

## Proposed Changes to the Pipeline Safety Act Regulations, C-46 Canada Gazette, Part I, Published March 19, 2016

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### Overview

Professional Surveyors Canada and its members propose changes to the proposed regulations based on reason and research. Our positions are further informed by review of the existing acts, regulations, standards and experience with problems identified in our practices. Our experience in the underground infrastructure industry deals with both owners of underground infrastructure and the land owners that are adjacent to them. This gives us a unique perspective to be an unbiased advisor on regulations that affect both.

It is imperative for the safety of the public and workers that clear regulations for underground infrastructure including pipelines are well known. It is also imperative that laws and regulations reflect and protect property rights for owners and adjacent land owners. The positions below are reasonable and considerate of that goal and strike a balance of the interests involved. The positions require no further cost to companies related to underground infrastructure as the standards already are followed by prudent owners. The logic for the changes is clear.

The table below proposes additions or wording changes to these regulations. We have tried to ensure that there is no conflict with other regulations or acts, and in some cases cited current regulations that are in concert or slight conflict with our positions. The goal always is for minimum conflict, with maximum benefit to the owners of underground infrastructure, the owners of adjacent lands, the land tenure system and the workers of each. These goals are also influenced by the federal and provincial government's own initiatives which may not be immediately evident, but are corollary to good planning. It is important to realize the needs of digital cadastre standards being implemented.

## Table of Changes Required

- All additions and changes shown in green italics

**Interpretation** page 827

### Definitions

**Addition** *Buried Depth means the vertical distance from the general surface of the ground to the top of any buried infrastructure.*

Buried Depth is also referred to by the term depth of cover or depth. Depth of cover has been used to describe a temporary state and so we selected the specific term for clarity, however, the term is not the important factor. Currently depth is mentioned in reference in CSA standard S250 and depth of cover is used in CSA Z662 in most instances, but not defined in the definitions. CSA Z662 also refers to 'depth of burial' in 10.2.9.5 and 'burial depth' in 10.4.2 and 10.16.5 for example. CSA Z662 refers to varying numerical depths of cover in Table 4.9, but a general depth of cover of 0.75 metres in that table, and 2.0 metres for depth of cover in Table 4.11. There are several regional requirements as well as requirements for rail crossings, road crossings and parallels. The current standards are useful but are insufficient given the reasoning provided below. This is in keeping with proposed changes provided by PSC to Bill S-233. The minimum standard in the US is 3 feet (+/- 1 metre), 'except in bedrock areas which are 2 feet (+/- 0.610 metre). This is reasonable, notwithstanding existing pipelines. This is also the standard to which testing has been done. See below for further discussion.

**Addition** *Buffer Distance means the horizontal distance from a buried infrastructure inside a right of way or easement to a right of way or easement limit.*

Currently there is no sufficient standard for this in legislation. There are standards for buffer distances between underground infrastructures though. A term of 'running line location' which is used to describe an offset from a property line is sometimes used. Buffer Distance is meant to describe all scenarios. The logic and common sense of the matter is explained below.

### General Provisions

**Locate Request** page 827

**Change** **3 (1)** Subject to subsection (2), any person that intends to the construct a facility across, on, along or under a pipeline or engage in an activity that would cause a ground disturbance *or planned ground disturbance* within a prescribed area must make a locate request in the following manner at least three working days before the day on which the construction or activity is to start:

This allows for the safe planning of a facility and addresses the current problem of some utilities refusing locates for arbitrary reasons. See below for further discussion.

## Operation of Vehicles of Mobile Equipment across a Pipeline

Authorization – Operation across pipeline Page 833

**Comment** 12 The precise wording is not known, but if there is a total day requirement for response to a locate request, then there should be a total day requirement for response to a vehicle crossing request. This request type will likely be used mostly where potential or actual harm to a pipeline is minimal, snowmobile, ATV, tractor etc. Therefore a timeframe may garner better compliance by the public.

## Obligations Following Request to Locate

**Timeline** page 840

**Change** 6 (1) Subject to subsection (2), if a pipeline company receives a request to locate its pipes from a person that intends to construct a facility, *or a licenced professional surveyor that is conducting a survey for a planned construction of a facility*, on, along or under a pipeline or engage in an activity that that would cause a ground disturbance.....

