September 29, 2023
29069-20

GM BluePlan
330 Trillium Drive, Unit D
Kitchener, ON
N2E 3J2

Attention: Angela Kroetsch, P. Eng.

Dear Madam:

Re: Sewage System & Water Supply Consultation
Proposed Alma Subdivision
Township of Mapleton

1.0 Introduction

Van Harten is pleased to provide this report regarding sewage disposal within a new estate lot subdivision being proposed within the Village of Alma.

The purpose of this engineering task is to identify the subsurface soil and groundwater conditions within the subdivision and provide preliminary design recommendations that will assist with the overall grading and drainage design being completed by your firm.

2.0 Background Information

CMT Engineering Inc. was retained to conduct a geotechnical investigation for the proposed subdivision. Three boreholes that were advanced within the lands to be developed, found surficial topsoil overlying an extensive deposit of clayey silt. Groundwater depths varied from 0.06 m below grade to 7.40 m below grade. The predominant soil was assigned a percolation rate of T = 50 min/cm.

HCS was retained to carry out a scoped hydrogeological assessment and provide recommendations for the proposed development. A predictive nitrate impact assessment carried out as part of this work has concluded that with the use of enhanced tertiary treatment units, the nitrate-N concentrations in groundwater at the downgradient property boundary will be below the ODWQS limit of 10 mg/L. The enhanced tertiary treatment systems in this subdivision are to be designed to achieve a maximum effluent nitrate-N concentration of 12 mg/L.

3.0 Sewage System Design

The project involves the proposed development of a new estate lot subdivision within the Village of Alma. The purpose of this work is to provide some preliminary sewage system design information that will assist with the overall grading and drainage design of this subdivision.

The percolation time of the predominant soil deposit has been determined by CMT Engineering Inc. to be T = 50 min/cm. For planning purposes, we will use a conservative value of T > 50 min/cm.

While final house plans are not available at this time, Van Harten has been provided with a set of house plans that are reported to be similar to what is being envisioned for this development. Referring to the plans provided, it is understood that houses will have less than about 200 m^2 of total living area with three to four bedrooms and no more than about twenty-eight (28) fixture units. The peak daily sewage flow calculated in accordance with Table 8.2.1.3.A of the OBC is anticipated to be in the order of Q = 1,600 to 2,400 L/day. A conservative peak flow of Q = 2,500 L/day is proposed for planning purposes.

Based on the nitrate reduction requirements established by HCS, the CAN/BNQ 3680-360 certified Waterloo Biofilter advanced sewage treatment system shall be used in conjunction with the Waterloo Biofilter WaterNOx-LS&D denitrification unit. Referring to the attached conceptual design drawings, the proposed sewage treatment system comprises of an anaerobic digester complete with an internal pump chamber that discharges to a biofilter tank. A portion of the treated effluent from the biofilter tank is then recirculated back to the inlet of the anaerobic digester with the remaining portion discharging to the WaterNOx-LS&D tank. An effluent pump located in the WaterNOx-LS&D tank will then dose the treated effluent to the leaching bed. Considering Unit Precast Ltd. as the supplier, the anerobic digester tank and WaterNOx tank will have a 2 m by 3 m footprint while the biofilter tank will have a 2.2 m square footprint.

With aerobically treated sewage, the two primary types of leaching beds are shallow buried trench leaching beds and Type A Dispersal Beds. The following paragraphs provide a brief summary of each type.

Consideration could be given to a shallow buried trench leaching bed designed in accordance with Section 8.7.6 of the OBC. In this case, aerobically treated effluent is time-dosed evenly over a 24-hour period to a closed loop of small diameter pressurized lines. Referring to the conceptual design layouts for Lots 2 and 6, somewhere in the order of 85 to 90 m of shallow buried trench would be designed at 2.0 m minimum spacing beneath prefabricated plastic dome structures. The shallow buried trench lines must be located a minimum of 5 m off of the dwelling and 3 m off of lot lines. The bottom of the chamber must provide a minimum 900 mm vertical separation to groundwater. Note that while the length of shallow buried trench is based on the underlying poor draining native soils, it is recommended that sand fill be imported to the bed areas as indicated on the conceptual layouts to provide a better drainage environment and minimize the potential of smearing during excavation. From a grading perspective, the leaching bed area must remain higher than the surrounding land to shed surface water runoff.

Considering a percolation rate of T > 50 min/cm and peak sewage flow of Q = 2,500 L/day, a Type A Dispersal Bed designed in accordance with Section 8.7.7 of the OBC could be considered. In this case, aerobically treated sewage is pumped to traditional 75 mm diameter perforated piping installed within a continuous layer of stone overlying a layer of sand. Referring to the conceptual design layout for Lot 8, the leaching bed comprises 4 runs of 9.2 m of distribution piping contained within 50 m^2 area of crushed stone overlying a 340 m^2 area of imported sand. The stone area must be located a minimum of 5 m off of the dwelling, 3 m off of lot lines and be provided with a sand mantle extending at least 15 m downgradient of the stone. For this type of system, a minimum 900 mm vertical separation must be provided between groundwater and the underside of stone layer. From a grading perspective, the final grade over the pipe and stone area must be kept no less than about 1 m above the final grade at the toe of the sand mantle extension.

