

Proximal Work Requirements

Metro Vancouver Water and Liquid Waste System Facilities

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ISSUED FOR USE

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1. Introduction

Metro Vancouver (MV) provides drinking water and liquid waste water collection and treatment through its member jurisdictions for 2.8 million residents in the Lower Mainland. Water Services achieves this through managed water supply areas, treatment facilities, and a network of transmission mains. Sewer services are achieved through collection and transmission of sewage through arterial sewers, major interceptors, and waste water treatment facilities. Protection of MV's water and sewer transmission mains is crucial to ensuring the continued and uninterrupted supply of drinking water and liquid waste water collection and treatment for the residents of Metro Vancouver.

Interruptions to MV's water and/or liquid waste infrastructure can cause major disruptions to the regional system

Projects with works proximal to MV infrastructure (Proximal Work) have a role to play in protecting MV's regional water supply and liquid waste water collections systems by ensuring that their work meets MV's requirements. The nature of the transmission network means that any interruption to a water supply main or a sewer interceptor and related infrastructure has the potential to cause a major disruption to the system. Any damage resulting in a leak or spill of drinking water or sewage has potential to cause adverse impacts to the surrounding natural environment. As such, a risk averse approach to Proximal Work is necessary. It is critical that work around MV infrastructure is planned and executed carefully, meets MV's requirements, and is reviewed and consented to in writing by MV prior to the start of work.

Please direct questions regarding this document to the MV Technical Representative assigned to your project. General inquiries can be sent to constructreview@metrovancouver.org.

2. Purpose

Additional considerations may be applicable to projects led by MV member jurisdictions. For further details, please contact MV.

This document is intended to help proponents and their agents (consultants, contractors, etc.) understand MV's minimum technical and submission requirements for works performed in proximity to MV water and liquid waste system facilities. MV Proximal Work requirements must be fully complied with and incorporated in the planning, design and construction stages of a proposed project working near MV infrastructure.

2.1 Projects Requiring Relocation

This document is not intended for projects that result in a change, modification or relocation of MV infrastructure. In those cases, requirements for design submissions, design and construction review, construction, right-of-way impacts, costs and charges, payments, acceptance, etc., will be established on a case-by-case basis through a signed agreement between parties.

2.2 Disclaimer

This document is subject to ongoing review and is updated from time to time. Nothing in this document is to be interpreted or construed to constitute: any approval, acceptance, or support on the part of Metro Vancouver for any project or any drawings, specification, reports, work methodology or work plans with respect thereto; or any promise or commitment by or impose any obligation on Metro Vancouver related to or in connection with any project including and without limitation, any Metro Vancouver infrastructure which may require relocation or protection.

This document is not intended to conflict with any act, regulation, bylaw, contract, or agreement. In all cases where a conflict arises, the act, regulation, bylaw, contract or agreement with the most stringent requirements shall apply.

3. Project Planning

3.1 Getting Information on MV Infrastructure

General information on MV Sewer and Water Mains is available on MV's web-based GIS mapping application. Available record drawings¹ can be requested through the MV website - metrovancover.org - under the heading "Doing Business - Underground Infrastructure Drawings" or at <https://apps.metrovancover.org/flore>.

Metro Vancouver is not currently part of the BC One Call Program

Always obtain and review MV's record drawings¹ to approximate the locations and elevations of MV infrastructure in relation to the proposed works. Do not rely solely on drawings¹ provided by others, which may or may not include MV infrastructure. MV infrastructure can be easily misinterpreted as our member jurisdictions infrastructure. Also, note that MV is not currently part of the BC One Call Program.

3.2 Locates

Not all system features may be fully captured in record drawings

MV record drawings are made available for general information only. Certain features of the system such as thrust blocks and concrete cradles may not be fully captured in the drawings. It is the proponent's responsibility to verify the depth, location, and extents of MV infrastructure prior to construction. Field confirmation of MV facility location is recommended and may be required at MV's discretion. Completing locates and, if required, daylighting of the infrastructure should be done as early as possible and preferably during the design stage.

¹ These documents are provided for information only and are provided without any guarantee, representation or warranty of any kind, whether express, implied, or statutory. Metro Vancouver Regional District, Greater Vancouver Water District, and Greater Vancouver Sewerage and Drainage District (collectively, "Metro Vancouver") assume no liability whatsoever with respect to your use of these documents or any errors or omissions herein. These documents may be updated, amended, or withdrawn at any time and without notice and may not be suitable for all purposes. Any reliance on the accuracy, currency, suitability, or completeness of the information contained herein is entirely at your own risk. These documents are the property of Metro Vancouver and may not be copied, reproduced, or distributed in any way or for any purpose without Metro Vancouver's prior written permission.

3.3 Identifying Proximal Work

Generally, Proximal Work occurs within 30m of MV infrastructure

Works that have the potential to impact MV infrastructure are considered Proximal Work. Generally, these are works that take place within 30 meters of MV infrastructure. Examples of Proximal Work include excavation and backfilling for pipe and equipment crossings, relocations, preloading, stockpiling, directional drilling, and any other sources of additional live or dead loads within 30 meters of MV infrastructure. Impacts to MV infrastructure from Proximal Work can include direct conflicts, potential deflection and displacement, risk of damage, reduced resiliency and potential disruption of critical services to large areas of the region.

To screen for Proximal Work, the proponent is to review all planned project works within 30m of MV infrastructure with the potential for impact and discuss these with the MV Technical Representative.

In some cases, works greater than 30 meters from MV infrastructure have the potential to impact MV infrastructure and are considered Proximal Work. Construction activities involving large static and dynamic loads such as surcharge fill or pile driving necessitate large setbacks. If you are unsure if your work constitutes Proximal Work, contact MV to discuss.

3.4 Engaging with MV

If a proposed project is, or is likely to include Proximal Work, please initiate discussion with MV by submitting available project information (i.e., conceptual drawings and project details) to constructreview@metrovancover.org. MV's Water Services and Liquid Waste Services departments will review the details submitted and contact the proponent to discuss next steps.

