



Utility Corridor Along 14th Street S.W.

January 8, 2016

DISCLAIMER

Although care has been taken to ensure the accuracy, completeness and reliability of the information provided, the participants involved in *ready to engage!* assume no responsibility for such information or content. In using the information, the user of the information agrees that the information is subject to change without notice and that neither *ready to engage!* nor its constituent members assume any responsibility for the consequences of use of such information, nor for any infringement of third party intellectual property rights which may result from its use. IN NO EVENT SHALL *READY TO ENGAGE!* BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL OR INCIDENTAL DAMAGE RESULTING FROM, ARISING OUT OF OR IN CONNECTION WITH THE USE OF THE INFORMATION.

www.readytoengage.ca

ready to engage! is a group of concerned citizens who have joined together to give SW Calgarians and other stakeholders a voice on The City's *SW Transitway and Bus Rapid Transit (BRT)* project

Utility Corridor Along 14th Street S.W.

A utility corridor exists along the entire length of 14th Street S.W. from Glenmore Trail to Canyon Meadows Drive. This report provides information about this corridor as presented in the Calgary South West BRT Functional Planning study commissioned by Calgary Transit in 2010. Details of the utility corridor within this right of way are discussed, including natural gas and petroleum products pipelines, water mains, sewer lines and storm sewers. Pipeline relocation challenges are identified, as well as safety and risks to nearby communities.

South West BRT Function Planning Study

Calgary Transit commissioned the Calgary South West BRT Functional Planning Study, which was completed by Delcan in October 2010.¹ The following is directly from the Delcan study:

"There is a substantial utility corridor on the east side of 14 Street...which limits potential road development. The utility corridor consists of various deep utilities; stormwater, sanitary and water, and shallow utilities including; street lighting, pipelines and likely telecommunications."

"There is a utility corridor that runs parallel to 14 Street SW along the east side within the right-of-way. It is not desirable to construct or operate a roadway or busway over these utilities. Utility relocation would be significant."

Details of Utility Corridor

There are numerous pipelines in the utility corridor that range from water and sewer lines to high-risk, high-pressure natural gas and petroleum products pipelines. Conoco Phillips and Plains Midstream each have 2 licensed pipelines along 14th Street. There may be other unregistered pipelines present as 14th Street acted as the corridor for pipelines between the Turner Valley Field and the Oil refinery in SE Calgary dating as far back as 1920. In the early years of the petroleum industry in Alberta, regulations requiring licensing of pipelines and registration of legal surveys marking them were far less precise than in more recent times. For example, when The City undertook the Glenmore Trail/Elbow Drive/5th Street SW Interchange Project (GE5), which is along the same pipeline corridor, a number of unregistered pipelines were discovered that had been discontinued and left in place, This required abandonment and removal of the pipelines discovered by The City and added greatly to the time and cost of constructing the underpass (budget and schedule were grossly exceeded compared to original estimates). Similar experiences with budget and schedule were encountered more recently with relocation of utilities associated with the redevelopment of Elbow Drive from 4th Street to Sifton Boulevard, as well as relocation of utilities on 8th Avenue at the commencement of the West LRT.

¹ *Calgary Southwest BRT Functional Planning Study*, Calgary Transit.
https://www.calgarytransit.com/sites/default/files/reports/calgary_sw_brt_functional_planning_study_20110802.pdf

Plains Midstream and Conoco Phillips have pipelines immediately adjacent to the traveled roadway on both east and west sides of 14th Street (oil on both sides and gas on the east side). Currently, the Plains Midstream pipelines are classified as “discontinued” which is a technical term meaning not in service but not formally abandoned. Plains Midstream has not completed formal "abandonment" of its pipelines, possibly to defer additional cost. It is not known if the pipes have been purged which opens the possibility that there may be residual oil left in the lines which could potentially result in a spill if the line or lines are accidentally punctured or removed improperly. The Conoco Phillips oil pipelines have been abandoned in place which suggests they have been purged of hydrocarbons, cut and capped. Conoco representatives indicated they would like to remove their pipelines, but realize it would be very expensive and disruptive to traffic flows along 14th Street.