## CHANGES WITH NO SPECIFIC PAGE REFERENCE

**Addition** *Owners installing pipelines must maintain a minimum buried depth of one metre except in areas of bedrock or in transition zones between underground and above ground infrastructure.*

**Addition** *Owners installing pipelines must maintain a minimum buffer distance of one metre.*

## Mapping and Cadastral

**Addition** *New pipeline installations crossing private property shall be surveyed and mapped to an accuracy level from level 1 to level 3 in CSA Standard S 250.*

This is best practice and ensures the underground infrastructure actually falls within the easement or right of way. Most prudent owners install underground infrastructure and survey it at the same time. This protects workers, the owner and the public.

**Addition** *Owners installing pipelines across private lands, must register within one year of installation a plan of easement showing the lands affected by the pipeline in a property registry or land titles office in the jurisdiction of that private lands.*

Easement requirements are very similar to Alberta Legislation. This is common sense and allows for everyone to be aware, including One Call of where the limits of rights are. It is important to remember the federal and provincial governments' goals for digital cadastre.

**Addition** *Owners installing pipelines in existing rights of way shall survey and create a permanent record of the installation of the pipeline to the CSA S250 standard, accuracy level 1 to level 3*

## Reasoning

There are five areas of concern that have been observed by our members and the changes proposed are to address those problems. Many of these issues are related. The goal is to have the best system that is the most transparent and fair to all concerned. In some cases we have checked with other standards and studies to determine compliance with or conflict with our proposals. The areas of concern which Professional Surveyors Canada has observed are put in order of importance and are;

### Buffer Distance

In some instances pipelines are still being installed on or very close to the edge of a right of way limit, or easement corridor. This does not make sense and is not in keeping with the best practices of the Canadian Common Ground Alliance, Best Practices 1-2. This is not usually the case for major interprovincial pipelines which are well designed and sufficient easements or rights of way are taken to allow a proper buffer distance, to the best of our knowledge. Adopting the above standards however, will ensure land owners and municipalities are reasonably protected from unfair costs to establish their property limits. A licensed professional surveyor conducting a hand dig, after a locate, in an area to set a property monument should be reasonably assured of no harm. Hundreds of thousands of survey monuments are set each year in Canada. Having some pipeline owners substantially increase the cost or risk of a strike is not reasonable. Prudent owners ensure that pipelines are installed where the design calls for.

Placing pipelines on or very near a right of way boundary, easement boundary, or property boundary adds cost to adjacent land owners and municipalities for no reason. Again these are the few, and prudent owners should not be made to fulfill their obligations when a less than prudent pipeline owner has no guiding legislation. Further, the public has the right to fair use of their land up to that boundary on their side of an easement or right of way, after a One Call request and locates are performed. This buffer distance standard will keep new utilities where they are approved to be, and greatly reduce the risk of the facility being exposed or struck and danger to workers. This does not mean to imply a restriction to underground infrastructure servicing individual properties, nor imply any form of retroactivity.