We have outlined general sizing and construction requirements of both a shallow buried leaching bed and a Type A Dispersal Bed. The attached conceptual layouts demonstrate that both leaching bed styles are functional alternatives for this development. Decisions regarding which system is most appropriate and associated design details demonstrating compliance with the Ontario Building Code will be provided at the building permit application stage once the overall grading plan is established and once finalized house plans become available.

4.0 Operation and Maintenance

Following the requirements of the Ontario Building Code, each owner in this subdivision will receive an operations manual. This manual will outline the operating, servicing, and maintenance requirements of the unit and its related components to ensure proper operation in accordance with the design and specifications.

Each owner will need to enter into an agreement with a person who possesses a copy of a technical manual and is authorized by the manufacturer to service and maintain the chosen system. The person authorized by the manufacturer of the system shall take a grab sample of the treated effluent to determine the level of $CBOD_5$ and suspended solids with results submitted promptly to the chief building official. HCS may impose testing requirements related to nitrate removal that fall outside of the requirements of the Ontario Building Code.

5.0 Water Supply

It is understood that these lots will be serviced by individual private water wells. The wells shall be cased to a minimum depth of 6 m and located more than 15 m away from the treatment tanks and leaching beds.

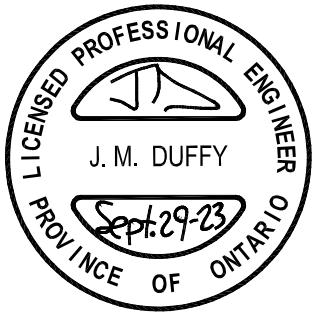
6.0 Approval and Construction Requirements

Once final house plans become available, Van Harten will be designing sewage systems that comply with Part 8 of the OBC and the conclusions of the HCS report. The designs will be accompanied with an engineering report that will be suitable for review by the Township of Mapleton building department and for construction by a licensed installer.

7.0 Closure

I trust that this report and conceptual design layouts have been completed within our terms of reference and will be helpful in your completion of the overall grading and drainage design of this subdivision. Please contact our office if you have any questions or require further information.

Van Harten Surveying Inc.



John Duffy, P. Eng.
Consulting Engineer

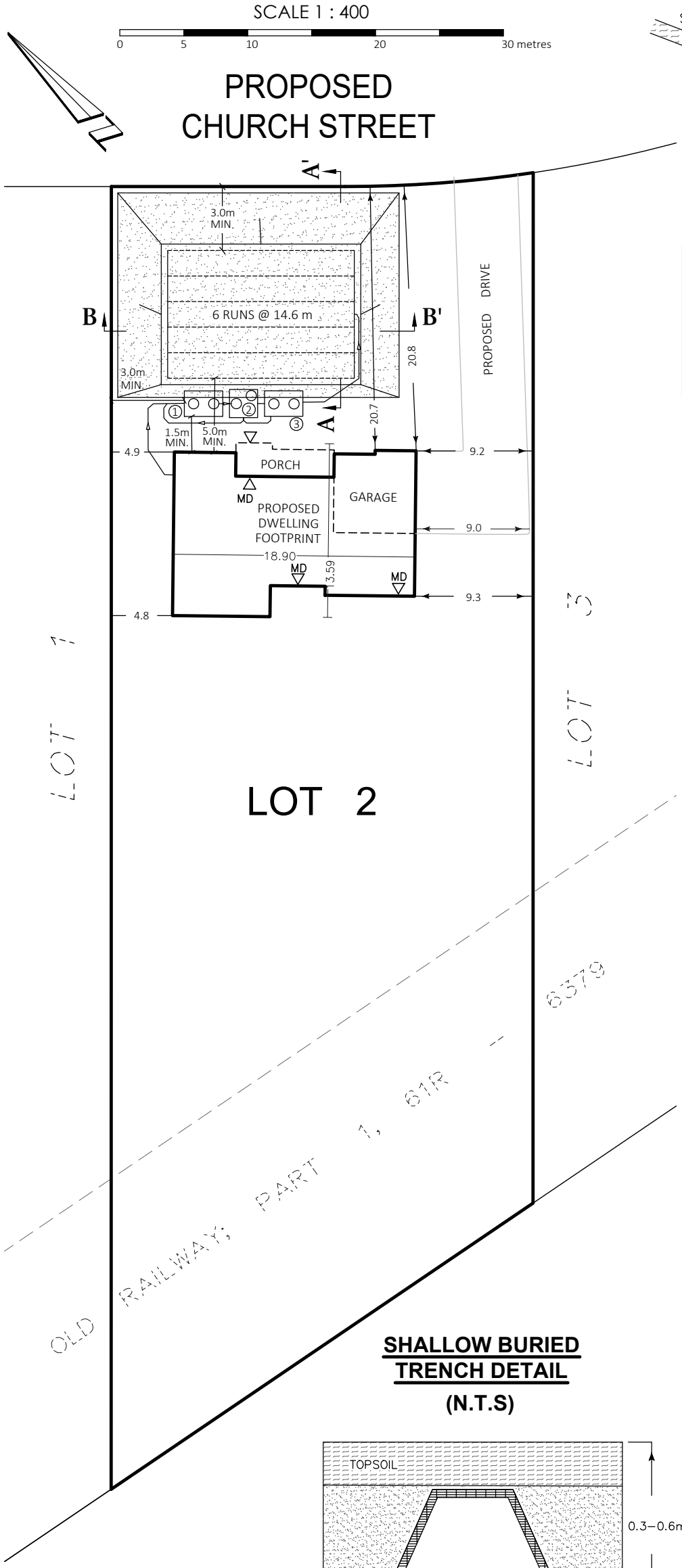
Encl. Conceptual Design Lot 2
Encl. Conceptual Design Lot 6
Encl. Conceptual Design Lot 8