ATCO Pipelines has a high pressure natural gas pipeline immediately beside the east lane of 14th Street between Heritage Drive and 75th Avenue. This is a 10-inch diameter, high-pressure pipeline with an operating pressure of 300 psi that supplies natural gas to a large portion of southwest Calgary. ATCO estimates the depth of cover over this pipeline to be approximately 0.8 to 1.0 meter, which is far too shallow for traffic over it. ATCO indicated it has plans to reduce the pressure in this pipeline sometime in 2018 but not before its new high pressure gas pipeline along Stoney Trail is complete and tied into the existing system. ATCO advised that it will be important that The City complete construction of Stoney Trail before it installs this replacement pipeline, in order that elevations be finalized before installing its pipeline. Following that, ATCO Pipelines plans to transfer the 14th Street pipeline to ATCO Gas for use as a low pressure distribution line.

The 14th Street high-pressure pipeline is part of the Urban Pipeline Replacement (UPR) Program which is designed to relocate high pressure pipelines away from highly populated areas to reduce the potential for catastrophic ruptures. This pipeline was reportedly built in the early 1970's, replacing the original pipeline built in about 1925. As with all high pressure pipelines in heavily populated areas, there is great risk if ruptured, damaged or subjected to dangerous activities. There have been several ruptures of urban high pressure gas lines in Canada and the USA and ATCO is attempting to avoid this here. The City of Calgary reportedly contacted ATCO Pipelines several months ago to enquire about constructing a roadway over top of the ATCO line. However, it is understood that ATCO Pipelines has not approved the 14th street expansion as there are conflicts with its pipeline. It is now up to The City to decide where they want to go from here.

Water Main Along East Side of 14th Street

Other deep pipelines in the corridor include large water lines, sewer lines and storm water drainage. It is our understanding that a large 60 inch diameter water pipeline that supplies water to most of Southwest Calgary is present within the buffer along the easterly edge of the road right of way. The pipeline, which was reportedly installed in the late 1970's and made of steel, replaced the original water line. Information regarding the precise location and depth of cover over this water main has not been obtained however it is believed to be located near the sound

wall on the easterly edge of the road right of way. To accommodate new travel lanes The City proposes to narrow or eliminate the grass median as well as portions of the buffer along the east edge of the right of way. The new easterly travel lane will be close to this water main, and portions of the berm covering the pipeline may need to be removed. Heavy equipment required to construct the new road bed and heavy trucks using the new lanes could cause unsafe pressure and vibration resulting in damage to this pipeline.

On November 25, 2015 a lateral water line within the median on 14th Street experienced a failure immediately adjacent to the water main, just south of the 75th Avenue overpass. The following picture, taken on November 26, shows workers hydrovacating to uncover the broken water line south of the pedestrian overpass. This relatively small job required 3 full days of site work and caused one north-bound and one south-bound lane along 14th Street to be shut down through the duration of the work. The traffic on both northbound and southbound 14th Street was slowed to a crawl throughout the entire time. During the construction, water was discharged through what appeared to be a large fire-hose onto Eagle Ridge Drive in front of the houses that back onto 14th Street. This water began to freeze, and the water/ice slurry would not flow down the storm drains. Residents were outside trying to push the slurry off their driveways so it wouldn't freeze solid. A City employee worked to try to get the slurry to flow down the storm drain. Had he not succeeded, much of Eagle Ridge Drive parallel to 14th Street would have been covered in a thick layer of ice. The community of Eagle Ridge experienced low water pressure during the time that the work was being done.



A worker at the site advised that the line break was likely due to corrosion in the pipe, which of course begs the question as to the integrity of the remaining pipe and whether it may soon require additional repairs or even replacement. The City of Calgary has published an information brochure (inserted below) that lists the primary causes of water main ruptures. These primary causes include:

1. age and material of the pipeline;
2. vibrations from vehicle traffic;
3. ground conditions including underground streams; and
4. damages to the pipeline as a result construction activity in proximity to the pipeline.

This water main along 14th Street has been significantly exposed to the first three causes and should the Southwest BRT proceed, additional pressure and vibration from road construction and operation immediately above it, as well as potential damage due to construction in close proximity, could occur. It is recommended The City avoid, to the greatest extent possible, the risk of damaging and disrupting this irreplaceable and critical utility.

Storm Sewer Capacity

The City has indicated that it has not conducted any investigation into the adequacy of storm sewer capacity along 14th Street. This is potentially a significant problem as widening of the paved surface of the roadway with no accommodation for increased surface runoff could create flooding and dangerous travel conditions. The runoff Coefficient for asphalt and concrete is 1.0, whereas the runoff Coefficient for the existing lawn surfaces on the grass median and shoulder along 14th Street is only 0.2. With no median and no shoulders to absorb rainwater and snow melt, the storm sewer along 14th Street will have to absorb significant additional runoff. It should be noted that the intersection of 14th Street and 90th Avenue has been completely flooded and shut down to traffic numerous times in the past years. Analysis and adjustment of storm water capacity along 14th Street is strongly recommended prior to widening of the paved road surface.