Early engagement with MV is essential for projects with potential conflicts with MV infrastructure

Early engagement with MV, ideally during the project planning stage, is recommended. This helps proponents develop an understanding of MV's submission and review process, and any general and site specific requirements that may be applicable to their project. It helps to identify specific MV groups and project teams that may have an interest in the proposed project, and to determine if there are scheduling or design conflicts with planned MV projects.

For projects where there are potential conflicts with MV infrastructure, early engagement with MV during the planning stages is essential. Any changes to the operation or configuration of MV infrastructure may require significant planning. The provision of conceptual designs and project milestones at the early stages of the project would be helpful. Alterations to the MV system must allow for the continuous operation of MV's facilities before, during, and following construction of the Proximal Work.

3.5 Permitting

If the performance of the Proximal Work requires any Permits², the proponent shall identify, apply for, pay for, obtain and comply with all such Permits required under applicable Laws³. If and when requested by the MV Technical Representative, the proponent shall keep the MV Technical Representative informed of the relevant details of discussions and negotiations with Governmental Authorities⁴ with respect to Permits required for the performance of the Proximal Work, and provide the MV Technical Representative with copies of all documentation and correspondence with Governmental Authorities⁴ relating to such Permits.

3.6 Schedule Considerations

- **Construction Windows**

No system isolation on MV water infrastructure is allowed during high demand periods

Construction that involves isolation of any existing water system, including tie-ins for relocations, is not allowed on MV water infrastructure during high demand periods. All construction activities proximal to MV water infrastructure will not be permitted during the high demand period where work provides for less than 2m horizontal clearance and/or MV considers the work high risk. The high demand period varies from year to year based on weather conditions but generally includes the period between May 1 to October 15.

Interfacing with live sewer must be conducted during periods of dry weather and low flows

Proponents should be aware that consent for Proximal Work planned during the high demand period, may not be granted due to the elevated consequences that would result if water infrastructure were damaged. Whenever possible, plan works outside of the high demand period.

Generally, interfacing with live sewer systems must be conducted during periods of dry weather and low flows. This may necessitate scheduling restrictions to seasonal work, night work and/or weekend work.

² **“Permits”** means all permissions, consents, approvals, certificates, permits, licenses, statutory agreements, zoning and by-law amendments and variances, and authorizations required from any governmental authority, and all necessary consents and agreements from any third parties, needed to carry out the Proximal Work.

³ **“Laws”** means all laws (including the common law), statutes, regulations, treaties, judgments and decrees and all official directives, bylaws, rules, consents, approvals, authorizations, guidelines, orders and policies of any governmental authority having the force of law from time to time, including Environmental Laws and the lawful requirements of any governmental authority having jurisdiction.

⁴ **“Governmental Authority”** means any federal, provincial, regional, municipal, local or other government, governmental or public department, authority, court, tribunal, arbitral body, commission, council, board, bureau or agency (and includes, when applicable, GVS&DD, GVWD, and Metro Vancouver Regional District).

- **Submission Package Preparation and Review**

Complete submission packages with sufficient level of detail will mitigate delays in the review process.

Depending on the project scope, technical studies on impacts to MV infrastructure may be required. These studies take time to complete and to review. Plan accordingly and allow for sufficient time in the schedule to engage with MV by starting as early as possible. As a general guideline, allow for a minimum of 15 business days for the review of each Notice of Work package submission. For additional details of what constitutes a Notice of Work submission see section 6 and 7. Please note that more than one submission is often required to produce a package that fulfills all of the information requirements and addresses all concerns to MV's satisfaction.

4. PROPERTY REQUIREMENTS

4.1 Impairment of Legal Access

If in the course of constructing any works, the legal access rights which are currently available to MV are materially impaired permanently or temporarily, the proponent will need to obtain, at its cost, any legal property tenure required by MV to provide reasonable access to MV for the purpose of operating, maintaining, repairing and replacing its facilities and to obtain priority for such statutory right-of-way over any other registered charges. In such cases where MV access and infrastructure may be within lands owned by a railway or within a provincial highway, the proponent shall obtain, at its cost, a crossing permit from the railway, or a highway permit from the province that is acceptable to MV.

The proponent will not without MV's prior written consent do or permit to be done anything which in MV's judgment or opinion may impair the operating efficiency of any part of MV's facilities, obstruct access to or the use of any MV right-of-way area or facility, interfere with or adversely affect any rights granted by third parties to MV, or create or increase any risk to any MV facility.

4.2 Construction within MV Tenure

Proposed Proximal Work that is to be constructed within or requires crossing access to MV property tenure (e.g., statutory right-of-way) must enter into a consent letter agreement or crossing agreement (if in the case of oil, gas, or railway crossing) with MV Real Estate Services prior to the commencement of the proposed works.

5. Design Requirements

The following are MV's minimum design requirements for Proximal Work. These minimum requirements are provided as guidance only and are not meant to be all inclusive and may be subject to change upon review of the submission package due to variations in actual field conditions. Each project will be reviewed on an individual basis and additional requirements may be added.

5.1 Utility Crossings

Where possible, crossings should be done perpendicular to MV sewer or water main, subject to review and consent by the MV Technical Representative.

- **Clearances**

The minimum utility crossing clearance requirements are detailed in Table 1.

TABLE 1: MINIMUM UTILITY CLEARANCES

PARAMETER	MINIMUM CLEARANCE	FACILITY	NOTES
Horizontal Clearance	1.2m	to water and/or sewer	Clear space between the proposed works and parallel MV pipe, and/or existing MV infrastructure
Vertical Clearance	0.6m for oil and gas, transmission, and large diameter crossings 0.3m for local jurisdiction utility crossings	to water and/or sewer	Clear space between crossing pipe. If concrete encasement is proposed, the clear space will be measured from the outside face of the concrete
Trenchless Crossings	1.0m	to water	Visual confirmation on the design vertical clearance is required and will be requested during the design review
	1.2m	to sewer	

Notes:

1. Table 1 does not apply to shoring anchors. Clearances between MV infrastructure and shoring anchors are assessed on an individual basis.
2. A vertical clearance of 0.6m or more for local jurisdiction utility crossings may apply to MV infrastructure over 50 years' service or otherwise required by GWWD/GVS&DD due to potential reduced safety factor
3. Small diameter gas lines and cables may meet the 0.3m requirement.
4. Construction parallel to MV infrastructure may require additional clearance requirements and/or mitigation measures. Subject to review by the MV Technical Representative.