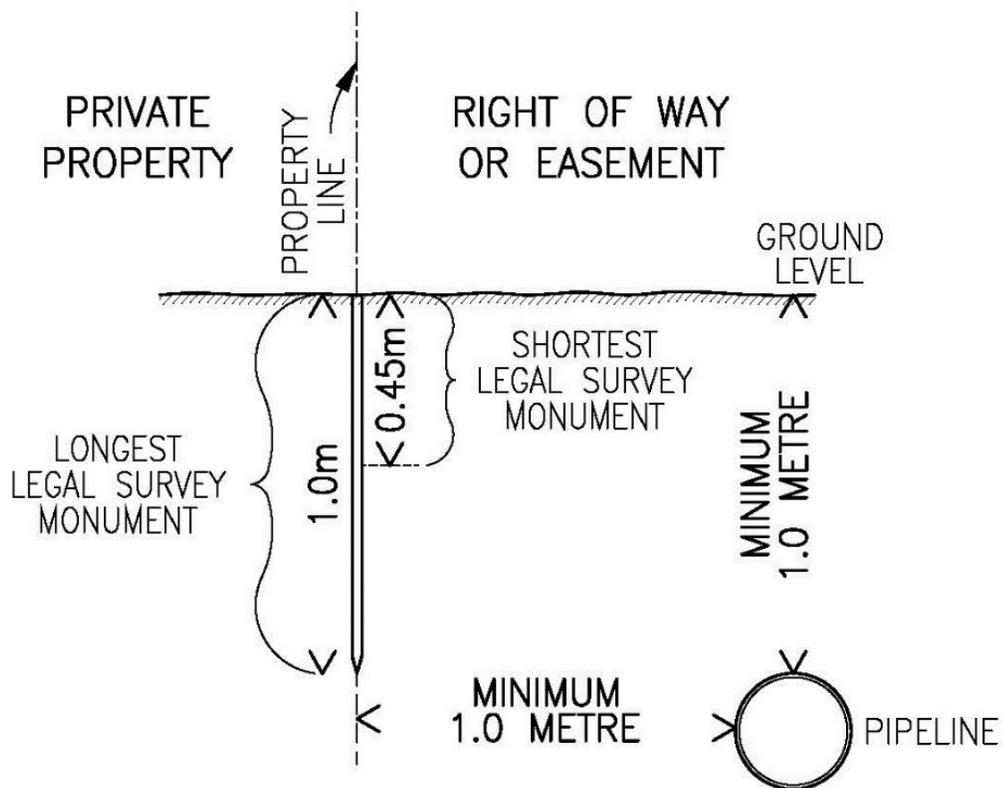
Further, standard underground infrastructure locating equipment is reliable to a distance of one metre from the buried facility depending on depth. Therefore, even with a locate, each facility on a right of way or easement corridor would require a hand dig for placement of say a fence post, where the pipeline is within 3 metres based on the proposed standard. This is expected, but if the actual pipeline is not where it is supposed to be or is within one metre of the right of way limit, a simple fence post may not be possible. This is not fair to the owner of the adjacent lands. The pipeline owner can take a larger easement for the pipeline if necessary, the adjoining land owner has no such advantage. As a comparison, highway curves are 'over designed' for the speed to be posted. In this

way if a driver makes a mistake, they have time to correct and an accident is avoided. Similarly here, adopting a reasonable buffer distance avoids conflict and risk of harm to the public and workers. Aircraft fly with more fuel than the trip requires; buffers are everywhere and they need to be in the pipeline industry as well.

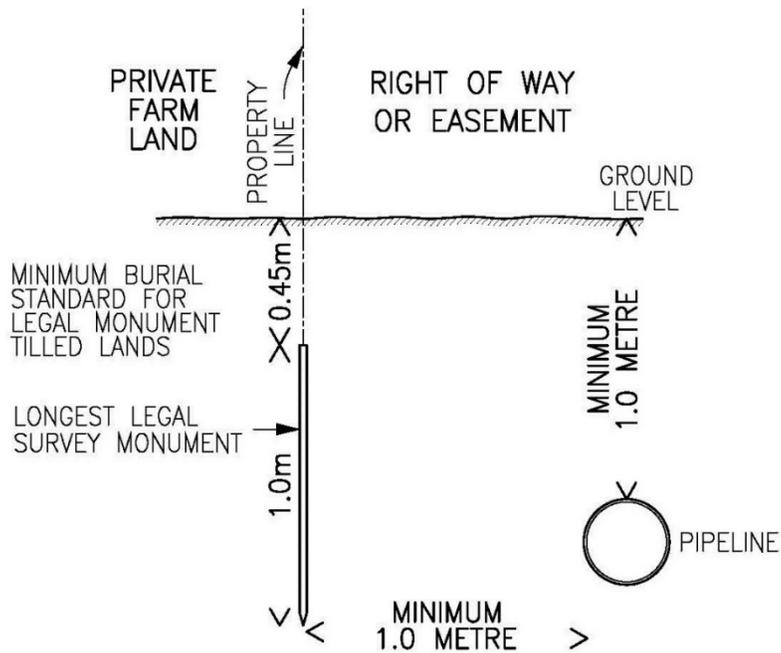
A similar comparison can be drawn from standards across Canada that require a buffer distance between underground infrastructure and buffer distances to existing property lines. It is only logical that a standard buffer distance is applied to the right of way, or easement limit itself. In the case of private lands, the easement can be made as large as necessary so there is not restriction on the area. In terms of practicality the below diagrams illustrate the issue clearly.