Another example of potential concerns relates to the waste water sewer lines. A few years ago the City was conducting work on these lines on the west side of 14th Street which caused a massive back-up of raw sewage into basements on the east side of 14th Street. Many basement developments had to be completely replaced, and residents have vivid memories of this horrific experience.

WHAT CAN CAUSE WATER MAIN BREAKS

THE CITY OF CALGARY | WATER SERVICES



Changes in water pressure within the pipes



Pipe age
(wear and tear)



Pipe material
(some older materials break down faster)



Weather conditions
(Sudden and extreme changes in temperature)



Installation process and unforeseen issues



Vibrations
(heavy traffic/construction /ground shifting moving)



Soil type and ground conditions
(corrosion, ground water, etc)

WHO WORKS ON THE WATER MAIN BREAKS?



Foreman

Responsible for crew and site safety, organizing the job and directing the crew to complete the repair.



Labourer

Responsible for assisting the pipeman's repair and acting as their eyes and ears at the ground level.



Pipeman

Responsible for assessing the break and executing the repair—from the bottom of the excavation, in any weather.



Tandem driver/labourer

Responsible for removal of wet excavated soil and replacement with dry backfill soil and gravel, as well as assisting with many worksite tasks.



Backhoe Operator

Responsible for excavating with precision around all utilities.



Utilityman

Responsible for organizing emergency locates, assists with traffic setups and scouting for potential safety hazards or job-specific challenges the crew may face. This individual works alone, before the crew arrives and is often a senior technical expert.

TYPES OF PIPE USED IN WATER MAINS

Wooden pipes

Pre-1910
(no longer in service)

Cast Iron

1910 – 1968

AC Pipe

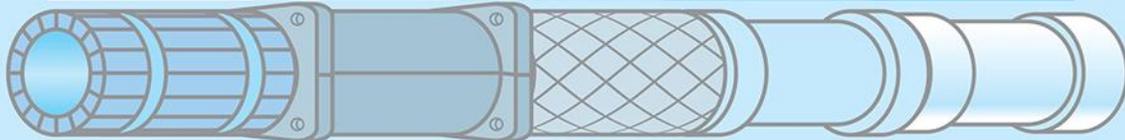
1955 – 1978

Ductile Iron

1963 – 2010

PVC

1976 – Now



Protecting what's precious. Land. Air. Water.

Onward! The City operates and maintains over 12,000 kilometres of underground pipe and provides reliable water service to all Calgarians.

calgary.ca | contact 311



THE CITY OF
CALGARY

Pipeline Relocation Challenges

As previously stated, the proposed widening of 14th Street SW for the Southwest Transitway and Bus Rapid Transit would involve major construction in close proximity to these pipelines, likely including installation of road bed and asphalt over existing pipelines.

Between Heritage Park and 75th Avenue the right-of-way is restricted, and there is a lack of sufficient space on the west side to locate the BRT bus lanes without installing 2 additional lanes on the east side and shifting the mixed traffic lanes to the east side of the right of way. There is also a grade difference between the existing road and buffer on the east side of the road (slight berming) which would require reduction of cover over the pipelines as well as installation of retaining walls if additional lanes are constructed. This would greatly increase the likelihood these pipelines would need to be lowered, relocated or removed. The costs and interference to traffic using 14th Street as a result of any or all of these activities would be massive.

According to two of the pipeline operators, some records of ownership and where the pipelines are physically located within the right of way are poor. It is not advisable and in most cases not permitted to construct or operate a road over operating utilities without protective measures being in place. Unsafe ground pressure and vibration from heavy vehicles (concrete trucks, dump trucks, large busses, other heavy vehicles, etc.) can cause pipelines to move, deform, crack and potentially rupture. Use of heavy equipment in the vicinity of pipelines can be very dangerous. Due to the unknown content of the 14th Street right of way, pipelines would need to be uncovered and identified by a slow and expensive method known as hydrovac. Hydrovac was used extensively to locate and identify pipelines on the GE5 Project, which proved extremely labour intensive and expensive. One pipeline operator commented that locating, identifying and possibly relocating pipelines along 14th Street would be far more difficult as it would presumably be undertaken immediately adjacent to active traffic whereas the traffic was diverted around the GE5 construction site.