- **Open Cut Crossings under MV Pipe**

Unless authorized in writing by the MV Technical Representative, for all crossings under a MV sewer or water main, engineered details of temporary pipe and/or joint supports and installation procedures, signed and authenticated by a Professional Engineer registered in the Province of British Columbia, must be submitted to MV for review.

Monitoring of the exposed MV water or sewer main is to be carried out continuously during the work. Settlement measured at any point along the sewer must not exceed allowable tolerances under Section 8.1. For additional details on monitoring, see Sections 8.3 and 9.6.

For additional requirements and guidelines regarding engineered details of temporary pipe supports and installation procedures, please see Appendix C – Additional Requirements for Utility Undercrossing for MV Sewer and Water Mains, or consult with the MV Technical Representative.

- **Sanitary Crossing Above MV Water Main**

Precautions on sanitary crossings minimize the risk of sanitary leaks contaminating the water main

When a proposed sanitary sewer pipe crosses an MV water main:

- the crossing sewer pipe must be pressure rated
- all joints of the proposed sewer within 3m of the crossing must be wrapped
- a casing pipe may be used; the ends of the casing pipe must extend 3m beyond the existing water main

5.2 Equipment and Vehicle Crossings over MV Infrastructure

Notify MV of ALL equipment crossings over MV infrastructure

A Notice of Work will need to be submitted to MV to advise of any proposed crossings of MV sewer and water facilities by equipment and/or vehicles. The proponent is to ensure that appropriate measures are taken to protect the MV sewer and water facilities being crossed. Depending upon site conditions and the MV infrastructure affected, protective measures may be required. See Section 7.6 for submission requirements.

5.3 Access Requirements

- **Vehicle Access**

MV requires safe access to facilities at all times

MV operates major water and sewer facilities throughout the region. Safe access to these facilities by MV Operations and Maintenance crews in a variety of vehicles, from light duty vehicles to heavy trucks, is required at all times. Road access must be designed to appropriate highway live loading design standards and specifications. Other aspects to consider in providing safe access include driveways, overhead clearance, letdowns, turnarounds, turning radii and acceleration/deceleration lanes.

- **Access to Appurtenances**

Include consideration of MV's access requirements during the project design phase

Project design must consider and accommodate continued access (with maintenance vehicles wherever possible) to MV appurtenances such as maintenance holes, chambers, valve boxes, control kiosks, and air vents. Maintenance holes and chambers may have to be re-built if the proposed or future loads exceed the maintenance hole or chamber's original design capacity.

- **Access and Containment for Pipe Repairs**

Project design must consider access for future pipe repairs

Project design must consider access and space for future pipe repairs. For both MV water and sewer main repairs, it is typical that the circumference of the pipe be exposed within a trench which is shored or sloped. At MV's discretion, where required, adequate space must also be provided to construct a temporary containment structure to mitigate risk of contamination to the environment. Access from surface is required to move personnel, equipment and materials to the repair area. All utilities must be constructed with a set distance (see minimum utility clearances in Section 5.1) from MV infrastructure to allow MV to safely expose and work on the MV utility in future.

5.4 Infrastructure and Appurtenance Redesign

For any MV sewer and water main, maintenance hole or chamber that is required to be relocated, re-constructed, reinforced or protected due to conflicts or excessive loads, the relocation, re-construction, reinforcement or protection must be designed and authenticated by a qualified Professional Engineer registered in the Province of British Columbia and submitted to MV for review.

5.5 Landscaping

Landscaping may interfere with the MV facility and can hinder emergency repair access

The design of landscaping over MV infrastructure must consider access for future pipe repairs and interference with the infrastructure. Unless authorized by written consent, no trees or ornamental or structural landscaping are acceptable over MV infrastructure or within MV land tenure. Examples include, but are not limited to; fountains, water retaining structures, retaining walls, structural foundations, gazebos, light standards, mail box structures, fixed benches, private fences or gates, unauthorized fills or playground apparatus.

Include landscaping plans in the submission package supplied to MV for review and consent. Protection measures and limitations on MV's obligations to restore landscaping following repairs may be required.

5.6 Dead Loads including Stockpiles and Equipment Storage

Additional dead loads near MV infrastructure may require further technical analysis as per section 8.1 and 8.2. Any proposed fill or stockpile placement on the work site in which the zone of influence could have a proximal impact on MV infrastructure must be reviewed and consented to by MV in writing before the work begins.

6. Submission Process and Requirements

After completing the record drawing request process as per section 3.1, for any proposed work in proximity to MV infrastructure, the proponent must notify and obtain consent from MV prior to the start of work. As part of the notification, the proponent must prepare a Notice of Work submission package.

6.1 Notice of Work Submission Process

A number of submissions may be required to produce a complete package

MV staff will review the proponent's submission package to determine if the requirements detailed in this document and any site specific requirements are adequately addressed.

If the submission package does not adequately address the requirements, MV will advise the proponent of any elements that fail to meet the requirement and will review the proponent's subsequent amended submission packages.

6.2 Submission Package

Any proposed construction in proximity to MV infrastructure requires submission of a package to constructreview@metrovancover.org and should contain the following information, as described in detail in Section 7.0, at a minimum:

- Application letter
- General site plan
- Issued for Review drawings
- Work plan
- Project schedule
- Equipment list
- Emergency Response Plan
- Technical studies, where required

6.3 Consent Notification

Consent will not be provided until all submission requirements are provided and considered satisfactory

If the proposed approach to working around MV infrastructure is to MV's satisfaction, MV will issue a written consent notification with conditions (if any) to the proponent. The proposed work must not commence until this notification is received. Consent will not be provided until all requirements are submitted and considered satisfactory by MV.

Where Proximal Work is proposed within areas of MV land tenure, a consent agreement provided by MV's Real Estate Services will be required before the work may commence. See section 4.2.

6.4 Submission Review Timelines

Overall review timelines are dependent on the quality and completeness of the submission package.

Allow sufficient time for the review process and to gather any information MV may procure during the course of the review. The overall timeline for the review is therefore highly dependent on the completeness of the application and the quality of the information provided.