## Minimum Underground Pipeline Installation Standards

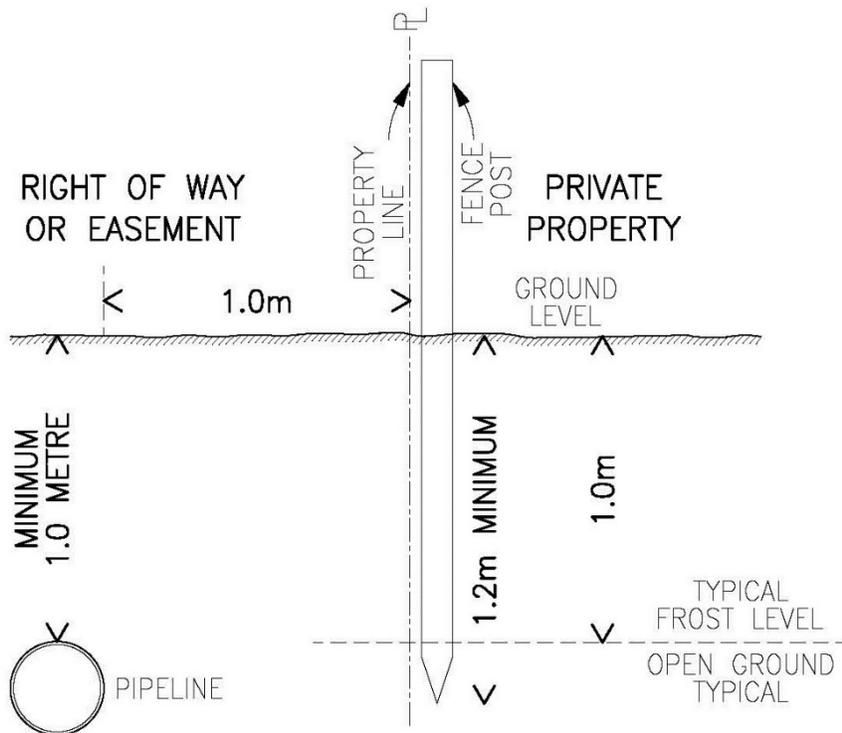
### Non-Farm Lands Installation Standard for Survey Infrastructure



