.3 Summary of Modelling Results

The results from the HEC HMS model showed that the peak outflow from the developed site during the 95th percentile event of 0.0049m³/s is less than the maximum release flow of 0.009m³/s when using the proposed stormwater management plan with parameters and assumptions as detailed above. The results from the model are summarised in Table 6.

Table 5: Modelling Result Summary

ARI Storm Event	Total Pre Development Peak Flow Discharge (m3/s)	Total Post Development Peak Flow Discharge (m3/s)
95th Percentile Event	0.0161	0.0049

The post development flows in the model are routed via a stormwater management device which has been represented with a reservoir within HEC-HMS. Flows out of the device has been restricted using a low flow orifice of diameter 0.15m, at the invert of the device. This results in the peak runoff flow being released over 24 hours to ensure net flows leaving the site do not exceed the maximum release flow rate. The orifice structure is too optimised during detailed design stage and once a school layout has been confirmed, HEC Modelling shows that the dry basin does not completely drains over 24 hours and that further refinement of the basin and outlet structure is required.

The flow through the low flow orifice was modelled using the orifice equation:

$$Q = 0.62A\ (2gh)\ 0.5$$

The HEC model results confirms that a storage capacity of 300m³ is required for the 95th percentile storm event.

The stormwater management device will ideally be a dry basin, which will be located close to the fully protected stream within the school playing field. It should be noted that the raintanks for the roofed areas can be sized to incorporate detention, however for the purpose of this memo it assumed that all detention will be undertaken in the dry basin. The full detention/retention component will be further explored during the detailed design stage.

For detailed HEC HMS results please refer to Appendix A.

4. Recommendations

A preliminary desktop modelling exercise has been conducted to manage stormwater for the proposed school development at 187 Flat Bush School Road. This was carried out based on assumptions made regarding the layout of the site. The following stormwater management elements are proposed to be included for the school:

1. Roof runoff will be captured via rain tanks for the purpose of re-using and attenuating peak flows
2. Runoff from hardstand surfaces such as carparks will discharge to bioretention devices such as rain gardens or treatment swales.
3. Permeable pavement to be used where possible, permeable paving seen as hydraulically neutral and therefore will not require additional mitigation
4. All overflows and treatment swale discharge will be directed towards a dry basin which will provide detention for the 95th percentile event.
5. Incorporate the use of other methods for stormwater reuse to achieve water sensitive design

It is recommended to finalise the site layout and areas before sizing for stormwater management devices.

5. Conclusions

It is concluded that stormwater as a result of development of a school on this site can be managed in accordance with Auckland Council's current requirements for the management of stormwater within the Flat Bush catchment.

It is proposed that a complete and final stormwater management plan will be provided at the Establishment outline Plan of Works stage in which the following conditions will be satisfied:

- Incorporate the use of stormwater reuse to achieve water sensitive design
- The location and sizing of the onsite stormwater detention/retention and/or connection to Auckland Council's public stormwater network;
- Management of the overland flow path;
- Management of any flooding hazards at the time of development.

6. References

Design Guideline Manual for Stormwater Treatment Devices – Technical Publication 10 (2003). Auckland Regional Council.

Guidelines for Stormwater Runoff Modelling in the Auckland Region – Technical Publication 108 (1999). Auckland Regional Council.

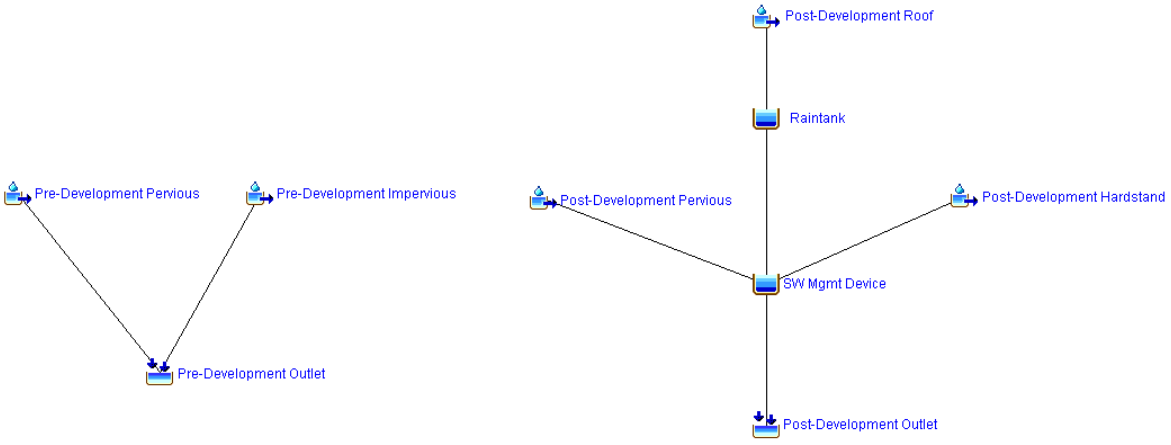
Auckland Unitary Plan stormwater management provisions: technical basis of contaminant and volume management requirements – Technical Report 2013/035 (2013). Auckland Council.

Flatbush Catchment Management Implementation Plan (Version 6) – Technical Report (2004). Beca.

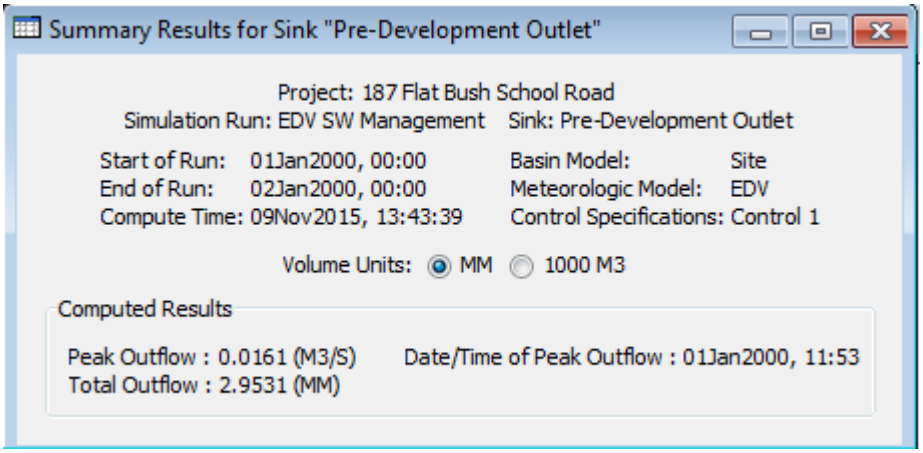
East Tamaki Comprehensive Catchment Management Plan – Technical Report (2001). Beca Carter Hollings and Ferner.

Memorandum

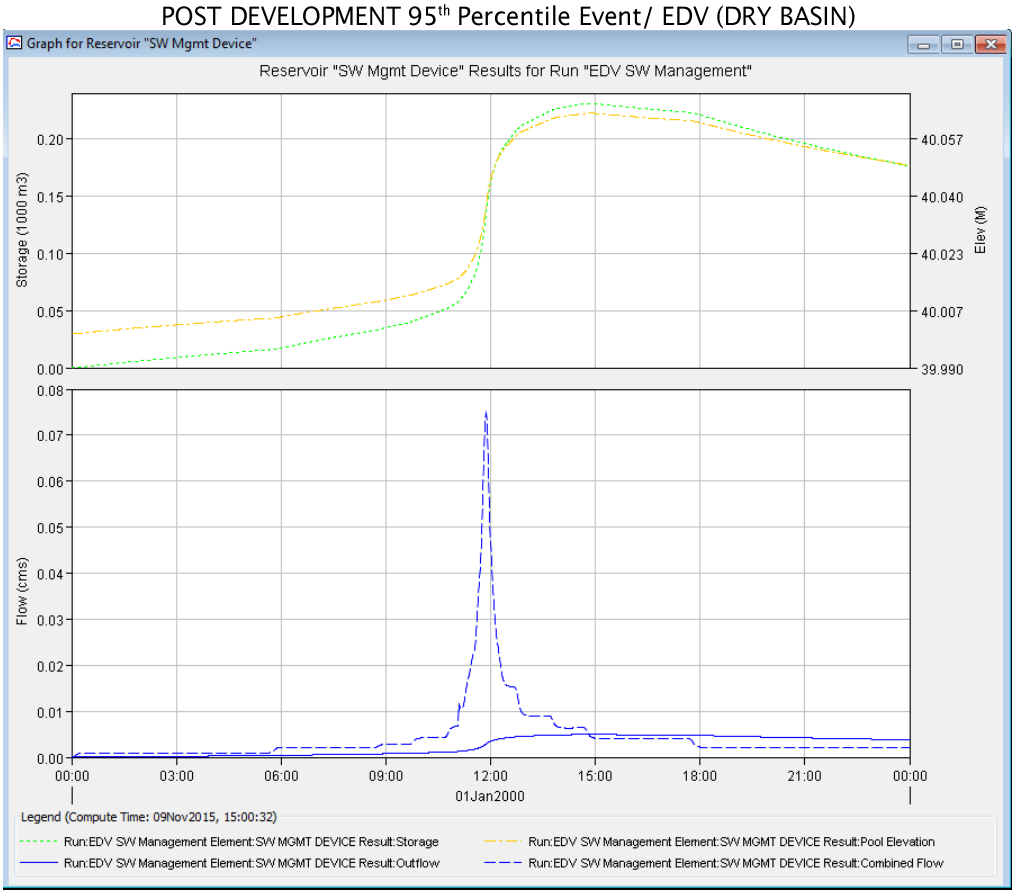
APPENDIX A
HEC-HMS MODEL RESULTS

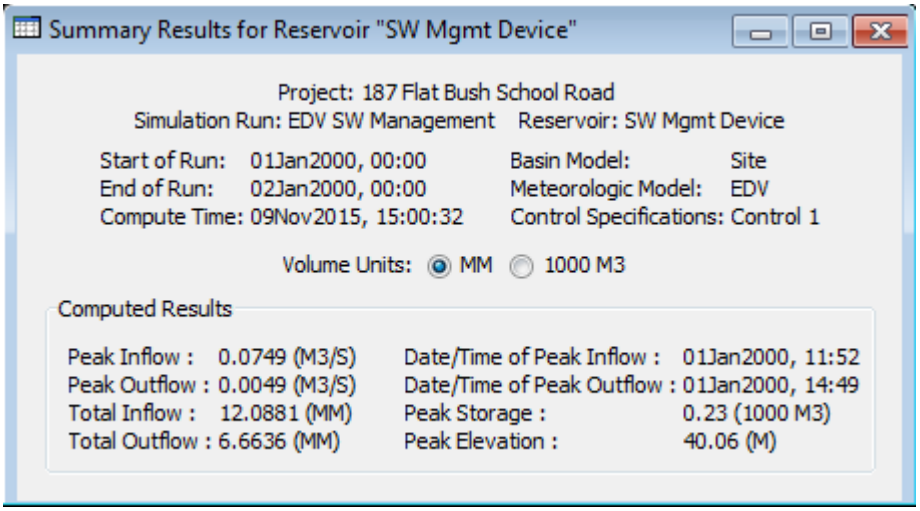


PRE DEVELOPMENT 95th Percentile / EDV



POST DEVELOPMENT 95th Percentile Event/ EDV (DRY BASIN)