In general, allow for a minimum of 15 business days for MV's review of the Notice of Work submission package plus an additional 15 business days for the review of each subsequent amended submission package provided.

To minimize submission iterations and long review timelines, clearly show how each MV requirement is clearly met in the submission package. Supply only the necessary information.

7. Notice of Work Submission Package Requirements

The following are the minimum Notice of Work submission package requirements. These minimum requirements are provided as guidance only. Each submission may be reviewed on an individual basis and additional requirements or conditions may be added.

7.1 Application Letter

The application letter must include the following:

- Applicant and applicant representative (proponent or its contractor or consultant) contact information
- Purpose of the project
- Location of the proposed work
- Description of the proposed work
- Tentative construction start date and duration

7.2 General Site Plan

The general site plan must clearly show the following:

- project extents/site limits including north arrow, reference street names or landmarks
- location and placement of the proposed work
- existing and, if known, future MV infrastructure
- all other known existing utilities adjacent to MV infrastructure
- marked Proximal Work areas
- offset distances to MV infrastructure
- locations of live loads including site access routes and turnarounds
- locations of dead loads including equipment storage areas, staging or landing areas and stockpiles
- property information including MV and other registered statutory rights-of-way, easements or covenant areas, public or private road allowances and property boundaries

Both permanent and temporary loadings have the potential to result in displacement of MV infrastructure

7.3 Design Drawings

Field confirmation of MV facility location is recommended and may be required at MV's discretion

Issued for Review design drawings must be dated with a title block and include plans, profiles, sections and details that clearly indicate the following:

- type, construction material, specifications, and dimensions of the proposed works
- vertical and horizontal location of the proposed works
- location and depth of MV infrastructure
- vertical and horizontal clearances between the proposed works and existing MV infrastructure
- excavation design and temporary shoring or falsework design, where required
- engineered temporary support of MV infrastructure

7.4 Work Plan

Provide a work plan that outlines:

- the scope of the proposed works as it pertains to existing MV infrastructure
- general sequence of pre-construction and construction/remediation activities
- proposed methodology for performing various phases of the work, including general sequencing of work activities, the use of the site for staging, stockpiling and other activities
- method of construction including proposed construction equipment, means of access and their proximity to MV infrastructure

7.5 Project Schedule

Provide a project schedule (and subsequent updates) that indicate the anticipated start dates and duration of the design (if applicable) and construction of Proximal Works. If a significant number of Notice of Work packages are anticipated, MV may request a submission list which should include proposed timing of delivery of such packages.

7.6 Equipment List and Specifications

Provide a list and specifications for all equipment proposed during construction. For equipment with payloads, provide:

- gross vehicle licensed weights
- expected loaded weights
- specifications including weight distribution
- ground pressure
- if requested, structural and/or geotechnical analysis against failure
- protective measures if required

Axle loadings and configurations help determine if existing and proposed protective measures are suitable

If equipment is to be assembled on-site and may be operated in proximity to MV infrastructure, provide a loading plan that includes the following:

- axle and outrigger loadings
- axle and outrigger configuration diagram

7.7 Emergency Response Plan

Submission of project level Emergency Response Plans may be insufficient if they do not specifically address accidental damage to MV infrastructure

Damage to water utility infrastructure has the potential to cause the release of chlorinated drinking water into the environment. Damage to sewer utility infrastructure has the potential to cause release of sewage into the environment. The emergency response to such damage may be complex and require coordination amongst the utility owners/operators, agencies, and governments in order to maintain the utilities continued provision of essential operations, ensure public safety, and mitigate any effects on the receiving environment.

For the proposed work, provide an Emergency Response Plan that includes:

- detailed procedures for avoiding damage to utilities (risk avoidance measures)
- actions to be taken in the event of damage to an MV facility
- a spill containment plan
- an emergency contact list
- notification procedures should damage occur

The "Emergency Preparedness and Response - Damage to or Spill from a Water Main or Sanitary Sewer" document is provided in Appendix A to assist with the development of an Emergency Response Plan.

8. Technical Study Requirements

Removal or addition of soil fill including pre-load requires geotechnical and structural studies

If the proposed construction involves removal or addition of soil or implementation of ground improvement techniques such as preloading with soil fill or soil densification over or in close proximity to existing MV infrastructure, MV requires that geotechnical and structural assessments be completed and a report produced that is shared with MV. The report(s) must:

- address the potential impact to MV infrastructure due to the proposed work
- provide recommendations to alleviate or mitigate the impact
- be completed by a qualified Professional Engineer(s) registered in the Province of British Columbia

8.1 Geotechnical Assessment

The geotechnical assessment report must clearly state:

- soil analysis (including the properties of soil) and borehole logs
- identify any factors of safety and condition assessments of the existing infrastructure
- the work and loads assessed. The assessed loads shall include an analysis on the proposed net weight gain on the MV facility and design concept(s) to minimize the net weight gain and/or actions to mitigate effects of the assessed loads
- for ground improvements, the extent of proposed work and zone of influence for the technique proposed
- where applicable, the maximum height of fill, type of fill materials, maximum excavation depth, and stabilization technique proposed

Simply stating "no impacts" is insufficient; studies must indicate the predicted settlement and/or vibration expected

- any impacts expected **specifically** to MV infrastructure from the activities and method of construction (including excavation, preloading, ground densification, de-watering, drilling, construction equipment and vehicle loading) and recommended measures to be taken to mitigate impacts
- the predicted settlement, differential settlement, lateral displacement and/or vibration expected (quantitative, not qualitative) and the method used to determine values
- a statement indicating if the values meet MV's geotechnical tolerance guidelines shown in Table 2 and Table 3, unless otherwise advised by MV
- mitigation and monitoring requirements to verify that the analysis results are not exceeded

TABLE 2: METRO VANCOUVER GEOTECHNICAL SETTLEMENT TOLERANCES

APPLICATION	PARAMETER	TOLERANCE
Water or sewer – Welded steel main	Horizontal and vertical differential displacement	1 in 1000
Sewer – Reinforced concrete pipe	Horizontal and vertical joint displacement	1 in 1500
Sewer – HDPE/PVC pipe	Horizontal and vertical joint displacement	1 in 1200
Sewer – general	Sag or uplift in pipe profile over affected length	10mm

TABLE 3: METRO VANCOUVER GEOTECHNICAL VIBRATION TOLERANCES

APPLICATION	TOLERANCE (MM/SEC)	NOTES
Water – Welded steel main	25	Measured at pipe surface
Sewer	25	Frequencies between 25 and 100 Hz Measured at pipe surface
	19	Frequencies between 3 and 10 Hz Measured at pipe surface

Allowable tolerances for MV infrastructure will be based on the current condition of the pipe and the pipe material and will be evaluated on a case-by-case basis. These tolerances should be considered as a guide only.