The design requirements for oil and natural gas pipelines, when they are located under roadways, are far more stringent than those not impacted by roads. Cyclic loading of traffic and of the roadbed itself determine requirements such as minimum depth of burial, the minimum pipewall thickness and/or other requirements such as installation of a culvert or casing for the pipeline. See CSA Z662-94, Oil and Gas Pipeline Systems. ATCO Pipelines would likely not allow construction or operation of a roadway over its high-pressure gas line without significantly lowering it or installing other protective measures which, according to ATCO, can not occur until its replacement of its high-pressure pipeline is completed in 2018 or later.

If The City proceeds with its plans to widen the travel lanes on 14th Street, it must first develop a plan to identify and deal with all of the pipelines (active or not) in the utility corridors where construction is planned in close proximity along 14th Street. Plains Midstream and Conoco Phillips have indicated their pipelines are no longer in service and once they are uncovered and identified they would likely be removed as sections of these same lines were for GE5. During that project a multitude of other unregistered pipelines were discovered that date back to the early days of Turner Valley in the 1920's. Each pipeline needed to be uncovered by hydrovac,

tested to ensure there was no residual oil in the lines, and removed in an environmentally safe manner. One operator indicated that an oil pipeline near the GE5 intersection was discovered to be only 6 inches below surface when it was accidentally hit by paving equipment. These unregistered pipelines may extend along the 14th Street right of way as well.

The ATCO high pressure gas pipeline would require a significant amount of work if The City were to widen the travel lanes over it. ATCO has no plans to remove this pipeline from service however it does plan to lower the pressure and convert it to a distribution line sometime in 2018. It would nevertheless require protection before ATCO would permit a paved road over top of it.

To do this, The City has four options:

1. Lowering the pipeline: The *ready to engage!* group has undertaken discussions with engineers who have extensive pipeline installation, repair and relocation experience, and they have informed us that the costs, time and disruption associated with trying to relocate or replace utilities can be prohibitive. Crowded easements with multiple lines and congested working areas are technically very difficult and expensive. There are serious challenges with this option:
 - a. Cost: This portion of the SW Transitway project alone would be hugely expensive. It would require excavating/hydrovacating around all of the pipelines, removing abandoned lines and then lowering at least the ATCO gas pipeline. *ready to engage!* considers the \$500,000 estimate in the Delcan report for handling of utilities along the 14th Street utility corridor to be woefully inadequate. Consolidated Edison of New York City has estimated that it can cost as much as \$2,000 a foot, or well over \$10 million a mile, to replace a gas main in urban areas. The ATCO high-pressure gas pipeline may not need to be replaced, assuming the line could be lowered without being damaged, however, it would need to be taken out of service during excavation and lowering which would create a whole other problem for hundreds of thousands of customers serviced by this gas pipeline.
 - b. Service Disruption: The disruption of service to customers would be unacceptable. It is extremely unlikely that pipeline relocation could be accomplished without shutting off water, sewage and natural gas service to much of southwest Calgary. As discussed earlier, the ATCO pipeline is a large, high-pressure line. If this line needs to be excavated and lifted out of its trench to make room for excavation underneath, and then lowered back into place, gas flow would first need to be shut off and the line purged of residual gas. This could be a highly dangerous undertaking in this heavily populated area. The water and waste water lines would also likely need to be temporarily shut down if relocation or lowering is required.
 - c. Labour Intensive: If The City was somehow able to develop a plan to remove, lower or otherwise protect this cluster of utility lines, it would be hugely labour intensive. The fill above and surrounding the pipes would have to be hydrovaced for safety reasons. The slurry (mud from the water and soil mixture) from the excavation would need to be hauled away to a secure landfill and clean fill returned for back filling. In order to conduct these operations, the work area

required for a safe operation would likely need to be 10 or more metres wide throughout the lengthy construction period.