ec Kevin Vanleeuwen, Exact Construction

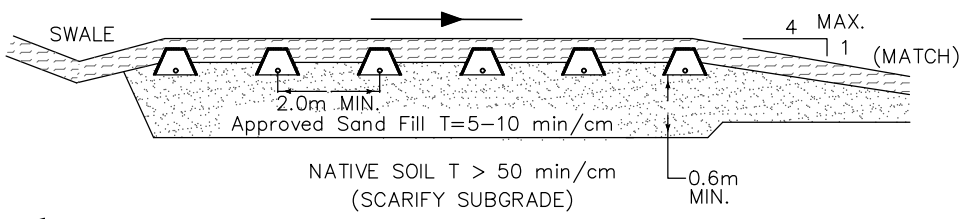
CONCEPTUAL DESIGN FOR: LOT 2, ALMA SUBDIVISION

SCALE 1 : 400

0 5 10 20 30 metres



CROSS-SECTION A-A'
(N.T.S)



CROSS-SECTION B-B'
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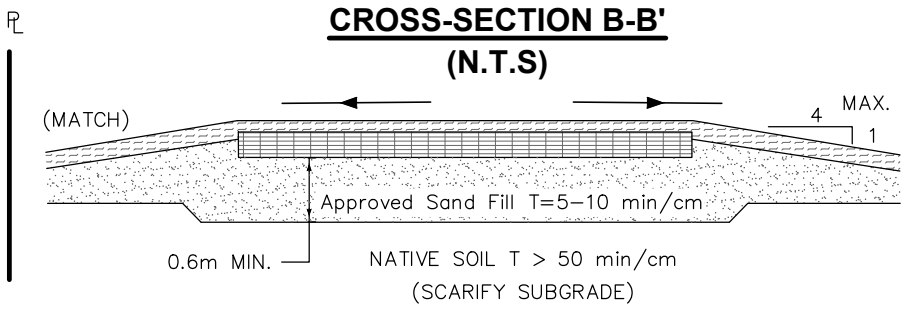
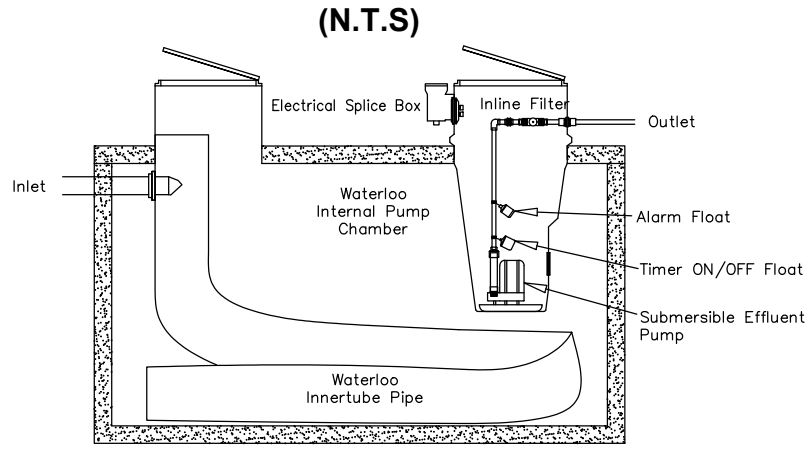
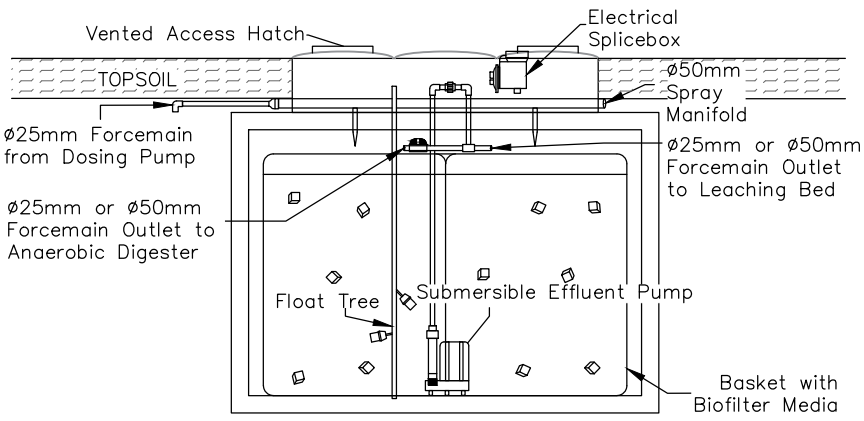