8.2 Structural Assessment

In conjunction with the geotechnical assessment, an assessment of the structural impacts to existing MV infrastructure is required. This structural assessment will consider the impact that live load, dead load, internal pressure, soil characteristics and settlement have on MV infrastructure.

If it is determined that the proposed work will cause unacceptable stress to existing MV infrastructure, an alternative design must be proposed to eliminate this concern. Alternative measures may include reduced fill height, use of lightweight fill or bridging.

8.3 Monitoring Program

Monitoring programs must include ongoing review and reporting from a Geotechnical Engineer

MV requires that a settlement and/or vibration monitoring plan be prepared and overseen by a Geotechnical Engineer for any major excavation, ground improvement, piling, drilling, boring or dynamic loading work, completed in proximity to existing MV infrastructure. Recording of settlement, vibration and, in some cases, use of inclinometers may be required.

The monitoring program must include:

- a plan drawing indicating the number and locations of monitoring gauges
- the frequency of measurements
- initial baseline, construction and post construction monitoring schedule
 - Settlement monitoring results shall include northings, eastings and elevations. Baseline readings including identification of benchmarks must be established before any construction can proceed at the site. Baseline settlement readings shall be provided to MV prior to construction start. (See also Section 9.6)
- reporting frequency and method
 - The monitoring results shall include a sample calculation and analysis of the differential settlement in all three directions within the affected area.
- the interpretation of results
- triggering points and proposed actions if the prescribed limits are exceeded
 - The proposed monitoring plan and interpretation of the monitoring results by a Geotechnical Engineer shall include a three-point warning system where the work is monitored as green (proceed) yellow (warning, monitor procedures closely) and red (cease work).

8.4 Pre-Construction Closed Circuit Television and/or Sonar

In the case of gravity sewers, at the request of MV Technical Representative, the proponent may be required to submit a pre-construction Closed Circuit Television (CCTV) video (720p resolution or better) and/or sonar inspection, including inspection report meeting NASSCO PACP condition grading guideline.

9. Construction Requirements

Once MV provides written consent, the proponent will have to arrange for inspection by an MV Technical Representative. After an MV Technical Representative has been scheduled for inspection, construction of works as described in the Notice of Work is permitted to begin. Proponents are to follow WorkSafe BC Occupational Health and Safety Regulations applying to worker training, procedures and safety requirements. Parties working proximal to MV infrastructure are responsible for all damage to MV infrastructure and the environment as a result of the work.

9.1 Locates and Daylighting

Early locates are recommended as design changes following locates will likely require resubmission of a Notice of Work package

The proponent is responsible for identifying the depth and location of the MV infrastructure prior to construction. Field confirmation of MV facility locations is recommended and may be required at MV's discretion. Written consent from the MV Technical Representative from each affected department must be received before the work commences.

9.2 Inspection

It is at MV's discretion for an MV Technical Representative to be on site at the start of the works and for as long and as often as deemed necessary. Please contact MV to arrange for a representative to be present during the works after MV provides written consent and at least 10 business days prior to the start of the Proximal Work.

The MV Technical Representative does not provide direction or supervision to site construction crews

The MV Technical Representative monitors work around MV infrastructure, identifies areas of concern, and observes whether MV requirements are being met. The MV Technical Representative is not to be seen as a technical resource or to be asked to provide directions. It is the proponent's responsibility to develop and execute the construction methodology, provide direction to site crews, and ensure that MV's requirements are being met.

9.3 Quality Control and Assurance

The proponent is responsible for the quality control of the work, in addition to site inspections and engineering field review (if applicable), and must keep MV's Technical Representative informed through regular correspondence, quality control inspections and reports.

At MV's discretion, MV may conduct quality assurance of the work, but this will not relieve the proponent from its obligations under the proximal work requirements or the written consent.

9.4 Proximal Excavations

Only hand tools and/or hydro-vacuum excavation tools are to be used within 500mm horizontally and vertically of MV infrastructure, or as directed by the MV Technical Representative.

9.5 Existing Infrastructure

All existing infrastructure must be protected from damage. If the existing MV water or sewer main is exposed, the proponent is responsible for restoring pipe bedding and backfill to MV standards. MV maintenance holes shall not be opened without written consent from a MV Technical Representative.

9.6 Settlement and Vibration Monitoring

- **Monitoring Points**

The pipe settlement monitoring points shall be installed on the MV sewer or water main as per MV standard detail (see Appendix B) unless MV directs otherwise. An MV Technical Representative must be present when this work is carried out (see Section 9.2).

Baseline surveys must be completed prior to the start of Proximal Work

Initial baseline survey monitoring must be conducted before the work starts and the results must be forwarded to the MV Technical Representative within 1 business day. The submission must include a scaled site plan for the locations and reference numbers of the monitoring points (see Section 8.3).

Vibration tolerances are specified at the pipe surface. If measuring vibrations at the pipe surface is not practicable or advisable, monitors may be located elsewhere if it can be shown that the readings provide a reliable indication of the vibration levels at the pipe surface.

- **Submission of Readings**

Submit raw monitoring data promptly followed by monitoring reports

Raw monitoring data (e.g., survey elevations or vibration readings) must be shared with MV within 1 business day of collection followed by regular analysis and reporting of the monitoring results as outlined in the Monitoring Program (see Section 8.3).

Settlement monitoring data should be collected to a tolerance of +/-1 mm.

- **Exceedances**

If the settlement or vibration exceeds the specifications detailed in Tables 2 and 3 (or as otherwise required by MV) during construction, the work must cease and the MV Technical Representative must be notified. Any fill placed must be removed immediately and an alternative design and/or method proposed.