Memorandum

GLOBAL SUMMARY

Global Summary Results for Run "EDV SW Management"

Project: 187 Flat Bush School Road Simulation Run: EDV SW Management

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 09Nov2015, 15:05:49

Basin Model: Site
Meteorologic Model: EDV
Control Specifications: Control 1

Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Hydrologic

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Pre-Development Pervious	0.030880	0.0078	01Jan2000, 11:53	1.5296
Pre-Development Impervious	0.001600	0.0084	01Jan2000, 11:52	30.4275
Pre-Development Outlet	0.032480	0.0161	01Jan2000, 11:53	2.9531
Post-Development Pervious	0.019077	0.0048	01Jan2000, 11:53	1.5296
Post-Development Hardstand	0.008350	0.0436	01Jan2000, 11:52	30.4275
Post-Development Roof	0.005083	0.0266	01Jan2000, 11:52	30.4275
Raintank	0.005083	0.0265	01Jan2000, 11:52	21.5884
SW Mgmt Device	0.032510	0.0049	01Jan2000, 14:49	6.6636
Post-Development Outlet	0.032510	0.0049	01Jan2000, 14:49	6.6636

10 APPENDIX A – STORMWATER CALCULATIONS

11 APPENDIX B –PRELIMINARY PLANS

FLAT BUSH SCHOOL ROAD

PDP SSMH 14

PDP SSMH 15

SCHOOL SITE
~3.06ha

KEY

EXISTING CONTOURS

DESIGN CONTOURS

SPORTS FIELDS

PRELIMINARY

FOR DISCUSSION ONLY

REV	DESCRIPTION	APPR'D	DATE

Candor3
ENGINEERING FOR LIFE

PROJECT

187 FLAT BUSH SCHOOL ROAD
FINAL CONTOURS PLAN

CLIENT

AUCKLAND COUNCIL

DESIGN SK	SCALE	DATE ISSUED	
DRAWN SK	1:1200 @ A3	24/09/2014	
CHECK			
APPV'D			
PROJECT NO.	DRAWING NO.	REVISION	
9202	EW102	-	

25.09.2014 J:\PRICING\9202 COUNCIL - OSTRICH FARM\12D SK\DRAWING\FLAT BUSH CATCHMENT.DWG

12 APPENDIX C – WASTEWATER CALCULATIONS

WOODS

Project:	Description	Page	File 61264
MoE Flat Bush School Rd.	SANITARY SEWER	1	Date Oct 2014
		Of 2	Computed JNO.
			Checked

Existing site is rural land with no reticulation. Wastewater for the existing house is disposed of through septic tank.

Proposed development does show new sanitary sewer lines, along front & rear boundaries, however no sizes are shown at present.

Pre Development.

0.00 l/s.

Post Development.

Non residential development, for the school site 187 Flat Bush School Rd.

Use wastewater flow of 200 l/p/d, school population of 550, 50 preschool & 20 staff

$$DWP = \frac{200 \times 620}{24 \times 60 \times 60}$$

$$= 1.435 \text{ l/s}$$

$$DWPF = 1.435 \times 3$$
$$= 4.306 \text{ l/s}$$

$$PWWF = \frac{620 \times 1500}{24 \times 60 \times 60}$$

$$= 10.764 \text{ l/s.}$$

Check 150ϕ line K = 1.5 @ 1% grade.

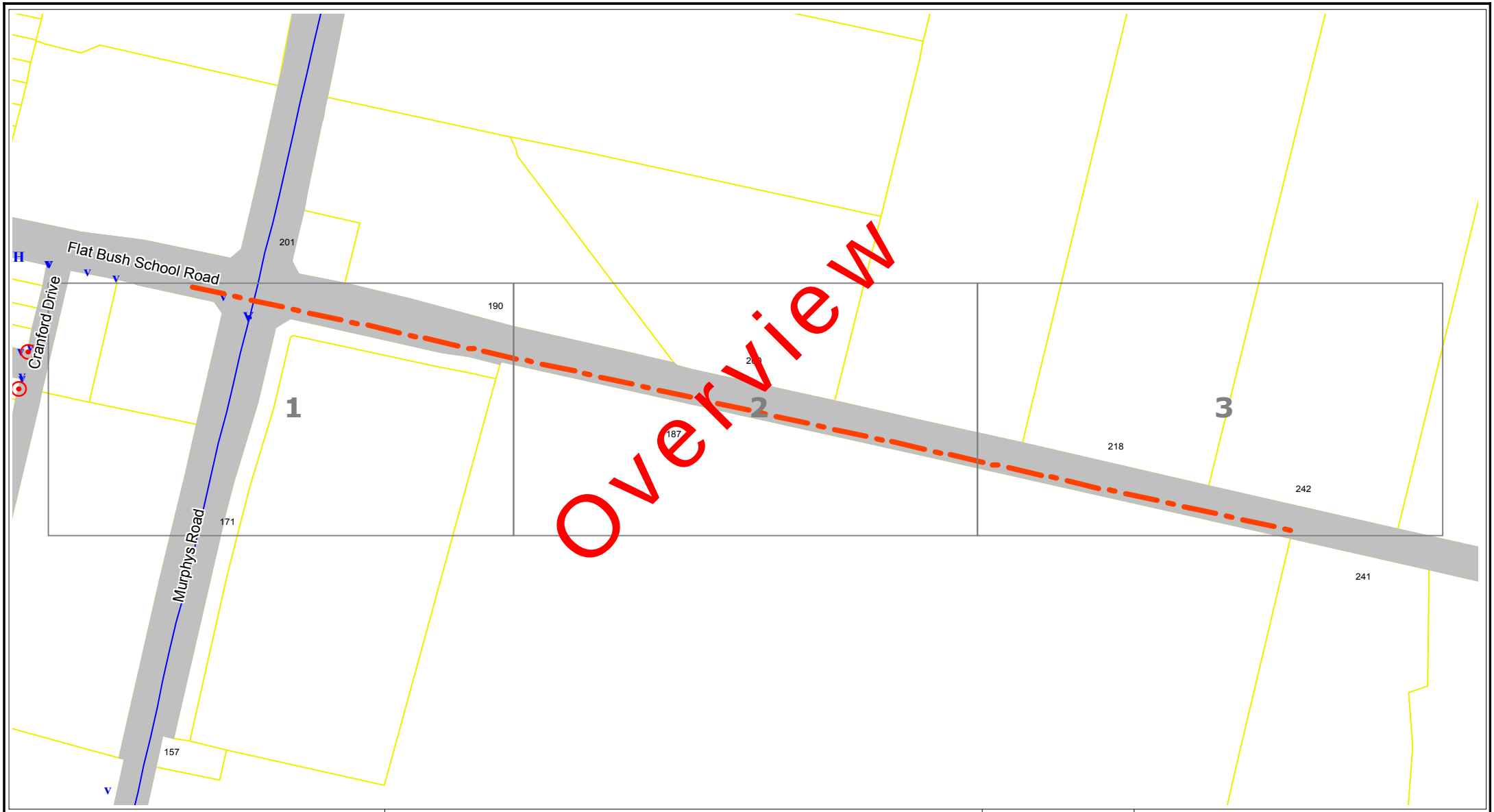
= 22 l/s @ 1.08 m/s velocity.

OK

WOODS
Consulting Engineers
Registered Professional Surveyors
Resource Planners

PO Box 6752, Wellesley Street, Auckland 1141
Email: reception@woods.co.nz
WWW.WOODS.CO.NZ

13 APPENDIX D – UTILITY PLANS



waterCare services limited

Sequence Number: 3443505

Address:187 Flat Bush School Road, Tuscany Estates, Not Supplied, 2016

- Waste Water
- Water
- Electrical/Cathodic Protection
- Waste Water Proposed
- Water Proposed

- V Valve
- H Hydrant
- M Water Meter
- Manhole

Scale: 1:1000

N

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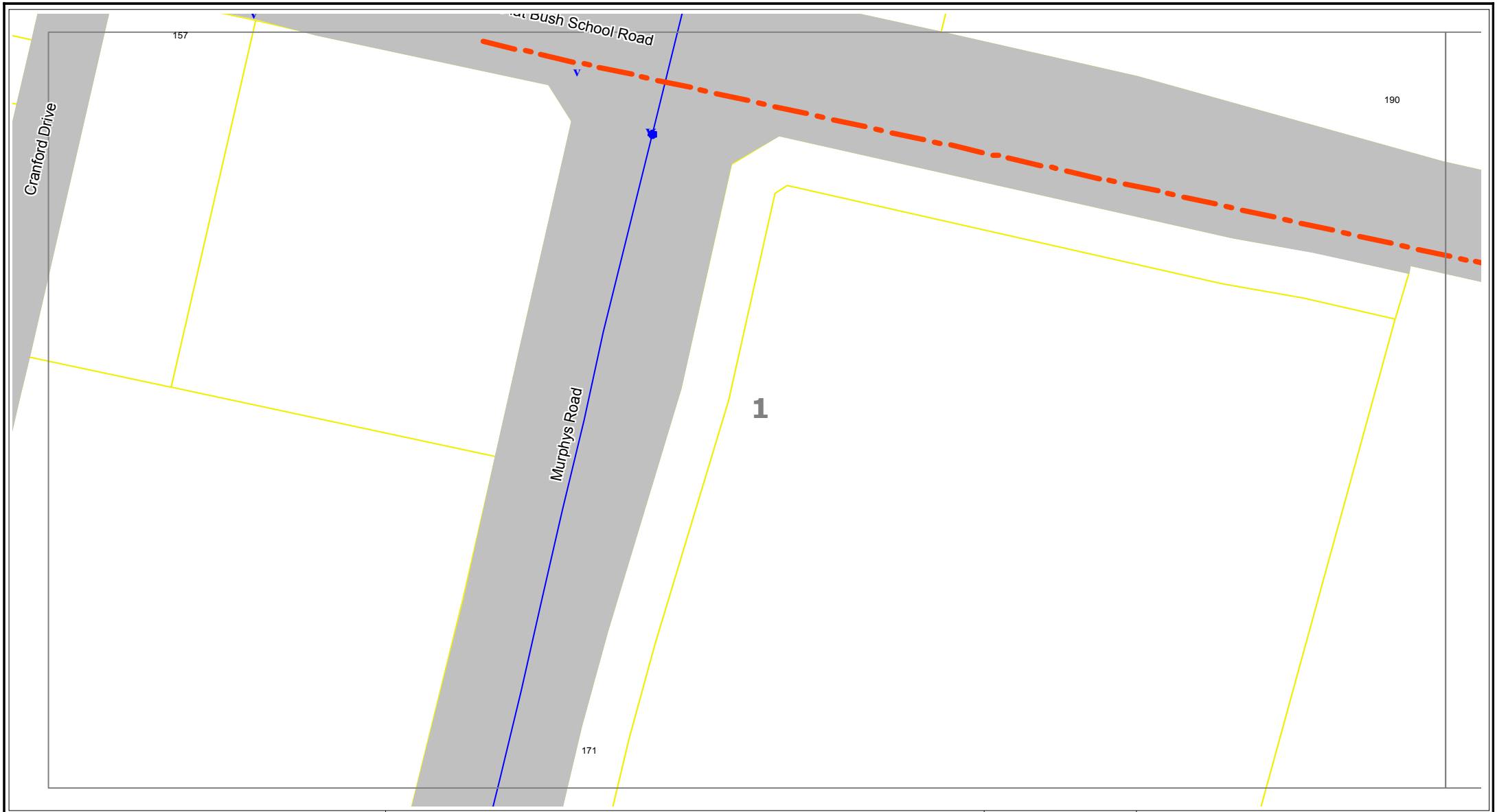
OVERVIEW NOT TO SCALE.