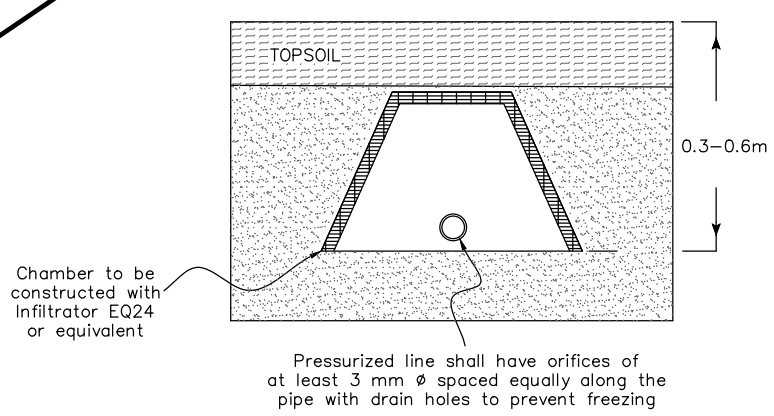
ANAEROBIC DIGESTER WITH INTERNAL PUMP CHAMBER DETAIL
(N.T.S)



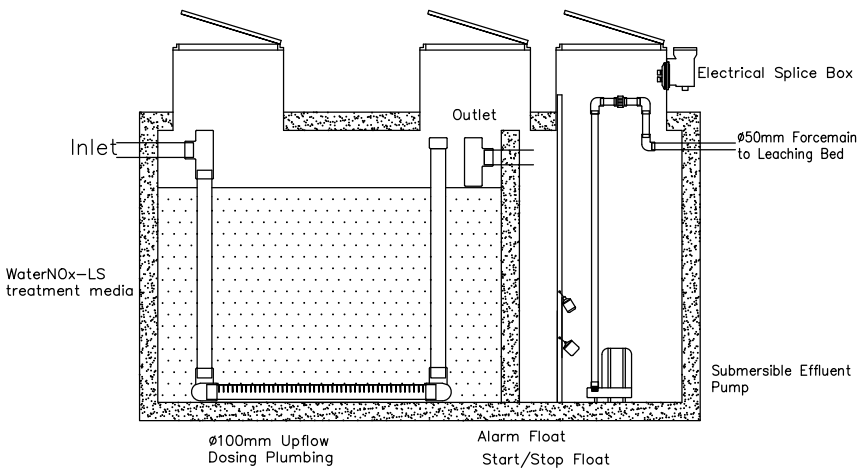
BASKETS IN CONCRETE TANK DETAIL
(N.T.S)



SHALLOW BURIED TRENCH DETAIL
(N.T.S)



WATERNOX-LS&D TANK DETAIL
(N.T.S)



SEWAGE SYSTEM DESIGN NOTES:

Q = 2,500 L/Day

T > 50 min/cm

Waterloo Biofilter Model AD-BA30

① Anaerobic Digester Complete with Internal Pump Chamber

② Biofilter Tank

③ WaterNOx-LS&D Tank

Sand Area = 352 m^2

Shallow Buried Trench = (6 runs @ 14.6 m) = 87.6 m

LEGEND:

- *AREA OF SAND*

Van Harten SURVEYING INC.
LAND SURVEYORS and ENGINEERS

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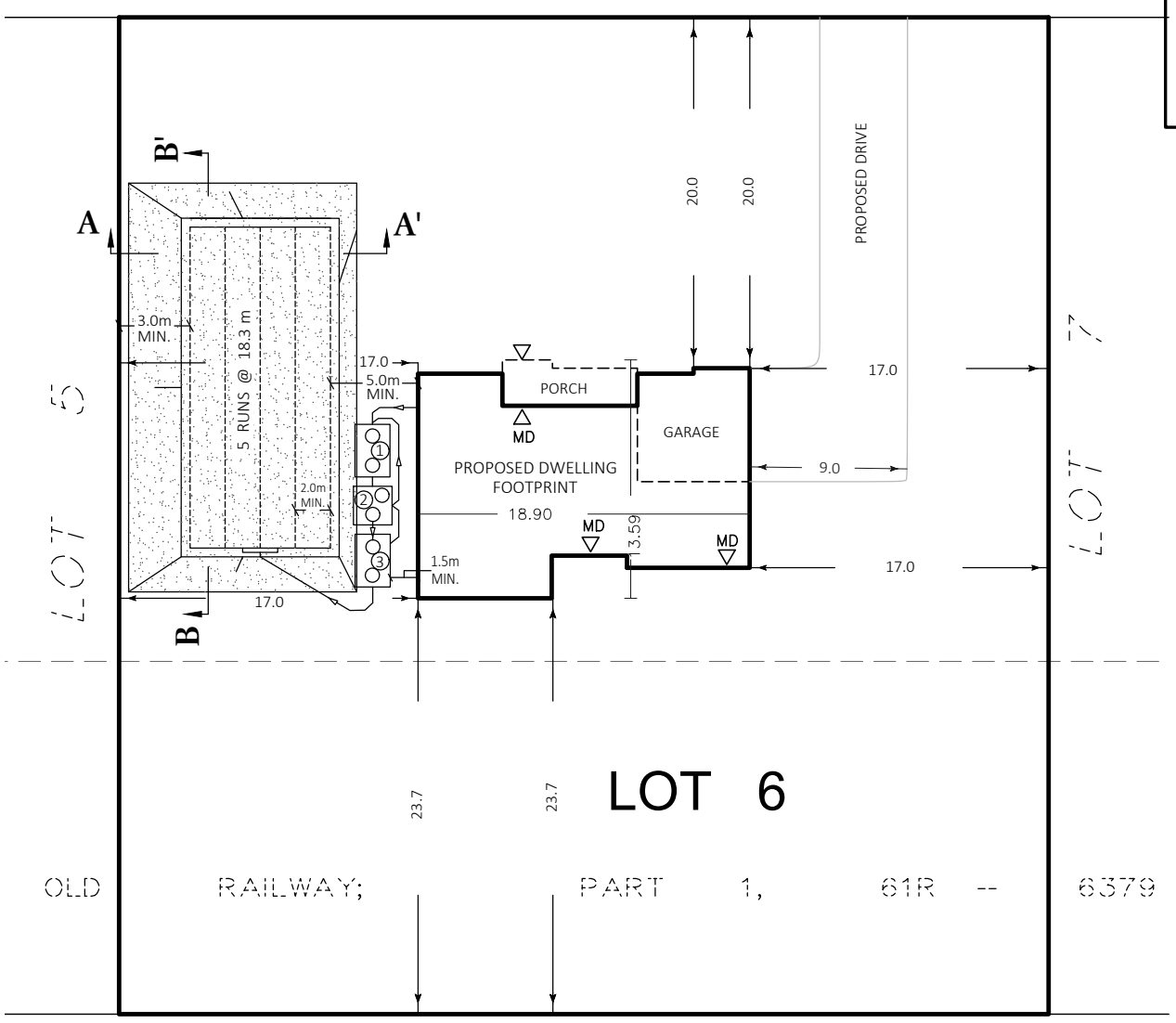
CONCEPTUAL DESIGN FOR:
LOT 6, ALMA SUBDIVISION