9.7 Notification of Changes

Any changes to the schedule, design details, work methods, or equipment related to work proximal to MV infrastructure must be immediately identified to the MV Technical Representative. Revised drawing submissions indicating the proposed changes must be forwarded to MV Technical Representative for review.

MV's review timelines apply to review of design changes

If the alteration affects a portion of the project that was subject to a geotechnical or structural study, a review of the alteration, summarized in a letter report prepared by a Professional Engineer registered in the Province of British Columbia must be provided to MV for review. MV's standard review timelines (Section 6.4) apply to design changes.

9.8 Emergency Response

Site staff must be trained on how to respond to damage to MV infrastructure

It is expected that on-site personnel are trained on how to respond to damage to MV infrastructure or a spill to the environment (as defined in applicable provincial or federal legislation [see Appendix A]) and have easy access to the supplies necessary to mitigate/minimize spill impacts to water and sewer operations and to the receiving environment.

9.9 Decommissioning

Decommissioning of MV infrastructure requires separate application and approvals

Where the proposed work includes the permanent removal of MV infrastructure from service, the infrastructure must be removed at the proponent's cost and in accordance with MV's decommissioning practice. An application and approval process separate from the Notice of Work process is required. Decommissioning must not commence until proper authorization is obtained.

9.10 Live Sewer Interfaces

Live sewer interfaces include bypasses, tie-ins, isolations, containments, switching flows, pipe draining and filling, or any other work that involves managing live sewage.

For procedural requirement and a checklist, the proponent shall request from the MV Technical Representative and adhere to the requirements.

10. Post-Construction Requirements

10.1 Monitoring Points

Unless otherwise indicated by MV, all monitoring points must be decommissioned and removed following the completion of the Proximal Work.

10.2 Post-Construction CCTV and/or Sonar

When pre-construction CCTV and/or sonar inspection has been requested, the proponent must complete post-construction inspection and submit inspection results and report to the MV Technical Representative.

10.3 Notification of Completion

Upon completion of the work described in the Notice of Work submission, the proponent must notify MV in writing within 10 days of the completion.

10.4 Record Drawings

Relocation record drawings are to be submitted ready for inclusion into MV's engineering drawing collection without the need for further edits by MV

Record drawings of all Proximal Works should be submitted to MV for record keeping. For works that involve modification to MV infrastructure such as relocations of MV infrastructure, MV requires record drawings to be:

- Completed on MV title blocks
- Completed to MV drafting standards
- Numbered using MV's convention – MV will provide drawing numbers
- Sent to MV for technical and drafting review and approval
- Once finalized, provided as two authenticated full-size copies and digital copies of the scanned PDF and CAD file

Appendix A — Emergency Preparedness And Response To Damage Or Spill From A Water Main Or Sanitary Sewer

Emergency Preparedness and Response to Damage or Spill from a Water Main⁵ or Sanitary Sewer⁵

1. Introduction

If you think you have caused a drinking water or sewage spill, rapid response is a priority

Drinking water and sewer main breaks have the potential to cause many adverse impacts including damage to persons or property, harm to surrounding environments and in the case of water mains, contamination of the drinking water supply. The emergency response to such damage may be complex and require coordination amongst the utility, agencies, and governments in order to maintain the utilities continued provision of essential operations, ensure public safety, and mitigate any effects on the receiving environment. If you think you have caused a drinking water or sewage spill, rapid response is a priority. The proponent and if applicable its contractor is to follow WorkSafe BC Occupational Health and Safety Regulations for training, procedures and safety requirements during all emergency response activities.

⁵ The proponent's bypass, isolation or containment system, its equipment or infrastructure are not considered to be a Metro Vancouver "water main or sanitary/combined sewer" within the meaning of Appendix A. The proponent is responsible for all emergency preparedness and response in relation to a bypass, isolation or containment system. For clarity, where any of these systems sustains damage and causes a spill or could cause a spill, the proponent is responsible for all emergency response actions including but not limited to: as soon as possible, stopping the spill or a potential spill and containing and mitigating its effects; reporting the spill or a potential spill to regulators; and upon becoming aware of the spill or a potential spill, informing Metro Vancouver using the emergency hotline: **604-451-6610**.

2. Site Inspection and Preparation

It is the proponent's responsibility to be familiar with all environmental regulations^{6,7} as well as the site specific environmental considerations associated with a potential drinking water or sewage spill from the work area.

It is essential that the proponent:

- Ensure locations of existing mains have been accurately determined before excavating.
- Identify nearby environmentally sensitive habitats, such as fish and non-fish bearing waterbodies, wetlands, ephemeral (seasonal) streams and storm catch basins and their proximity to the work area. Note that catch basins may lead to these habitats.
- Determine flow paths from potential break sites to the sensitive habitats. Plan and prepare for constructing temporary berms to direct water away from these areas in the event of a spill.
- Discuss work with MV and the local jurisdiction so a coordinated repair procedure can be planned should an incident occur.
- Ensure necessary supplies and equipment are readily available and staff have been trained in their use.
- Secure the work area to prevent unauthorized personnel from entering.

TABLE A1: RECOMMENDED SUPPLIES

TASK	DESCRIPTION
De-chlorination	Minimum of 40lbs of sodium sulfite pucks in mesh deployment bags, SDS & PPE for product
Containment/Diversion	Sandbags for construction of temporary berms

6 Environmental Management Act, SBC 2003, c 53 http://www.bclaws.ca/civix/document/id/complete/statreg/03053_04

7 Fisheries Act, RSC 1985, c F-14 <https://laws-lois.justice.gc.ca/eng/acts/f-14/>

3. Emergency Response Steps

Ensure the area is safe to access before initiating spill response actions.

TABLE A2: EMERGENCY RESPONSE STEPS

For all other types of environmental spills or incidents, the proponent will follow the project-specific emergency response and reporting plan.