## Farm Lands Installation Standard for Survey Infrastructure



## All Lands Installation Standard for Fences



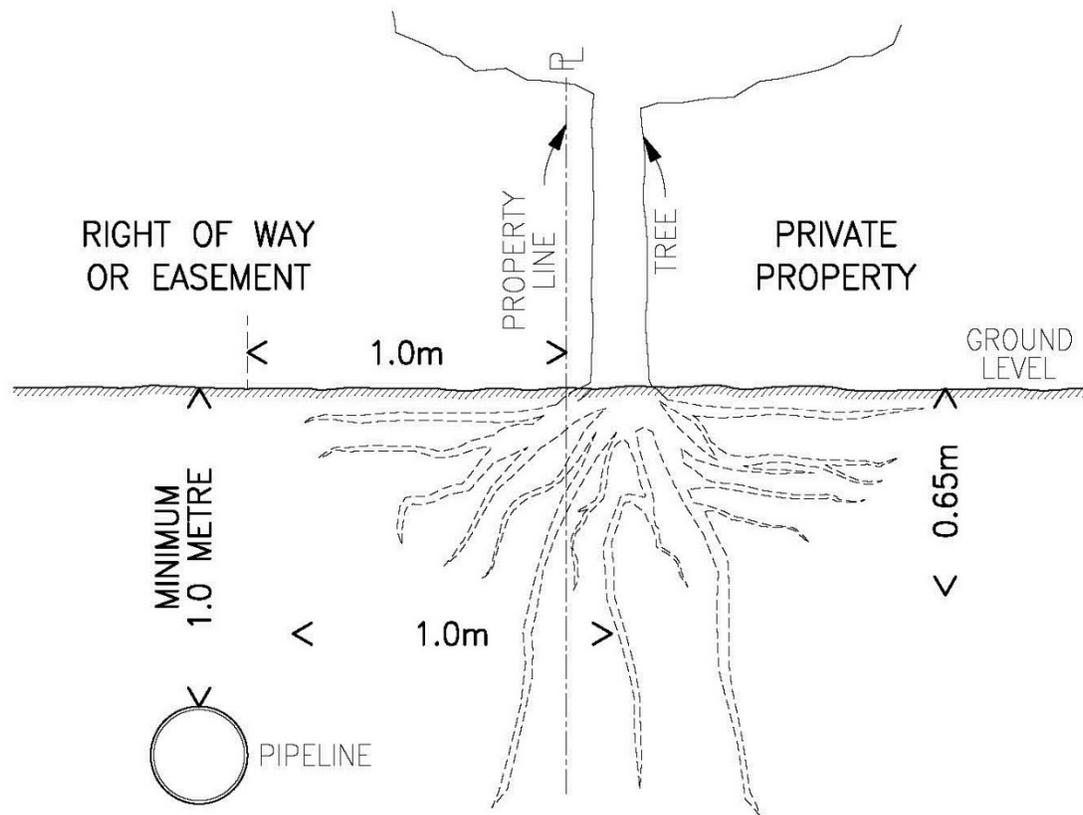
## All Lands Installation Standard for Tree Roots and Potential Upheaval

The following diagram use the best case scenario for a common deciduous tree. It is noted by experts that the bulk of the dense root system parts of most trees in North America exist within the first 1.5 metres of the trunk and to a depth of 1 metre depending on the species.<sup>1 2</sup> There are exceptions in the case of looser soils and varying water availability.

### The American Elm - Example

“**Rooting Habit-** The depth of rooting varies with soil texture and soil moisture. In heavy, wet soils the root system is widespread and within 0.9 to 1.2 m (3 to 4 ft) of the surface. On drier medium-textured soils, the roots usually penetrate 1.5 to 3.0 m (5 to 10 ft). In deep, relatively dry sands in the Dakotas, American elm may develop a taproot reaching 5.5 to 6.1 m (18 to 20 ft) down to the water table.”

### Estimation of Best Case Scenario for Blow Down Potential of Mature American Elm



<sup>1</sup> USDA Root Depth on Global Scale study

[ftp://ftp.aphis.usda.gov/foia/FOLDER\\_10/AR00038244%20Canadell%20et%20al%201996.pdf](ftp://ftp.aphis.usda.gov/foia/FOLDER_10/AR00038244%20Canadell%20et%20al%201996.pdf)

<sup>2</sup> Government of Canada, Root-system morphology of common boreal forest trees in Alberta, Canada

<http://www.nrcresearchpress.com/doi/abs/10.1139/x83-155>

## Blow down effect on surrounding soil of a typical tree.



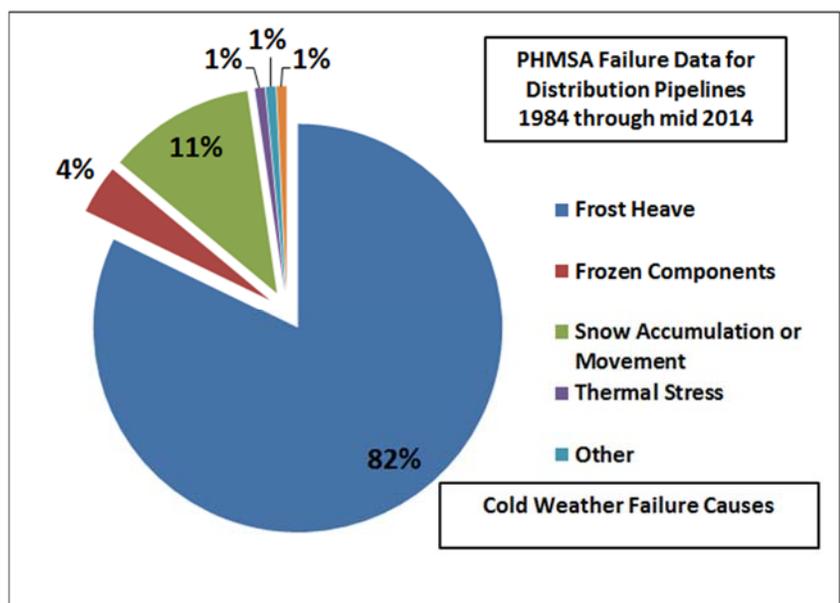
## One Example of Poor Installation of a Pipeline