SCALE 1 : 400

0 5 10 20 30 metres



SEWAGE SYSTEM DESIGN NOTES:

Q = 2,500 L/Day

T > 50 min/cm

Waterloo Biofilter Model AD-BA30

① Anaerobic Digester Complete with Internal Pump Chamber

② Biofilter Tank

③ WaterNOx-LS&D Tank

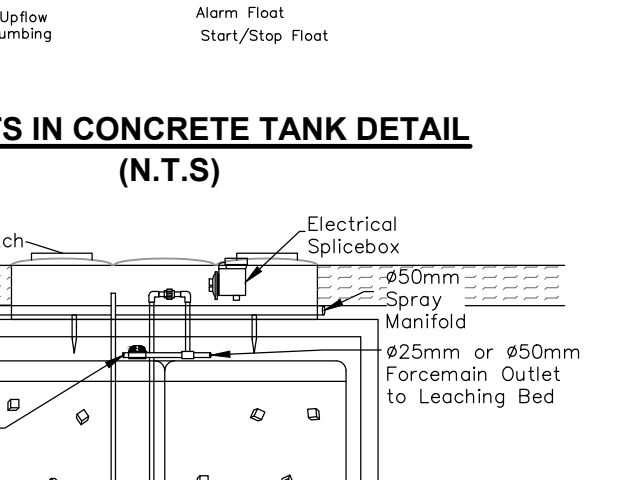
Sand Area = 303 m^2

Shallow Buried Trench = (5 runs @ 18.3 m) = 91.5 m

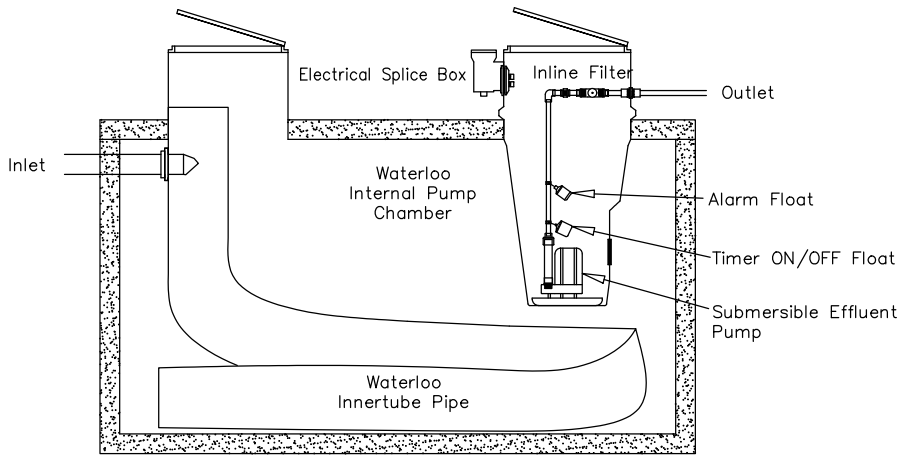
LEGEND:

- *AREA OF SAND*

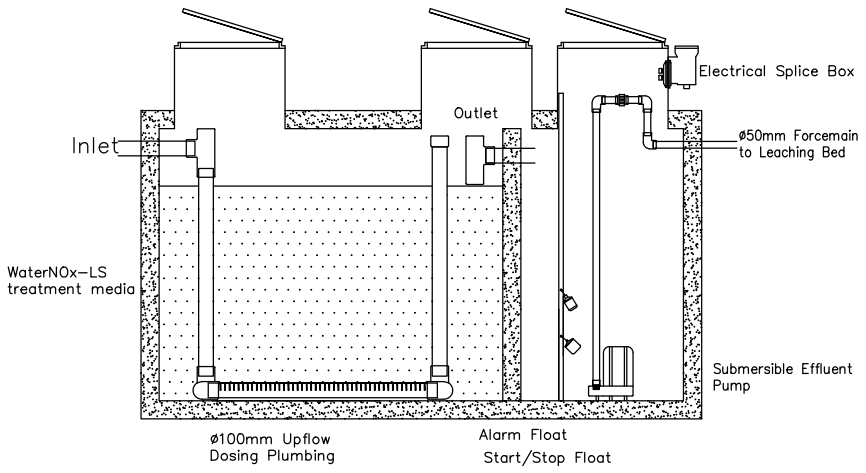
SHALLOW BURIED TRENCH DETAIL (N.T.S)



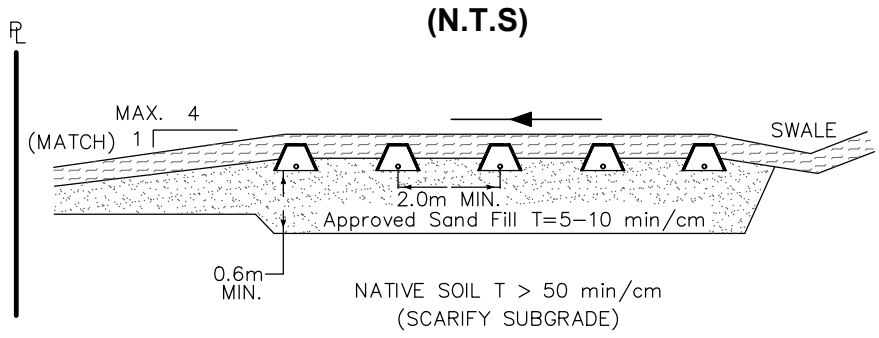
ANAEROBIC DIGESTER WITH INTERNAL PUMP CHAMBER DETAIL (N.T.S)



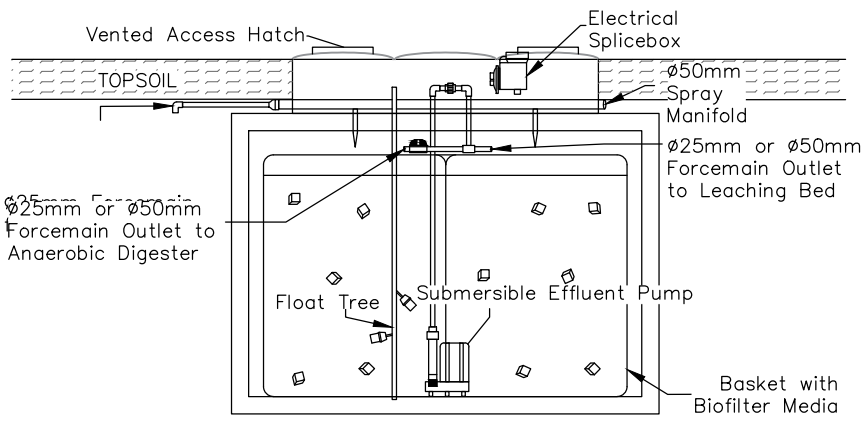
WATERNOX-LS&D TANK DETAIL (N.T.S)



CROSS-SECTION A-A' (N.T.S)



BASKETS IN CONCRETE TANK DETAIL (N.T.S)



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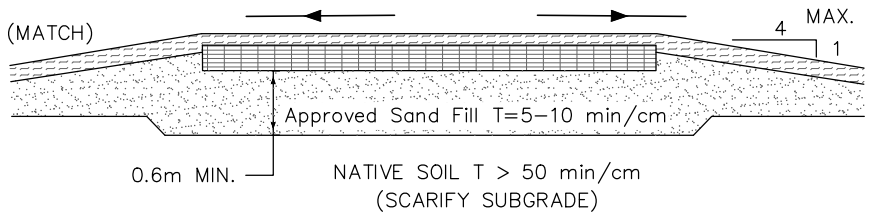