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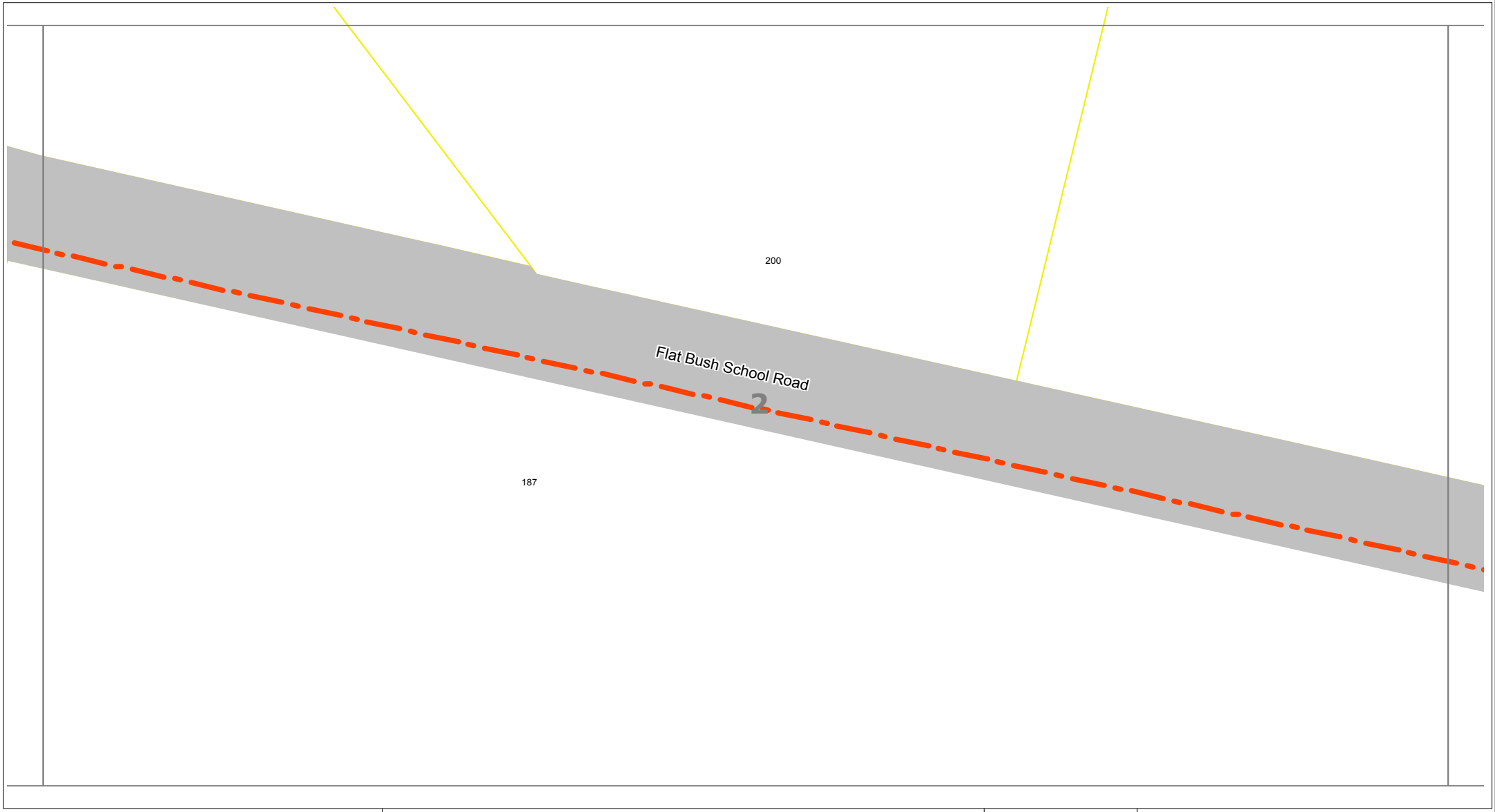

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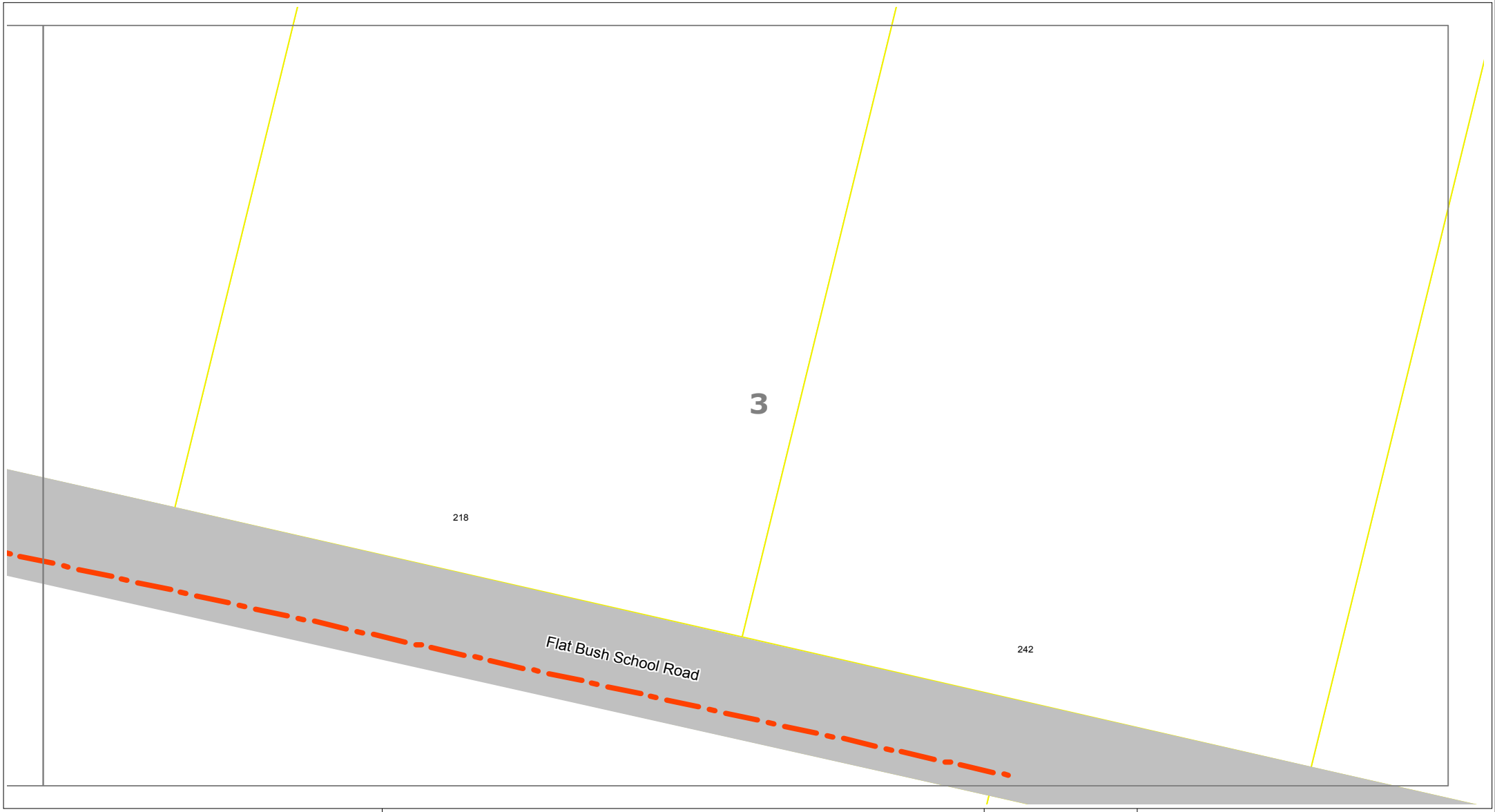

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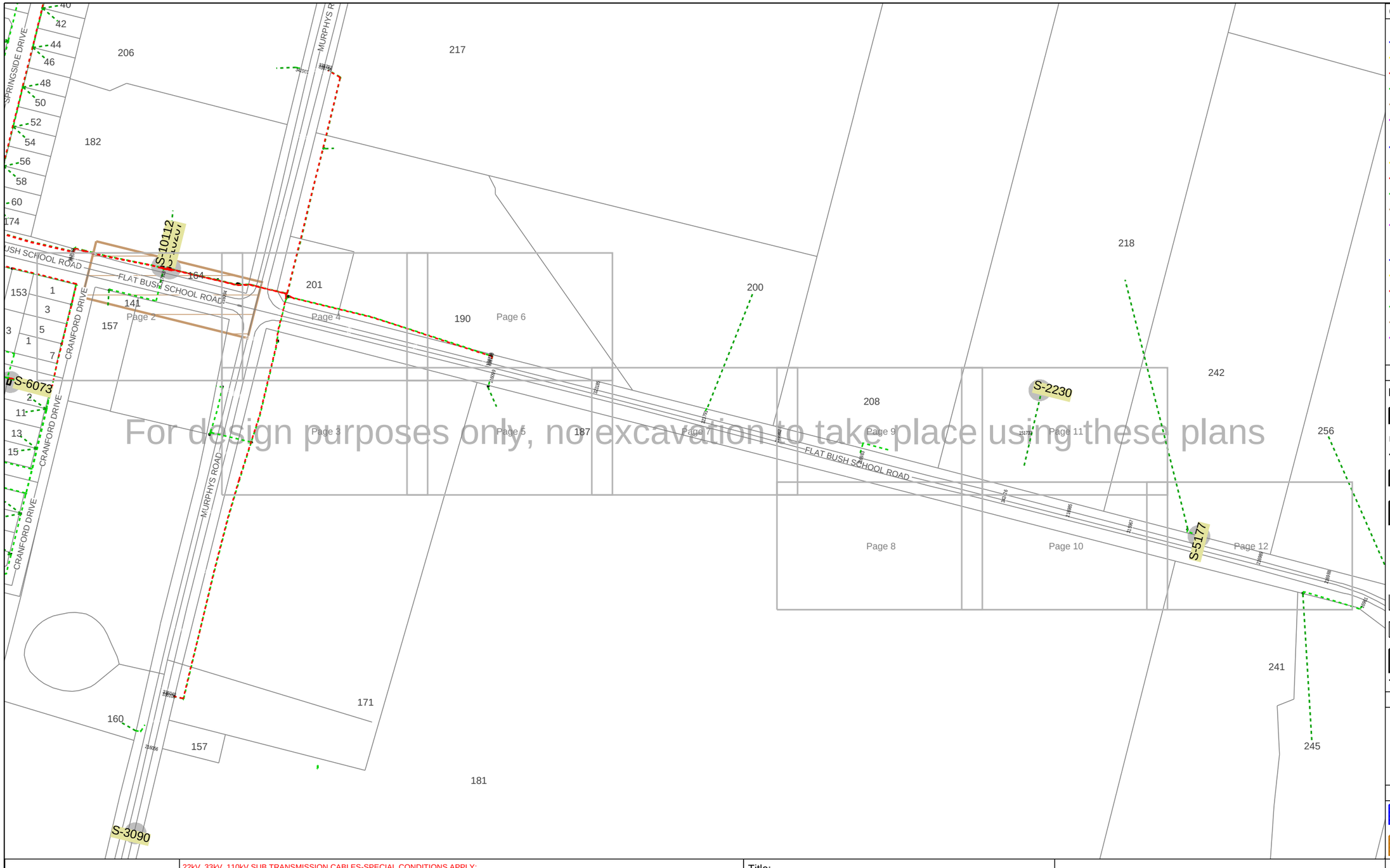