EMERGENCY RESPONSE STEPS	
	Contact your Supervisor and cease adjacent construction activities.
	Call Metro Vancouver’s water & sewerage emergency hotline (monitored 24-hours) immediately at 604-451-6610
	For Drinking Water: Place dechlorination product (10-15 sodium sulphite tablets per mesh bag) within all flow paths of the drinking water spill, as close to the leak source as possible. Bags should achieve 100% surface contact with leaking water prior to it entering a catch basin and/or any nearby watercourse or drain.
	For Sewage: Make every reasonable effort to contain the spill onsite.
	Use any means possible to prevent water or sewage from exiting the site or entering an environmentally sensitive habitat (waterbody, wetland, etc.) including setting up containment, using bypass pumping, and/or vacuum trucks.
	Maintain control measures in place and wait for further direction from Metro Vancouver Operations.

Metro Vancouver will be responsible for all verbal and written reporting to regulators that is associated with drinking water and sewage spills except for a proponent’s bypass pumping and containment system. The proponent shall not provide information to the media without Metro Vancouver authorization.

4. Post-Incident Investigation

Metro Vancouver will require assistance from the proponent staff who were onsite when the incident began, or involved in incident response in order to complete the post incident investigation.

Accurate and detailed record keeping during an incident is essential for post-incident investigations

To aid this process the proponent will:

1. Record and share the details of how the incident occurred including start time and sequence of events.
2. Record and share actions taken for initial response as and when they are completed. Gather photos and video of the incident.
3. Participate in post-incident investigation under the guidance of Metro Vancouver staff after the emergency is under control.
4. Provide Metro Vancouver all pertinent environmental information gathered on the site prior to, or following the incident.

5. Costs

The proponent will be responsible to reimburse Metro Vancouver for all costs, expenses or third party liabilities sustained by Metro Vancouver arising directly or indirectly from the damage or spill incident, incident response, repair, investigation and/or reporting.

Appendix B – Typical Settlement Gauge Details

metrovancover
ENGINEERING STANDARDS
Typical Settlement Gauge Details

Standard #:
CR-02-02-DS-SAI-00106
Published on: Aug 21, 2009
Printed on: 08/18/2009
Page 1 of 1

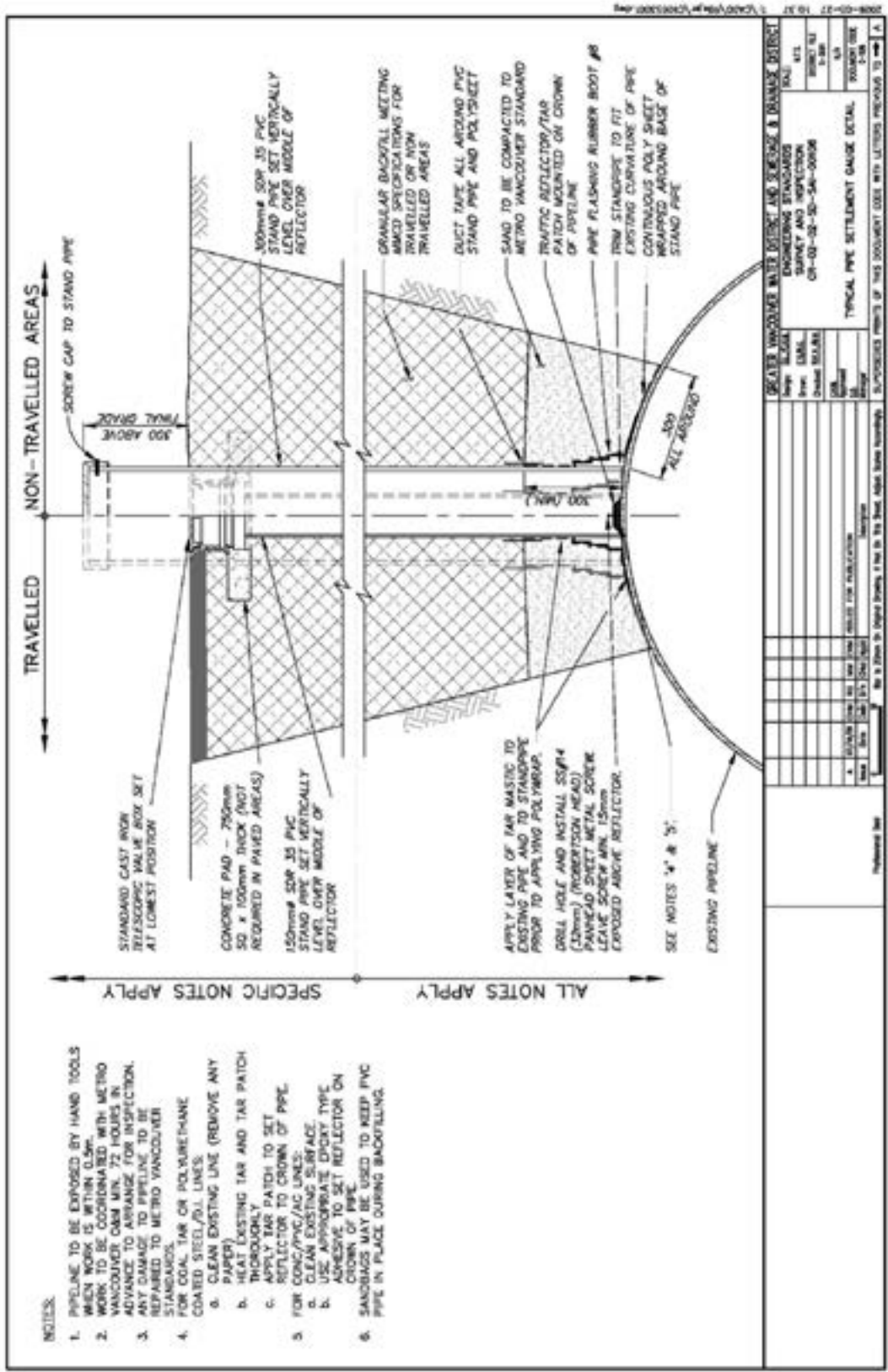
1.0 SCOPE:

1.1 *This Standard is intended for use by Metro Vancouver staff or consulting engineers working on Metro Vancouver projects, subject to site specific requirements, suitability of the usage of products, materials and methods referred to, as well as the conditions and assumptions noted. The engineer who signed and sealed this Standard is responsible only for the detail/document as presented and the appropriate use of the Standard is the user's responsibility. When used by a consulting engineer, he/she shall review the material and take full responsibility for the content of the Standard while incorporating it in their design or applying it in construction. If any alteration or deviation is made from the Standard, the appropriate Metro Vancouver discipline supervisor shall be notified.*