## Buried Depth or Depth of Cover

The standard should be a minimum of 1 metre of depth of cover or buried depth for all buried pipelines. The chosen name is not important. Currently there is no common legislated minimum standard for safe underground infrastructure placement by pipeline or utility companies. Currently the United States Department of Transport uses a standard for pipeline minimum depth of cover of 3 feet (1 metre) except in areas of bedrock which is 2 feet (0.610m). Within agricultural areas in the United States, it is common for pipeline owners to bury pipelines to a minimum depth of 4 feet (1.220m) to allow for continued agricultural use of the land, shelter belts and other uses. Throughout Canada there are varying standards in various jurisdictions for pipelines depth of cover. This lack of a minimum standard should not be continued and may put the public and workers at risk. CSA standard Z662 is a reference, but the minimum standard proposed should be adopted. All sewer and water lines are placed well below 3 feet for frost purposes and there are far more kilometres of these pipelines than any other. If there is a standard for ground disturbance depth there should be a standard for depth of cover or buried depth, and it just makes sense. Having standards less the American standard appears less robust. A comparison of US and Canadian standards can be found here.<sup>3</sup> (See page 3 and other)

A supplementary reason for having a minimum depth involves frost heave. It is not that the ground will freeze as is effected by temperature and moisture<sup>4</sup>, but rather installations such as fencing or other materials adjacent to rights of way can affect the depth of frost penetration and its actions. Below is an extract from a report noting PHMSA report on damage prevention for pipelines.



<sup>3</sup> Comparison of US and Canadian Pipeline Standards

[https://primis.phmsa.dot.gov/gasimp/docs/FinalReport\\_TransborderStandards.pdf](https://primis.phmsa.dot.gov/gasimp/docs/FinalReport_TransborderStandards.pdf)

<sup>4</sup> Study of Frost Depth

<http://conf.tac-atc.ca/english/resourcecentre/readingroom/conference/conf2008/docs/x1/soliman.pdf>

<sup>5</sup> Kiefner study noting PHMSA data

<http://kiefner.com/wp-content/uploads/2013/05/Gas-Distribution-System-Integrity-Threats-Due-to-Cold-Weather.pdf>

This graph, although reflective of the type of problems noting frost must be put in context however. Most of these problems occurred with older types of piping, and various causes. However, as with the bulk of safety analysis and testing in the United States, the assumption is the depth of cover is 3 feet (1 metre).

Abandoned pipelines have only been partially studied so far, and the effect on abandoned pipelines is ongoing with expected negative effects of heave as noted in studies.<sup>6</sup> Further to this the effect of the heating or cooling of the ground around active pipelines can have an effect on adjacent infrastructure. A simple fence post adjacent to a right of way, can have an effect on frost penetration. This gives more consideration to the 1 metre buried depth and 1 metre offset as possible mitigations. Buried pipelines need to have the most abridged effect on neighboring infrastructure because they are not frost neutral.

Similarly where ground to wire distances are concerned where electrical transmission lines are parallel to or crossing steel pipelines, studies conducted on the effect assume a minimum depth of cover or buried depth of 3 feet (1 metre). This was further studied where faults in the transmission line cause an increase in current discharge to the ground. The calculations for this indicate the larger the depth of cover, the lower the effect of inductive current to a pipeline. Mitigation measure for EMF effects are effective apparently, but studies assumed a minimum depth of cover of 3 feet (1 metre).