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CABLE COLOUR CODE

CABLES IN USE
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic

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JOINTS & SEALING ENDS
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic
- NOT IN USE

SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT
- IN PROGRESS
- ON HOLD
- PLANNED

Vector

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Title:

Request Title:

Company Name:	
Usage:	Request ID: 3443506
Request for:	No associated viewport
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 1 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

N W No associated viewport E S

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- 22,000 volt
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- 400 volt
- Streetlight
- Pilot / Fibre Optic
- NOT IN USE

SYMBOL LEGEND

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- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT
- IN PROGRESS
- ON HOLD
- PLANNED

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Title:	
Request Title:	
Company Name:	
Usage:	Request ID: 3443506
Request for:	Scale: 1:400
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 2 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

N W E S

208

FLAT BUSH SCHOOL ROAD

Warning! Live service within this property.

Warning! Indication only additional data is required

Transmission Pipeline (ex - NGC)
Please contact Vector - New Plymouth on 0800 734 567 for On-Site Location and Work Permits. A minimum of 48 hours notice is required.

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WARNING! Special conditions apply for high pressure gas pipelines (HP Pipe, IP20, IP10, MP7)

A permit/consent is required for any excavation within 2 metres of this pipeline. A MINIMUM of 3 working days notice is required when applying for a permit/consent. Refer to attached covering letter for additional information.

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Title:

Request Title:

Company Name:

Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 7 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES
- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT
- In Progress
- On Hold
- Planned

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- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

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WORK MANAGEMENT

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DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT

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A3 ELECTRICITY OBSTRUCTION PLAN

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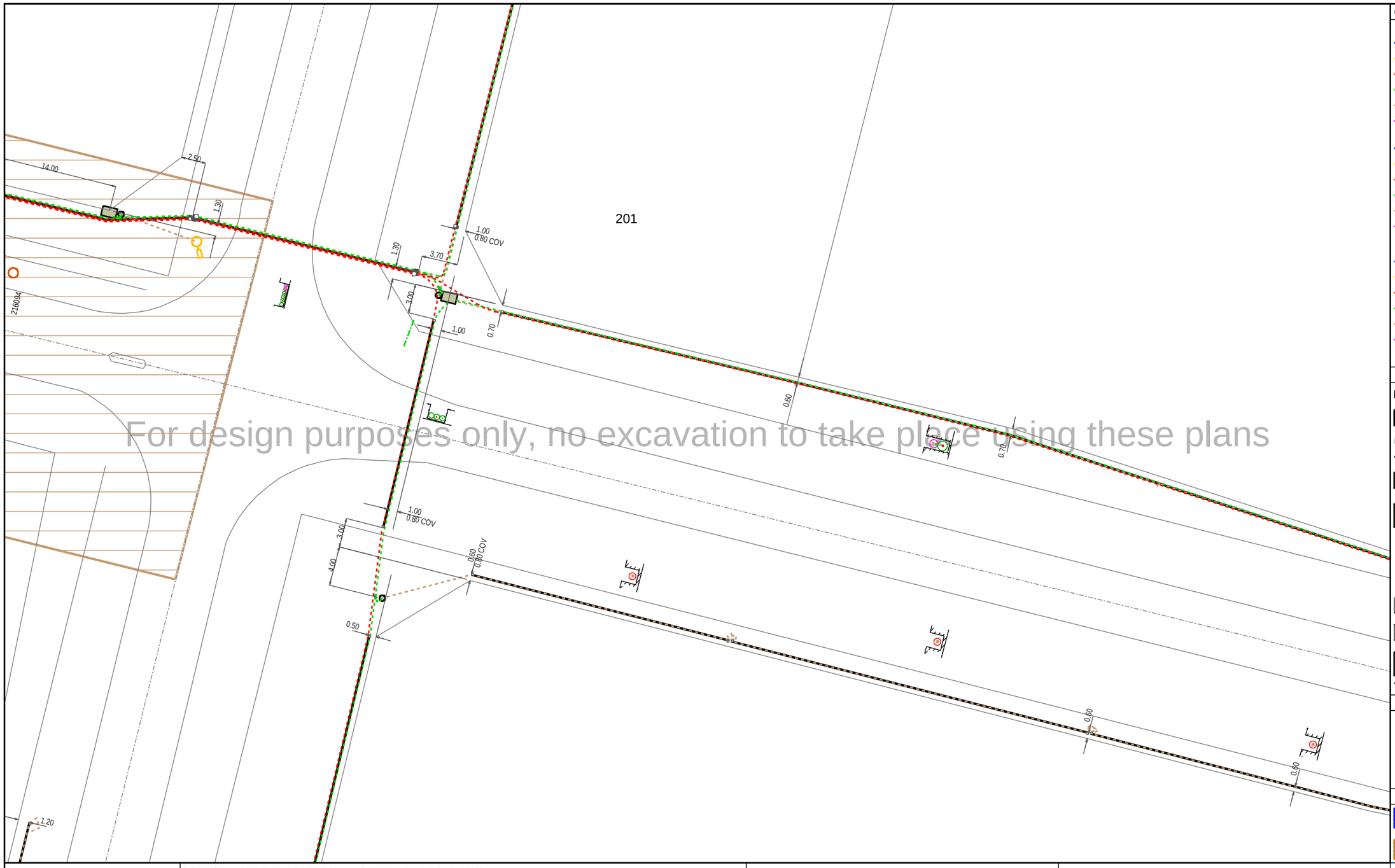

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SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
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- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT
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- ON HOLD
- PLANNED

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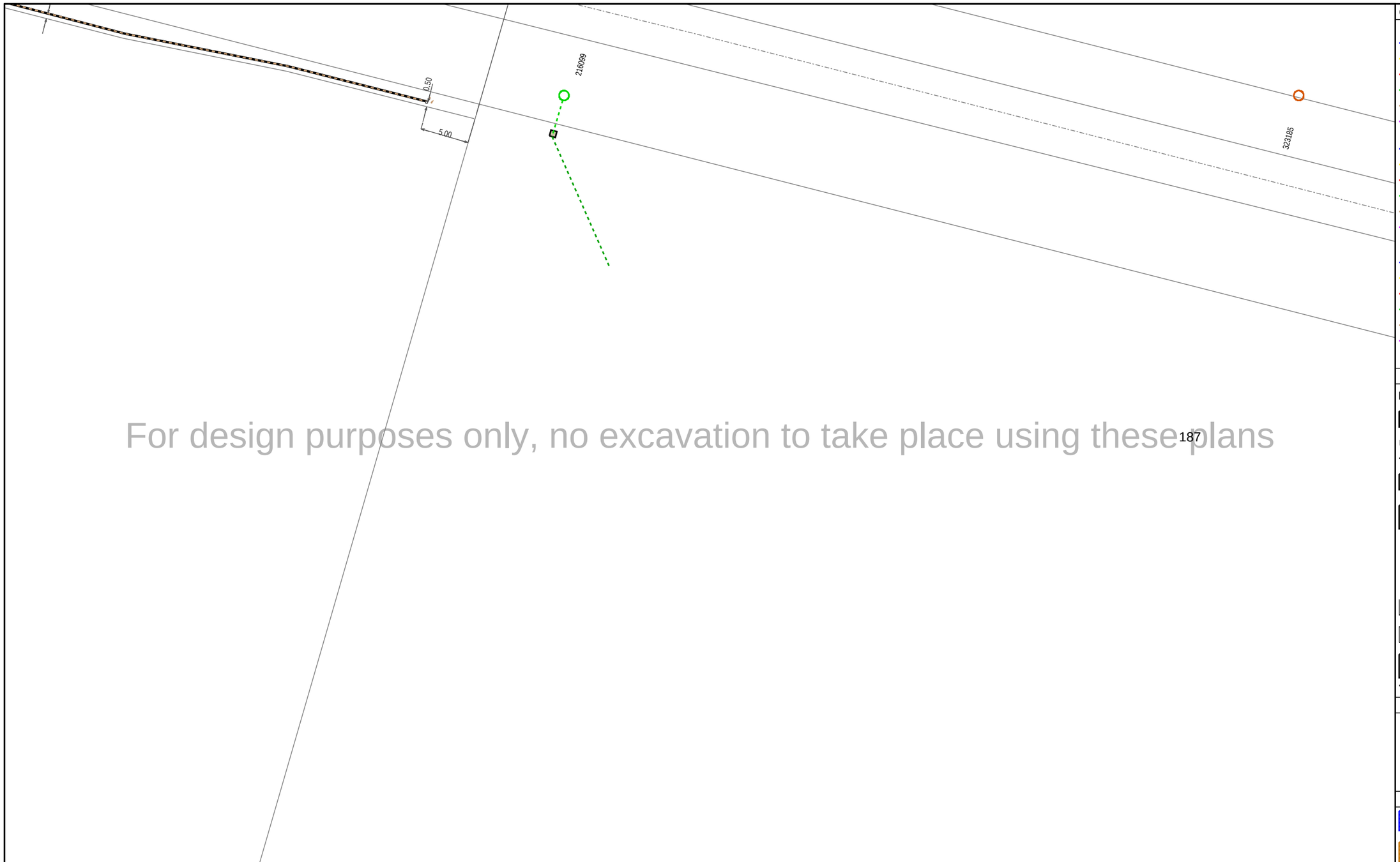
Request Title:	
Company Name:	
Usage:	Request ID: 3443506
Request for:	Scale: 1:400
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 4 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

N
W E
S



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DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT

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- ON HOLD
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Title:	
Request Title:	
Company Name:	
Usage:	Request ID: 3443506
Request for:	Scale: 1:400
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 5 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