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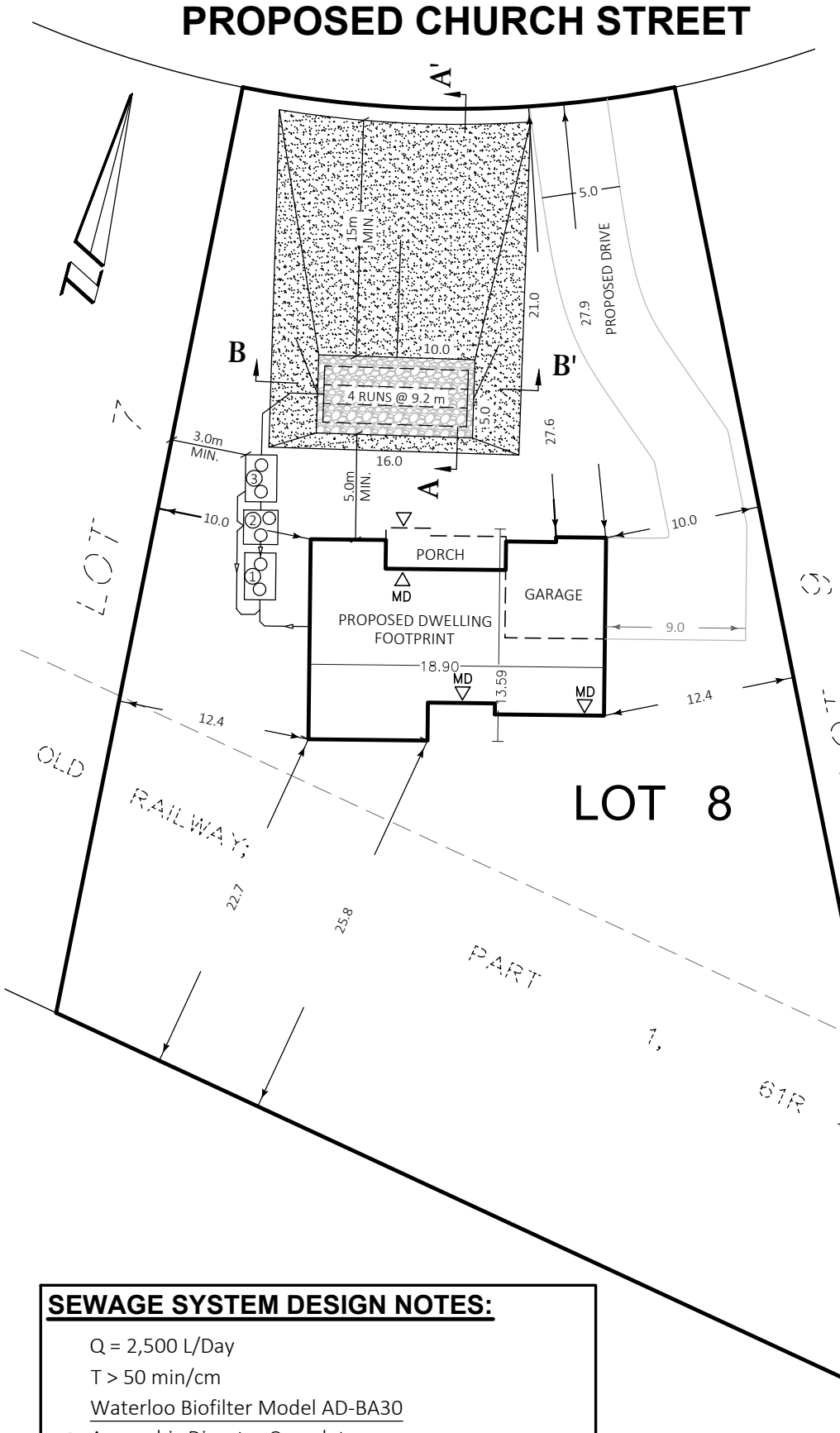
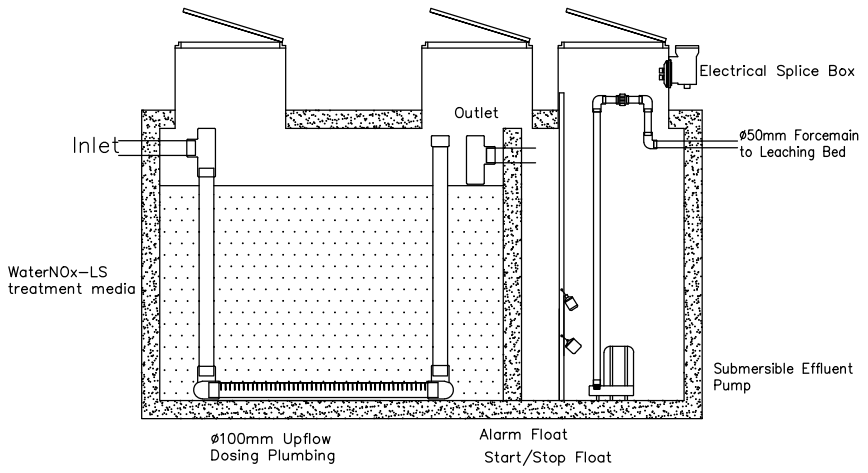
CONCEPTUAL DESIGN FOR: LOT 8, ALMA SUBDIVISION