## Locates

The third most common complaint by professional surveyors across the country is owners of buried facilities including pipelines (mostly provincially regulated) not performing locates where planning for a ground disturbance is done for a facility. Professional land surveyors will contact individual owners of underground infrastructure directly or through One Call centers for locates to plan a building or road or any development, often during a planned topographic survey in the area. There is usually lots of lead time. The integrated surveying allows for plans to be made for the orderly and safe development of the lands in the area. Some owners will not perform underground locates if there is not an immediate ground disturbance being conducted, citing current regulation wording. As well, locates may be denied for underground infrastructure in existing road rights of ways due to the same current wording. This makes planning for safe development difficult, more expensive, and benefits no one. If the owners will not accurately locate their underground infrastructure in a reasonable time, or outright deny service, who benefits from this? These are unreasonable acts. There is not an upsurge of architects and engineers planning to obtain critical information frivolously. Provisions need to be in place to ensure that information on underground infrastructure is provided in all relevant areas to a development, in a reasonable timeframe. Safe development and safe work rely on good information and should not be a subjective consideration of an owner. Professional Surveyors Canada does support, if necessary, longer lead times for this service, but denial or unreliable as-built information cannot be an option.<sup>7</sup>

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<sup>6</sup> Stantec study of abandoned pipelines. [www.ptac.org/attachments/1693/download](http://www.ptac.org/attachments/1693/download)

<sup>7</sup> TSB Study Westridge Pipeline <http://www.tsb.gc.ca/eng/rapports-reports/pipeline/2007/p07h0040/p07h0040.asp>

## Plans of Easement – Private Lands

In some cases in the oil extraction industry in particular, pipeline easements were only being registered as a caveat on titles. This is usually a provincial issue. Although not allowed in most jurisdictions by way of legislation, the practice has been used. In Manitoba this has led to problems with multiple owners having interest for extraction and pipelines on the same property of the same surface rights holder. This is further complicated as the public registry system does not get the data it requires and further, One Call systems do not have good data that is interoperable.

Members of the Association of Manitoba Land Surveyors have advised oil companies not to do this as it is bad practice and can lead to conflict and hits on lines, especially on new or abandoned pipelines and utilities. Prudent pipeline owners with advice were and are filing public easement plans in the Property Registry in Manitoba. This made their interests open and allowed for proper planning of other pipeline owners and developers, reducing the chance of harm. This is an example of good corporate citizenship by pipeline owners for the betterment of the public, the One Call system, and the landowners. It is recommended that every pipeline crossing private lands, have a plan of easement registered in the land titles office or registry system in that jurisdiction. This is the case in Alberta and should be adopted in legislation here. To the best of our knowledge all interprovincial pipeline rights of way are registered in the corresponding land titles office, but it is unclear if this is the case where these pipelines cross federal lands. This standard would normalize all pipelines whether they cross private lands, First Nation reserve lands, Parks etc. for the betterment of us all.

On a provincial level, an unintended problem occurs in Alberta and other jurisdictions where the above standard is common practice. Often during an extraction agreement with a surface right holder, a blanket easement will be set on the surface right holder's title. Once the plan of easement for the particular area is in place, the original caveat is to be removed. This often does not happen and this complicates development. It is recommended that a regulation exist that prevents blanket easements beyond a reasonable time frame, say 1 to 3 years. This would be similar to other caveats such as mortgages, which have fixed timeframes for removal from title. It just makes sense. The landowner should not have to go cap in hand to the pipeline owner, who already has a caveat and easement plan for the area they are using, to remove a blanket caveat that was necessary to start the process of the plan. This is an example where federal regulation can enhance the system, ensure fair and reasonable practices, and show leadership to the provincial levels.

## Surveying and Mapping

Currently the standards expressed in CSA 250 Table 1 are a good standard given the current technology available. It is recommended that the accuracy Level 1 through 3 in Table 1 of CSA S250 be adopted for all pipelines. The reason for this can be best summed up with a direct quote from Alberta's standards.

"The second factor listed is obviously the most important since it involves a high degree of potential for loss of life, personal injury, and/or property damage. Accordingly, it is necessary to utilize a considerable degree of care in designing a pipeline route, ensuring that the design route is adhered to through a pre-construction survey, accurately measuring and calculating the actual location of the buried pipeline through recognized

survey techniques and, finally, preparing plant location records to serve as a permanent record of pipeline locations. “

Documenting and creating reliable and reliable data about the location and depth of pipelines and other underground infrastructure begins with proper surveys being done during the installation of the pipeline. This is done with every interprovincial pipeline, and given that the declining cost and the increasing ease of this process, there is no longer any reason to not integrate this standard into all new installations. There is no significant cost or other impediment to this any longer.