N W E S

For design purposes only, no excavation to take place using these plans

CABLE COLOUR CODE

CABLES IN USE
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic

CABLES NOT IN USE
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic

JOINTS & SEALING ENDS
- 110,000 - 22,000 volt subtransmission
- 22,000 volt
- 11,000 - 6,600 volt
- 400 volt
- Streetlight
- Pilot / Fibre Optic
- NOT IN USE

SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150

200 250 300

WORK MANAGEMENT

- IN PROGRESS
- ON HOLD
- PLANNED

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22kV, 33kV, 110kV SUB TRANSMISSION CABLES-SPECIAL CONDITIONS APPLY:

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Phone:	Date printed: 8. October 2014
Client Reference:	Page: 6 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

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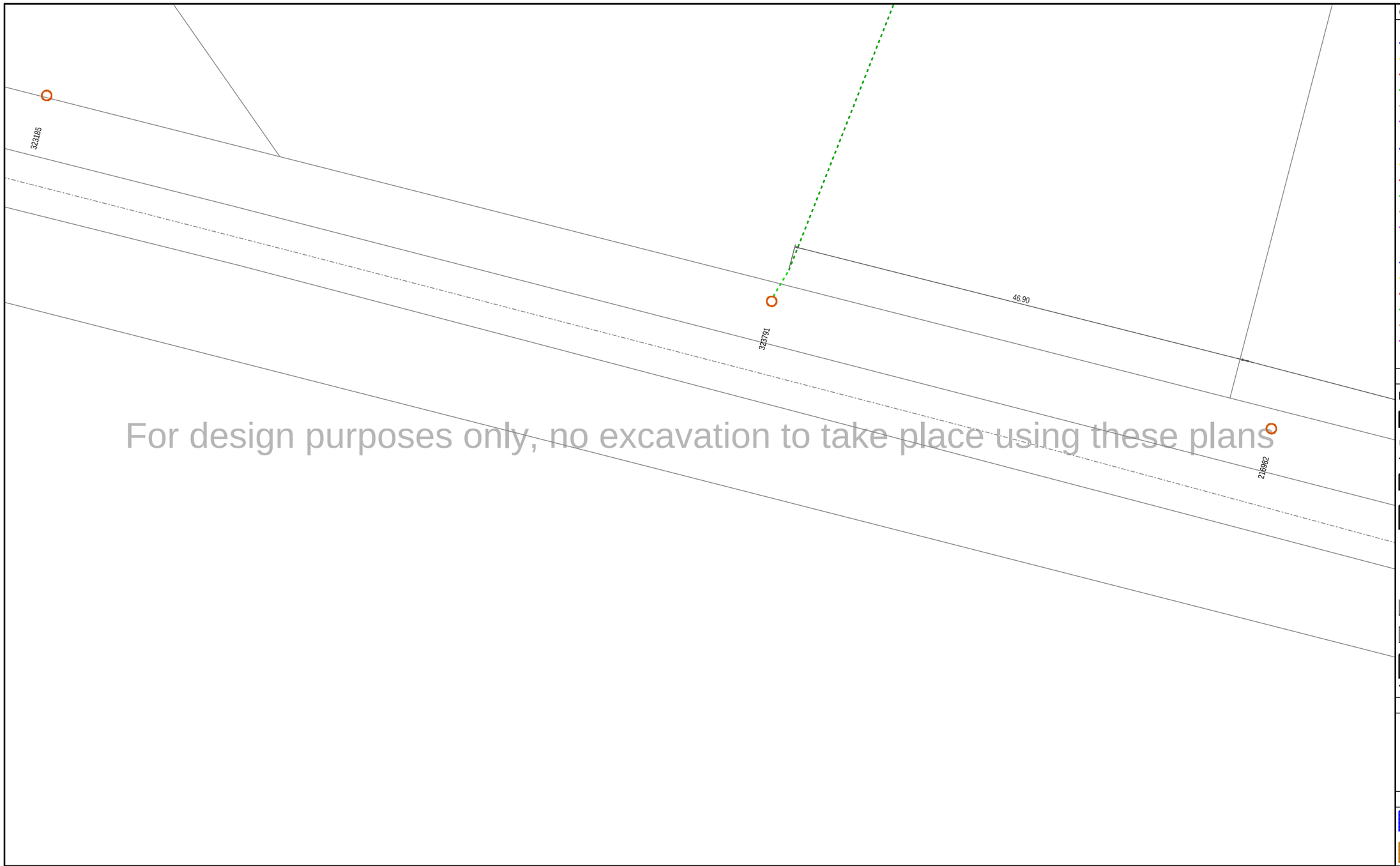

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SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
- PILLAR
- PIT
- DISTRIBUTION SUBSTATION
- POLES
- LAMP
- CESSPIT
- MANHOLE
- FIRE HYDRANT
- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT

- IN PROGRESS
- ON HOLD
- PLANNED

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Usage:	Request ID: 3443506
Request for:	Scale: 1:400
Customer Contact:	Printed by: swadmin
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 7 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

N W E S

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CABLE COLOUR CODE

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- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT

- IN PROGRESS
- ON HOLD
- PLANNED

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A3 ELECTRICITY OBSTRUCTION PLAN

N W E S

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- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT

- IN PROGRESS
- ON HOLD
- PLANNED

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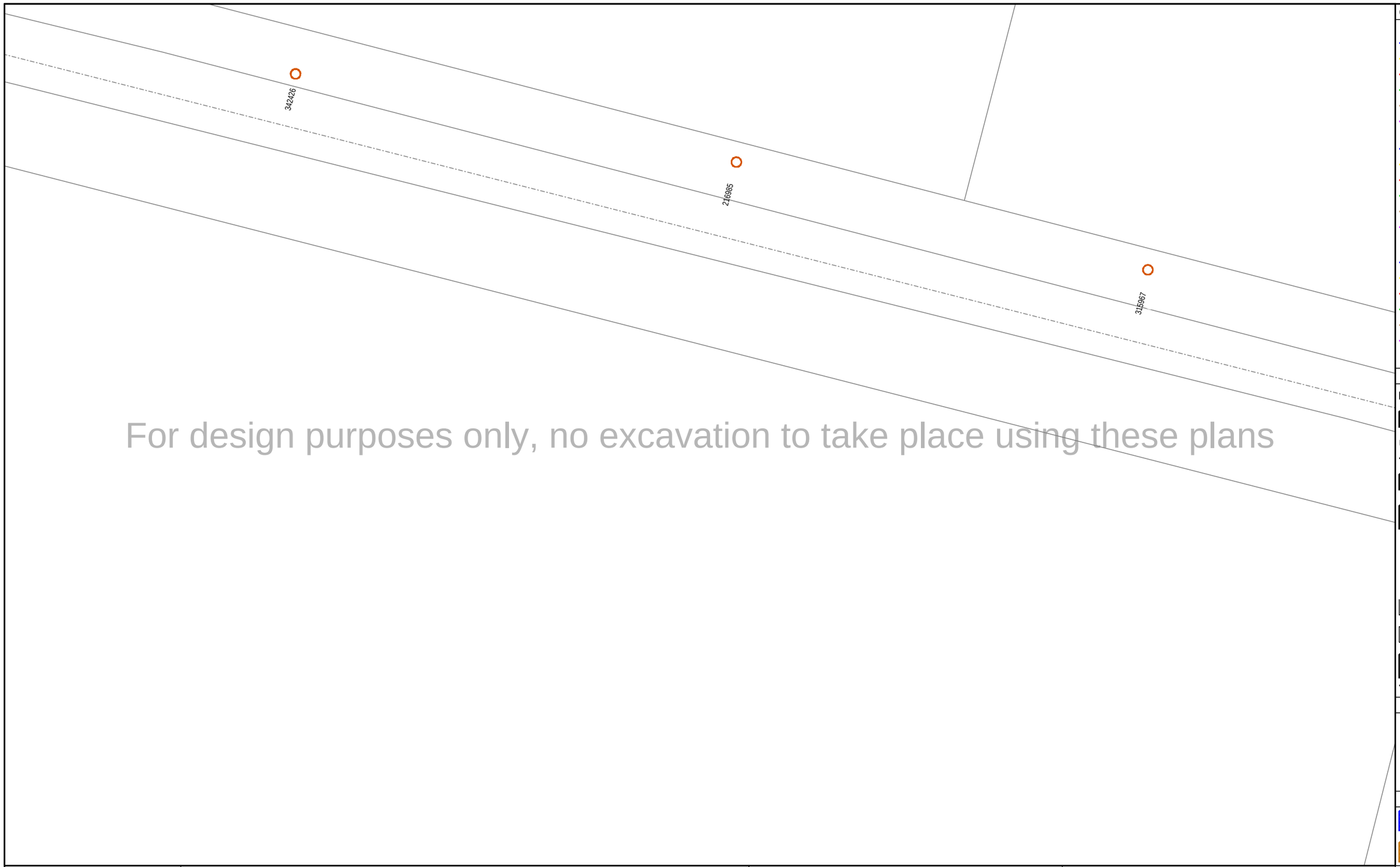
A3 ELECTRICITY OBSTRUCTION PLAN

N W E S



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FIBRE OPTIC DUCT
TRENCH
PILLAR
PIT
DISTRIBUTION SUBSTATION
POLES
LAMP
CESSPIT
MANHOLE
FIRE HYDRANT
DRAIN
FIBRE OPTIC PIT
EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT
- IN PROGRESS
- ON HOLD
- PLANNED