2.0 DRAWING:

2.1 *This document covers the following drawing:*

<i>DRAWING ISSUE</i>	<i>DATE</i>	<i>DESCRIPTION</i>
C-106	July 16, 2009	Typical Pipe Settlement Gauge Detail



- NOTES:**
1. PIPELINE TO BE EXPOSED BY HAND TOOLS WHEN WORK IS WITHIN 0.5m.
 2. WORK TO BE COORDINATED WITH METRO VANCOUVER O&M MIN. 72 HOURS IN ADVANCE TO ARRANGE FOR INSPECTION.
 3. ANY DAMAGE TO PIPELINE TO BE REPAIRED TO METRO VANCOUVER STANDARDS.
 4. FOR COAL TAR OR POLYURETHANE COATED STEEL/POLY LINES:
 - a. CLEAN EXISTING LINE (REMOVE ANY PAPER)
 - b. HEAT EXISTING TAR AND TAR PATCH THOROUGHLY
 - c. APPLY TAR PATCH TO SET REFLECTOR TO CROWN OF PIPE.
 5. FOR CONC/PVC/AG LINES:
 - a. CLEAN EXISTING SURFACE
 - b. USE APPROPRIATE EPOXY TYPE ADHESIVE TO SET REFLECTOR ON CROWN OF PIPE
 6. SANDBAGS MAY BE USED TO KEEP PVC PIPE IN PLACE DURING BACKFILLING.

GREATER VANCOUVER WATER DISTRICT AND SURROUNDING DISTRICTS

Project No.	2011-01-01-01-01-01-01
Drawn By	DLM
Checked By	DLM
Scale	AS SHOWN
Date	2011-01-01
Project Name	GREATER VANCOUVER WATER DISTRICT AND SURROUNDING DISTRICTS
Project Location	10000th Street, Surrey, BC
Project Description	REPAIR AND MAINTENANCE OF WATER MAINS
Project Status	CONSTRUCTION
Project Manager	DLM
Project Engineer	DLM
Project Designer	DLM
Project Checker	DLM
Project Approver	DLM
Project Date	2011-01-01
Project Version	1.0

TYPICAL PIPE SETTLEMENT GAUGE DETAIL

Project No.	2011-01-01-01-01-01-01
Drawn By	DLM
Checked By	DLM
Scale	AS SHOWN
Date	2011-01-01
Project Name	GREATER VANCOUVER WATER DISTRICT AND SURROUNDING DISTRICTS
Project Location	10000th Street, Surrey, BC
Project Description	REPAIR AND MAINTENANCE OF WATER MAINS
Project Status	CONSTRUCTION
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Project Checker	DLM
Project Approver	DLM
Project Date	2011-01-01
Project Version	1.0

Professional Seal

DLM

2011-01-01

Appendix C - Additional Requirements for Utility Undercrossing MV Sewer and Water Mains

Engineered details of temporary pipe supports signed and authenticated by a registered Professional Engineer licensed in the Province of British Columbia shall include, but are not limited to: pipe material type, size, depth, joints, bends, reducers, orientation of proposed crossing, width of the excavation, ground water and soil conditions, all aspects of the pipe support system including the beam, beam bearing support surfaces, location of abutments and support strap details, methodology for installing the pipe support, excavation, excavation support, backfill and compaction in the vicinity of the pipe, and all other details considered to ensure the MV pipe is not damaged or the pipe joints are not compromised as a result of the proposed crossing.

The following conditions apply for all MV sewer or water main unless authorized otherwise:

- Crossings should be done perpendicular to MV sewer or water main whenever possible.
- If the MV sewer is asbestos cement, vitrified tile, fiber reinforced, or has deteriorated joints, all exposed joints must be encased with an approved repair clamp or fiber-wrapped and be fully supported.
- Supporting beam to extend to solid ground beyond the angle of repose of the soils, which must be recommended by a Professional Engineer registered in the Province of British Columbia. If shoring is proposed, supporting beam suspending the pipe should not bear on the shoring which could settle.
- Supporting beam and straps need to be stabilized to prevent horizontal movement, installed on levelling shims and/or bearing plate of sufficient size and thickness, which must be recommended by a Professional Engineer registered in the Province of British Columbia.
- Size, material, quantity and spacing of supporting beam, leveling shims/ bearing plate to be recommended by a Professional Engineer registered in the Province of British Columbia.
- Size, material, quantity and spacing of supporting straps to be recommended by a Professional Engineer registered in the Province of British Columbia.
- Employ non-stretch polyester straps that can be cut off and abandoned after use. For longer duration supports, metal strapping may be required at MV's discretion.

- Straps should have pads (wider than the straps) installed between them and the pipe wall to prevent gouging because otherwise the straps will act like point loads.
- Discrete pockets to be dug one at a time (ie: max 300mm wide), to allow a strap to be slid underneath the pipe bottom one at a time and fully tensioned before digging an adjacent pocket.
- Not more than 1 pipe joint can be exposed at any time.
- Not more than 1 utility can be constructed across the sewer in a single excavation.
- There shall be at least three monitoring points installed for any exposed pipe/ joint, one on each side of the trench and one on the center of the exposed pipe/ joint to confirm any settlement is maintained within acceptable tolerances. Additional monitoring points shall be installed by the proponent at MV's discretion.
- For pipe bedding and haunch support, if adequate placement and specified compaction as per standard trench detail cannot be achieved, place lightweight cellular concrete (LCC) – maximum 0.8 MPa at 56 days and density to prevent buoyancy, by Gastaldo or approved equivalent —to between one third and half way up from the pipe bottom and extend 1m on either side of crossing. The pipe is to be wrapped with polyethylene sheeting as a bond breaker. LCC shall be placed on clean and undisturbed trench subgrade that is approved by a Professional Engineer registered in the Province of British Columbia.
- Submit LCC mix design prior to placement of LCC for EOR review and approval, and the EOR field review report.
- Placement and compaction of soils above the LCC to take place only after the LCC is hard set.
- To maintain continuous support of the suspended pipe, straps cannot be removed or cut off until after the LCC is set.

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