The Westridge Pipeline was an example where inaccurate data caused problems and the conclusions of the Transportation Safety Board are linked below.

“A post-occurrence site survey revealed that the offset location of the Westridge Pipeline varied from 4 m to 9.8 m from the east property line of Inlet Drive, instead of the constant 8.5 m offset that had been shown on the design drawings. The survey also showed that the sewer trench was excavated according to the design offset of 11.3 m. At the rupture site, the survey revealed that the Westridge Pipeline was only 1.5 m from the centreline of the sewer trench, instead of the 2.8 m separation that had been shown on the design drawings Rev. 1 and Rev. 2 (see [Appendix C](#)).”

<http://www.tsb.gc.ca/eng/rapports-reports/pipeline/2007/p07h0040/p07h0040.asp>

There is no longer any reason for the location and depth data for any underground infrastructure to exist, let alone for new installations. Our members can and do capture this data on pipelines every day in Canada. Professional Surveyors Canada will continue to work with our members and industry associations to ensure an open and reliable system becomes the norm for the benefit of all.

## Related Matters

### Ground Disturbance Standard

Professional Surveyors Canada is of the opinion that having two standards for ground disturbance is not practical. It is confusing, requires explanation, and sets the public into two categories. Adopting a common standard at the 0.45 metre level (1.5 foot) will make the standard more easily understood and fair to everyone. Consider the case where a small subdivision lies adjacent to farm lands. On one side of the boundary, the ground disturbance standard is 0.3 metres, on the other 0.45 metres. This highlights the incompatibility of having two standards. This would greatly reduce the incidents of strikes as a reasonable standard would apply to all, and be easily believed by the public. We have not observed that 1 foot of depth is believed by the public, nor practiced.

### Impacts on the Land Surveying Profession

If the current lack of placement standards for buffer distance and buried depth go forward, placing survey monuments for adjacent private property owners, as defined by most acts and regulations, will increase risk of harm to workers. We cannot do anything about the existing pipelines, but we can do something about the new ones. Ineffective practices need to stop somewhere. Further, the placement standards are hard to justify considering the standards in other jurisdictions that are more robust. As well, due to the lack of placement standards of pipelines within rights of way, actual work

may not be possible, or disproportionately expensive. We do not believe that any legislator knows of this. This can be avoided in most cases by adopting the proposals above.

## Background

Professional Surveyors Canada and the provincial corresponding regulatory and federal bodies were not consulted prior to introduction of current legislation nor standards even though our work requires excavations for evidence around boundaries and placing of survey monuments. Professional surveyors have been performing surveys in Canada since before confederation. We advise our clients on their property rights and how the cadastral systems work. Professional Surveyors Canada continues to promote and create integrated mapping for all underground infrastructure, including pipelines. Our members support pipeline companies in attaining harmonized standards for One Call and mapping for all underground infrastructure and broadly support, with recommended changes, Bill S-233.

The CSA Z247 and S250 Standard were formed by the CSA (Canadian Standards Association) taskforce. The professional surveying community was not widely consulted and input formed a small portion of the consultation in one province. Had a more robust consultation taken place, the duty of professional land surveyors would entail putting forward the proposals above and bringing to the fore the unfairness to landowners and the safety of our workers and theirs. In some instances proposals, were put forward but not adopted. These standards did not consider a minimum depth of cover of placement of the utilities themselves, which is counterproductive. To be clear, we believe the CSA does good work, but the standards in this paper should be adopted.

Studies of real world projects in Ontario concluded that proper surveying during installation of underground utilities saves at a ratio three to one. This is significant cost savings that can ease the financial burden of infrastructure and lead to less accidents, damages and harm. Professional Surveyors Canada is working to better survey, permanently record, and make available these records to better protect the public and our workers by improving the system. The above is the first of many steps yet needed to ensure that goal.