N W E S

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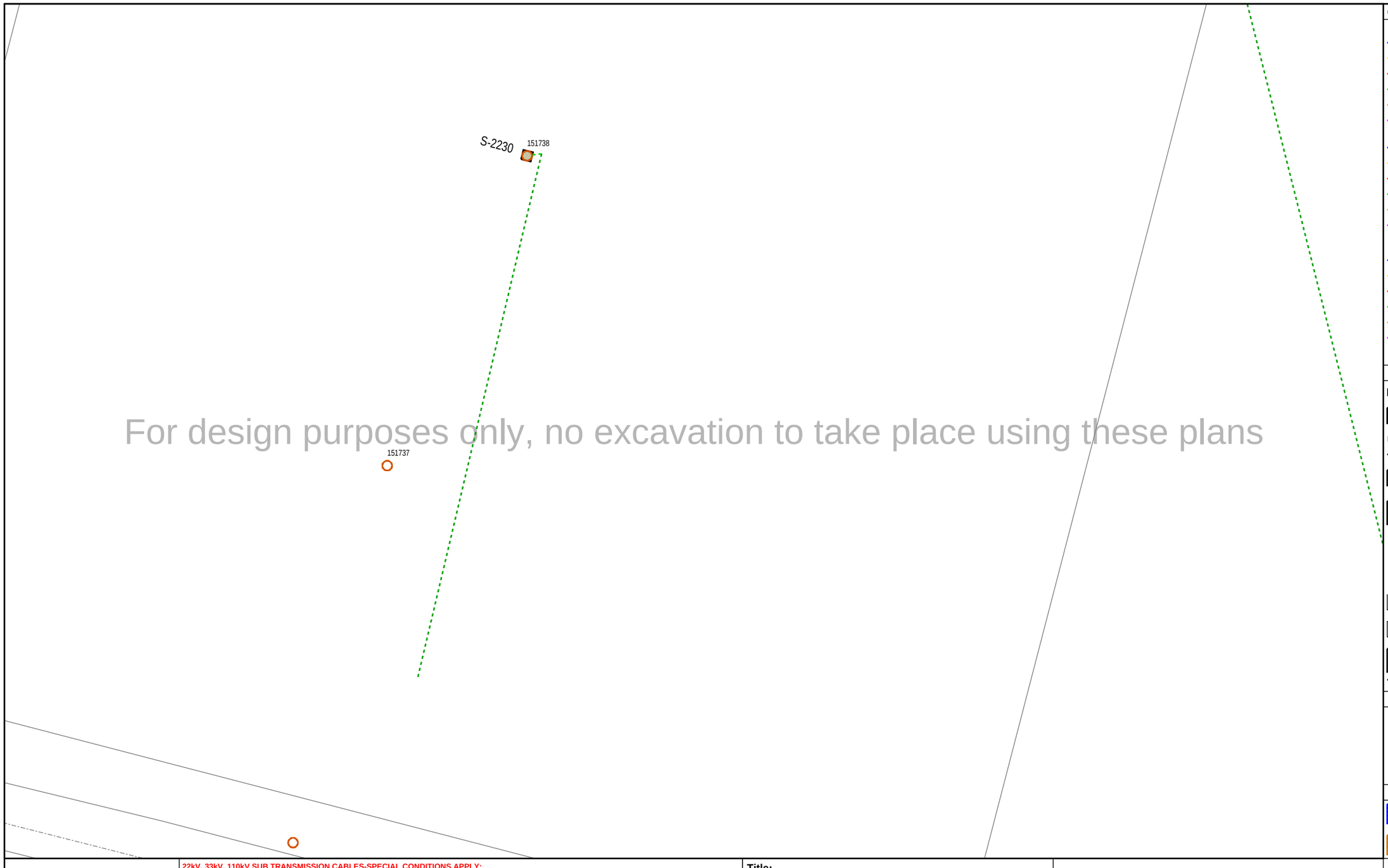
A3 ELECTRICITY OBSTRUCTION PLAN



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SYMBOL LEGEND

- TUNNEL
- DUCT BANK
- FIBRE OPTIC DUCT
- TRENCH
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- PIT
- DISTRIBUTION SUBSTATION
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DUCT CROSS SECTIONS mm

25 50 80 100 150 200 250 300

WORK MANAGEMENT

- IN PROGRESS
- ON HOLD
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Request for:	Scale: 1:400
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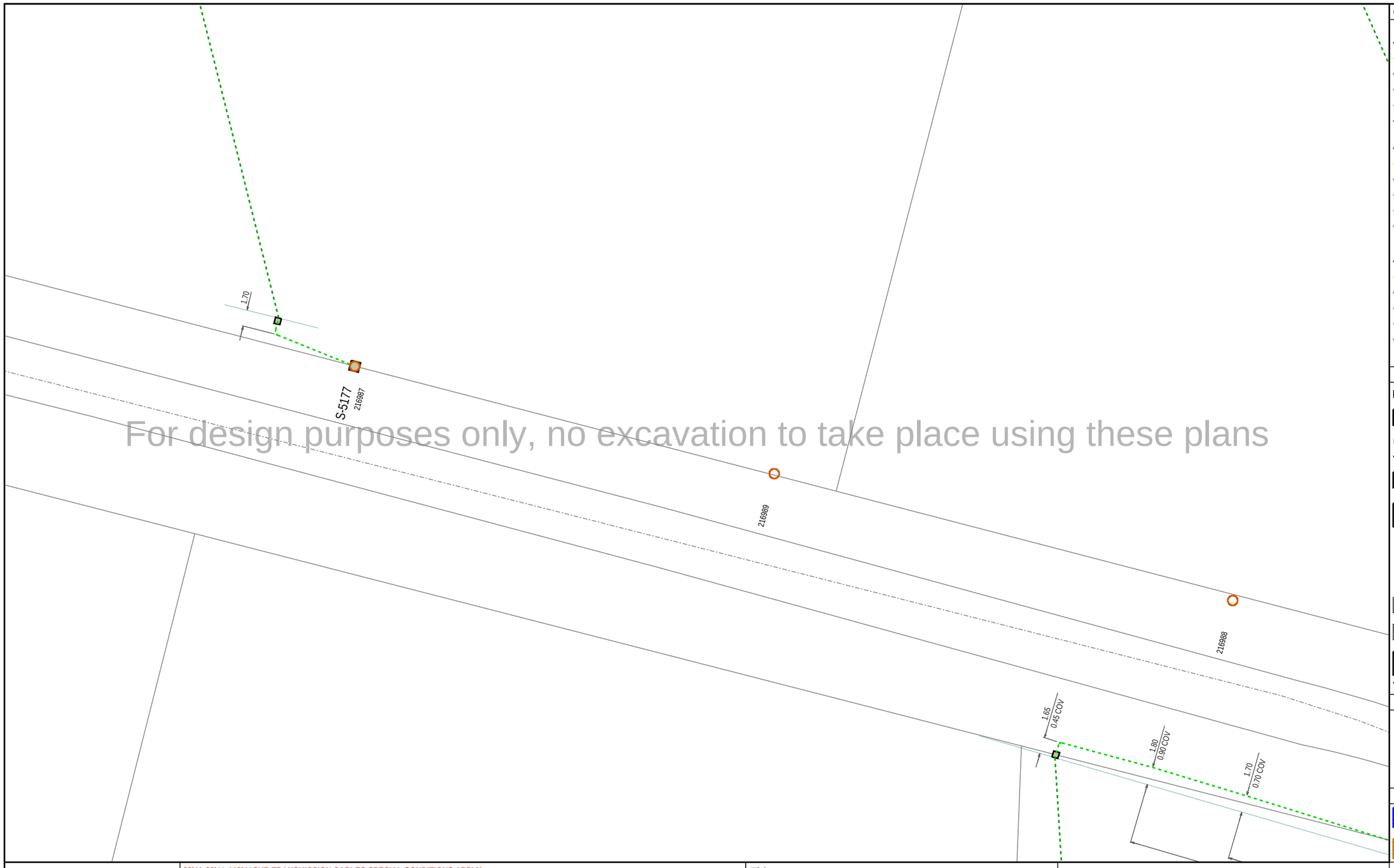
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 11 of 12

A3 ELECTRICITY OBSTRUCTION PLAN

N W E S



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SYMBOL LEGEND

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- DRAIN
- FIBRE OPTIC PIT
- EARTHWIRE & RODS

DUCT CROSS SECTIONS mm

25 50 80 100 150

200 250 300

WORK MANAGEMENT

- IN PROGRESS
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A3 ELECTRICITY OBSTRUCTION PLAN

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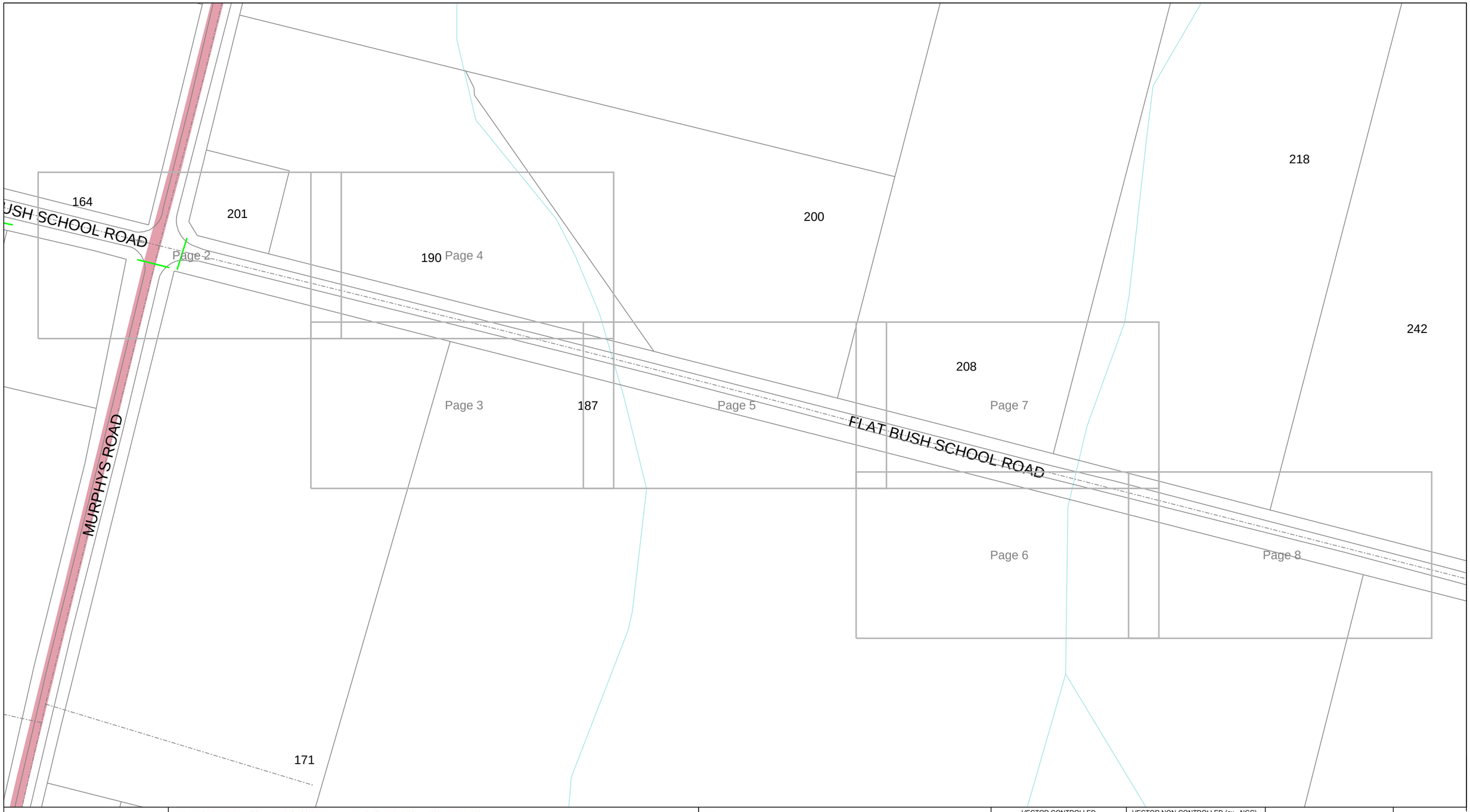

WARNING! Special conditions apply for high pressure gas pipelines (HP Pipe, IP20, IP10, MP7)

A permit/consent is required for any excavation within 2 metres of this pipeline. A MINIMUM of 3 working days notice is required when applying for a permit/consent. Refer to attached covering letter for additional information.