SCALE 1 : 400

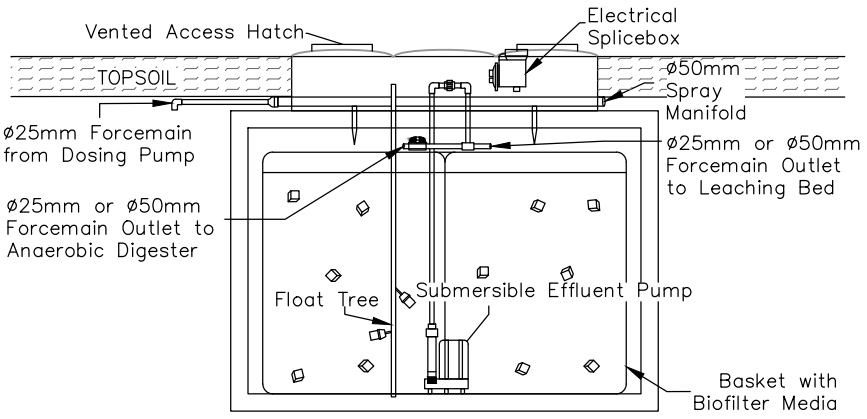
5 10 20 30 metres



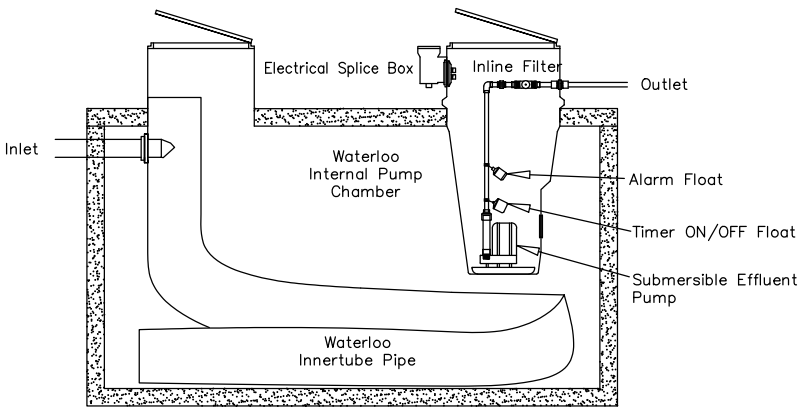
WATERNOX-LS&D TANK DETAIL
(N.T.S)



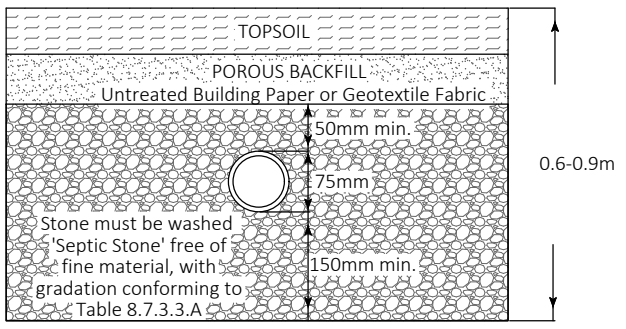
BASKETS IN CONCRETE TANK DETAIL
(N.T.S)



ANAEROBIC DIGESTER WITH INTERNAL PUMP CHAMBER DETAIL
(N.T.S)



DISTRIBUTION LAYER DETAIL
(N.T.S)



SEWAGE SYSTEM DESIGN NOTES:

Q = 2,500 L/Day

T > 50 min/cm

Waterloo Biofilter Model AD-BA30

① Anaerobic Digester Complete with Internal Pump Chamber

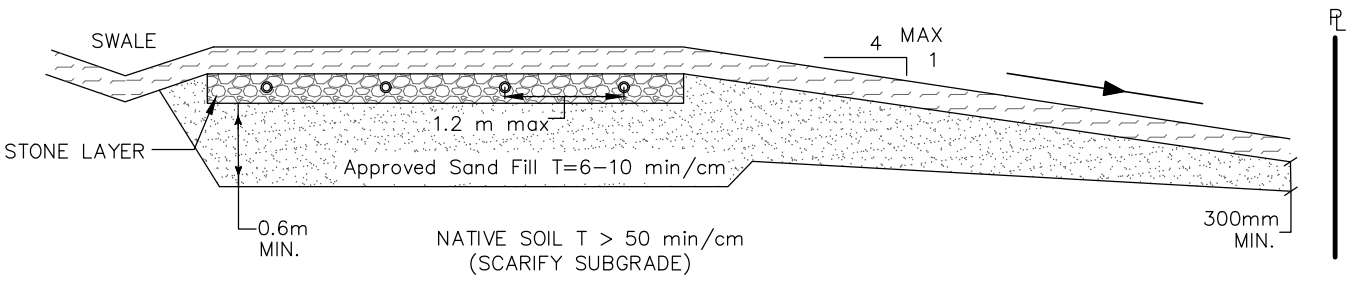
② Biofilter Tank

③ WaterNOx-LS&D Tank

Sand Area = 340 m^2

Distribution Pipe Length = (4 runs @ 9.2 m) = 36.8 m

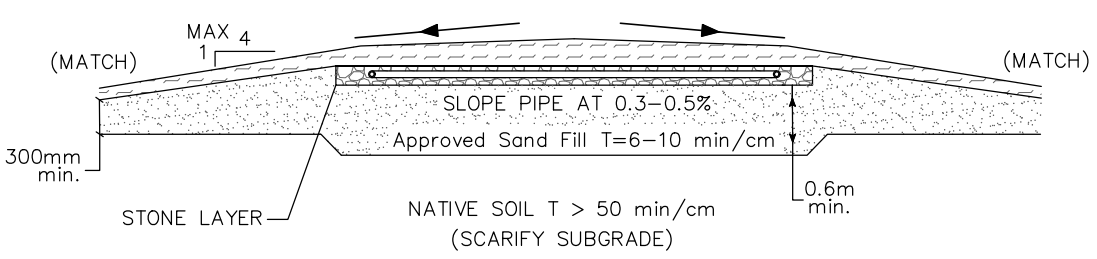
CROSS-SECTION A-A'
(N.T.S)



LEGEND:

- AREA OF SAND
- AREA OF STONE

CROSS-SECTION B-B'
(N.T.S)



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