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Company Name:	
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Request for:	No associated viewport
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 1 of 8

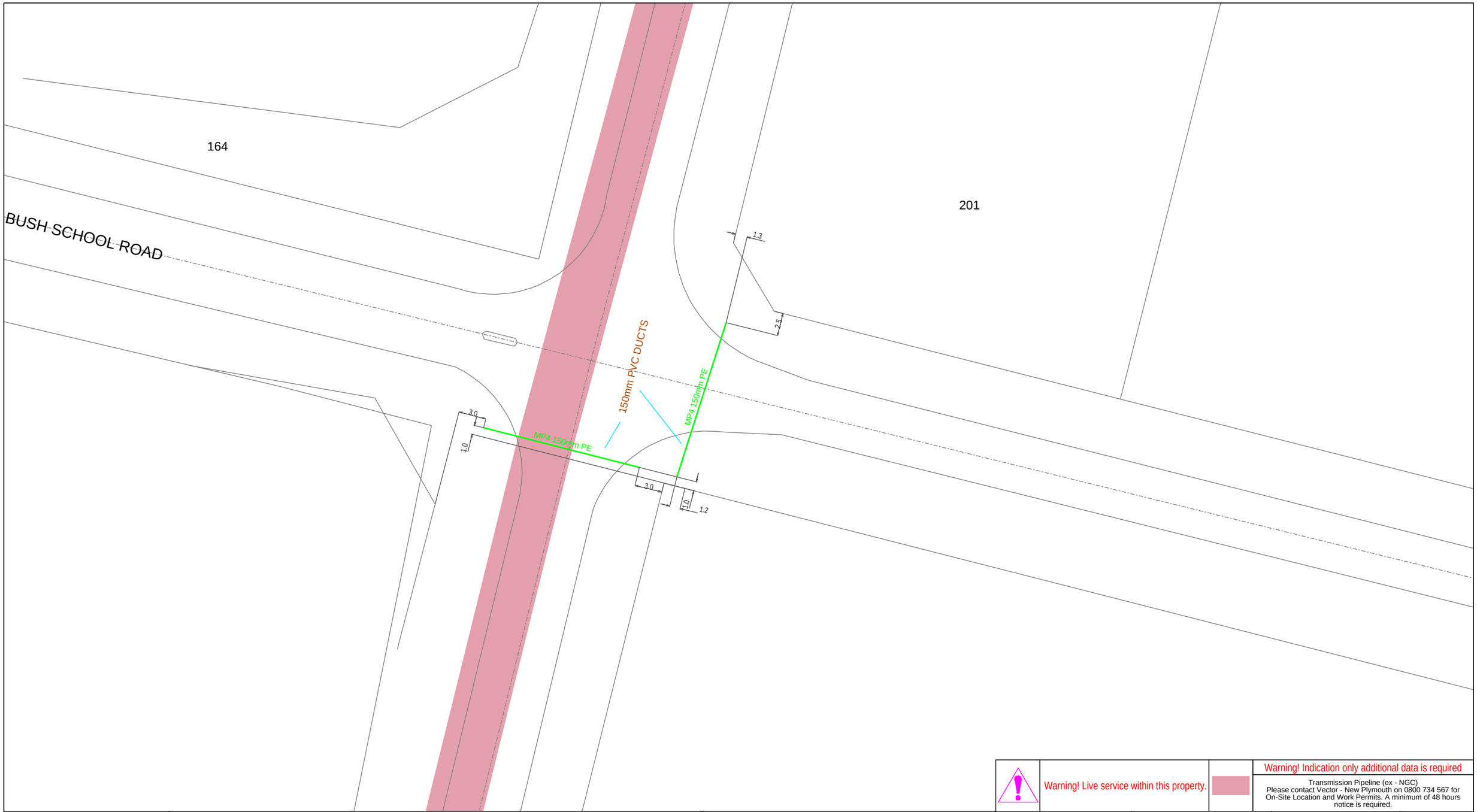
VECTOR CONTROLLED PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES
- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT
- In Progress
- On Hold
- Planned

No Work Management Report



Warning! Live service within this property.

Warning! Indication only additional data is required

Transmission Pipeline (ex - NGC)
Please contact Vector - New Plymouth on 0800 734 567 for On-Site Location and Work Permits. A minimum of 48 hours notice is required.

Vector

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Title:

Request Title:	
Company Name:	
Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 2 **of 8**

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE

- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE

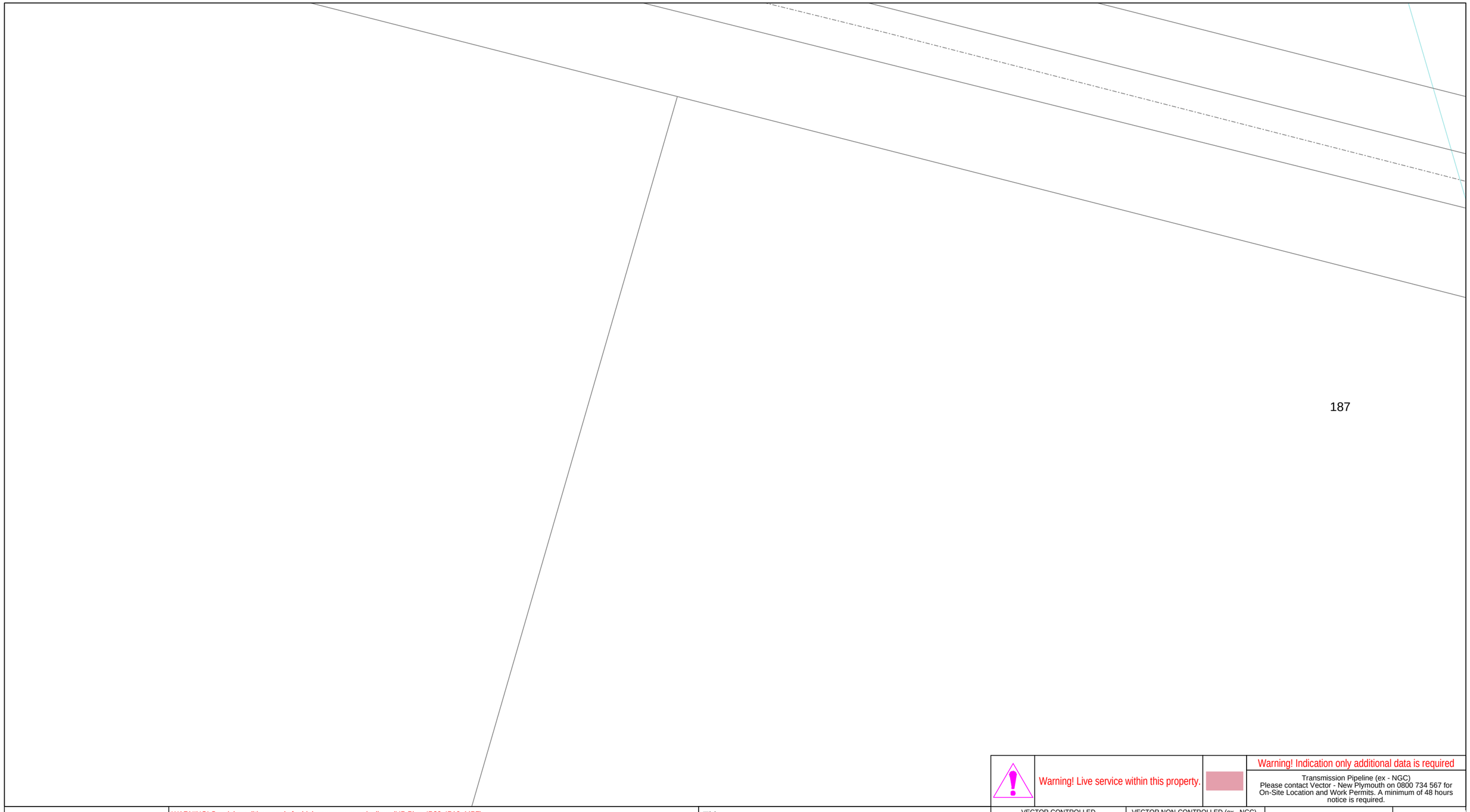
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES

- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT

- In Progress
- On Hold
- Planned



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Title:

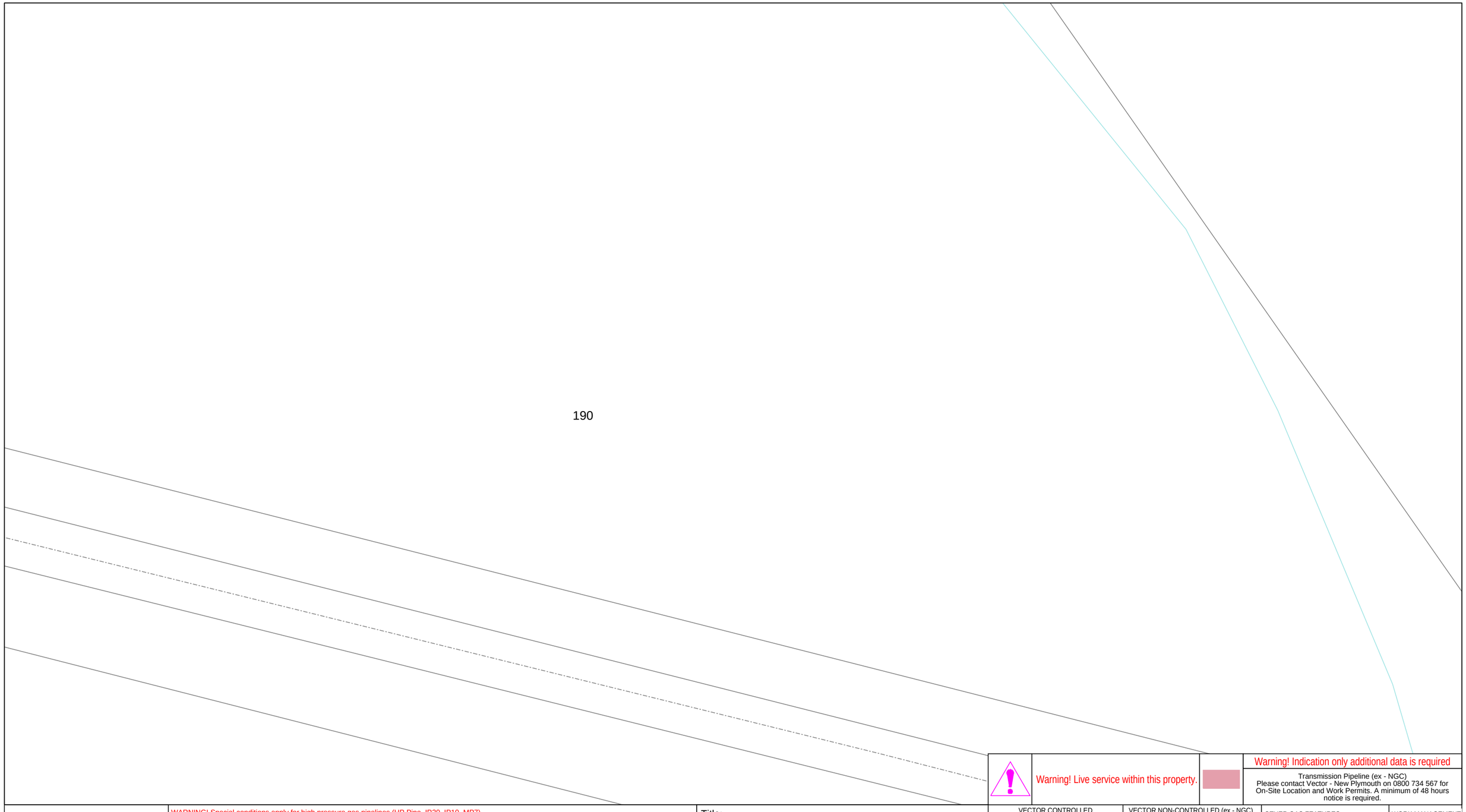
Request Title:	
Company Name:	
Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 3 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES
- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT
- In Progress
- On Hold
- Planned



Warning! Live service within this property.

Warning! Indication only additional data is required

Transmission Pipeline (ex - NGC)
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Title:

Request Title:	
Company Name:	
Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 4 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES
- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT
- In Progress
- On Hold
- Planned

187

Warning! Live service within this property.

Warning! Indication only additional data is required

Transmission Pipeline (ex - NGC)
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Title:

Request Title:

Company Name:	
Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 5 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE

- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE

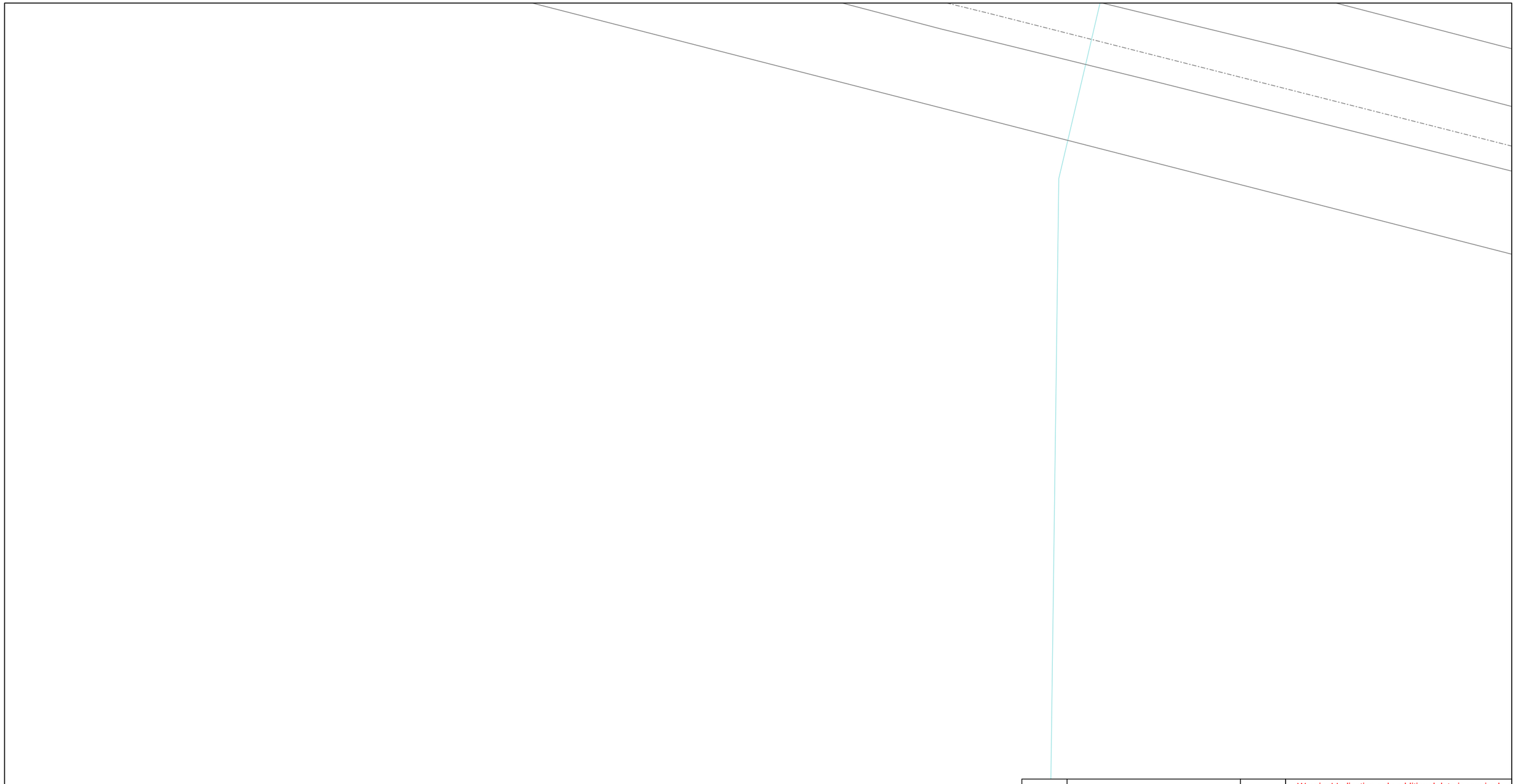
- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES

- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT

- In Progress
- On Hold
- Planned



Warning! Live service within this property.

Warning! Indication only additional data is required

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Title:

Request Title:	
Company Name:	
Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 6 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE

- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE

- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES

- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT

- In Progress
- On Hold
- Planned

N W E S

208

FLAT BUSH SCHOOL ROAD

Warning! Live service within this property.

Warning! Indication only additional data is required

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Title:

Request Title:

Company Name:

Usage:	Request ID: 3443507
Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 7 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE
- LP Pipe
- LPG Pipe
- MP1 Pipe
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- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
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- MP7 Pipe
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OTHER GAS FEATURES
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- Reducer

WORK MANAGEMENT
- In Progress
- On Hold
- Planned

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Request for:	Scale: 1:400
Customer Contact:	Printed by:
Phone:	Date printed: 8. October 2014
Client Reference:	Page: 8 of 8

VECTOR CONTROLLED PIPE COLOUR BY PRESSURE

- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

VECTOR NON-CONTROLLED (ex - NGC) PIPE COLOUR BY PRESSURE

- LP Pipe
- LPG Pipe
- MP1 Pipe
- MP2 Pipe
- MP4 Pipe
- MP7 Pipe
- IP10 Pipe
- IP20 Pipe
- HP Pipe
- 0 kPa

OTHER GAS FEATURES

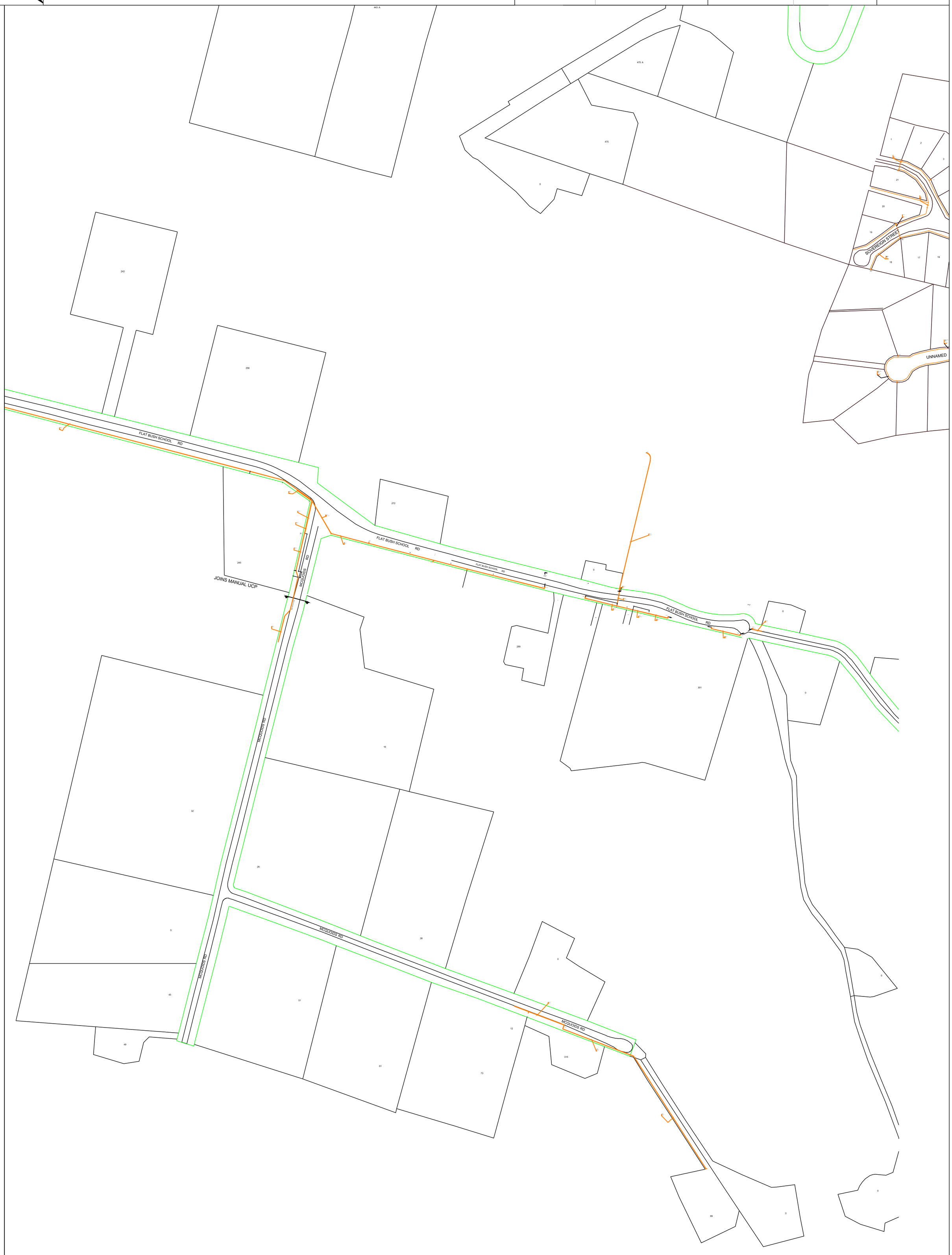
- Fibre Optic
- Gate
- Riser
- PRS
- Service Regulator
- Closed Valve
- Open Valve
- Reducer

WORK MANAGEMENT

- In Progress
- On Hold
- Planned

North

Plan Name:	**GJ57**		
Prime Rectangle:	**R11**	**Date of Printing:**	**09/10/2014**



North

Plan Name:	**GE57**		
Prime Rectangle:	**R11**	**Date of Printing:**	**09/10/2014**

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Lot 58
Lot 57
Lot 56
Lot 55
Lot 54
Lot 53
222
225
0
0
217
TYPK
TYNDALE PARK SCHOOL
MURPHYS RD
MURPHYS RD
201
200
FLAT BUSH SCHOOL RD
0
157