- d. Traffic Disruption: Disruption to traffic during the relocation would be long-term and significant. The work would need to be conducted from the existing travelled lane or lanes. That would reduce the available north bound lanes throughout the utility relocation/protection phase as well as during construction of the additional paved lane on the east side of the right of way. It may be possible to remove the median and build another lane before starting the utility and east lane construction, but protection of the water main within the median would first need to be in place which, of course, would further extend the traffic disruption. At any rate the congestion along this stretch of 14th Street would be unprecedented and long lasting.
2. Installing a concrete buffer: This would entail installing or pouring in place thick slabs of concrete above the ATCO pipeline to protect it from the weight and vibrations of large vehicles. This same requirement likely applies to the water main within the median. The road bed would then be installed and compacted, and asphalt surfacing would then be laid above the slab. There are numerous problems with this approach:
 - a. Difficult to access in the event of repairs: In the event of leaks, corrosion, cracks or ruptures, the asphalt roadway would have to be dug up, then the concrete slabs would have to be dug up, then the fill above and surrounding the pipes would have to be removed. This fill would either have to be piled beside the trench or, to limit the width of the construction corridor, would have to be hauled away by the truck-load or in the case of hydrovac slurry, hauled away in tanker trucks. The work area required for a safe operation of these activities would necessitate closing of one or more lanes throughout the repair process.
 - b. Traffic Disruption: The cost, time and traffic disruption during the initial installation of the concreted slabs, or during the repair process in case of cracks or ruptures would be enormous.
 - c. Long Service Disruption: The time to access and repair the utilities would be much longer because of the presence of the concrete slabs. Removing the slabs, repairing the utilities, and replacing the slabs would mean that services to customers would be disrupted for an extended period of time.
 3. Berming: This would require adding more fill on top of the pipelines to provide greater cover. This option also has serious problems:
 - a. The depth of cover over the expanded roadway would need to be heightened: This is not possible if the new lane(s) are to be used as contiguous lanes. All lanes on 14th Street would have to be raised. This would exacerbate problems with traffic noise and sound barriers.
 - b. Traffic Disruption: As with all the other options, costs and traffic disruption as a result of berming would render this option totally unrealistic.
 4. Directional Drilling: Another possibility might be to execute a directional drill from north of 75th Street to south of Heritage Drive and then pull a replacement section of pipeline

into place. There are numerous potential problems with this option including, but not limited to:

- a. Establishing an area of sufficient size to accommodate directional drilling: This area would have to be large enough for a drilling rig and all ancillary equipment without having to shut down a large portion of north bound 14th Street and the associated traffic problems. On the south side of Heritage Drive, establishing a “drag section” would require a level stretch of land long enough to accommodate a pre-welded length of pipe (drag section) in excess of the length of the directional drill and wide enough to permit safe work as well as guiding of the drag section into the directional bore hole..
- b. Traffic Disruption: It is unknown whether there are sufficient or appropriate areas of land at either the north or south end of a potential directional drill to accommodate these activities but it is inevitable that severe interference to traffic would occur in order to accommodate such an operation.
- c. Technical Challenges: In addition to very substantial costs associated with the directional drill method, there are numerous technical problems that occur with directional drills that can cause them to fail. A great deal of testing and planning is required to increase the probability of a successful directional drill including a detailed understanding of the soils along the length of the directional drill. This typically involves drilling of test holes and analysis of soils along the length of the drill section. If soils are silty or not conducive to maintaining the integrity of the hole, circulation can be lost resulting in a frack out, or the pull back of the drag section can fail. Many homeowners along this section of 14th Street require sump pumps in their basements to deal with the numerous sub surface water flows that prevail in the area which could create issues with a directional drill.
- d. Removal from Service: It is highly likely the line would need to be removed from service during tie-in operations, which would cause significant issues with downstream users as natural gas would not be available for that period.
- e. Risk of Failure: The directional drill option involves numerous unknowns that can increase the risk of failure and/or greatly increase costs.

Safety and Risks to Communities

Of utmost importance to the adjacent residents, and indeed to all Calgarians, is the integrity of these pipeline systems. We all need to know whether or not our communities will be exposed to significant risks associated with potential spills, pipeline failures or ruptures.

One of the problems is that certain of the pipelines likely to be found in this corridor are more than 90 years old and records as to physical location and what condition older pipelines were left in are very incomplete. For example, some of the very old pipelines that carried oil from the Turner Valley field to the refinery in SE Calgary were simply shut off and left in place with residual oil present. Accidental puncture or improper handling of these pipelines could result in a discharge of environmentally hazardous material.

The adjacent residents need to know if our community will be exposed to extremely dangerous pipeline failures which have occurred in other cities across North America and the world. It was 50 years ago that a natural gas pipeline rupture in LaSalle Quebec killed 28 people and injured 32 more. Gas-related explosions in New York City killed 11 people and injured more than two-dozen others. Elsewhere in the U.S., a rupture in a major pipeline in San Bruno, Calif., in 2010 caused an explosion that killed eight people. In 2011, a leak from an 83-year-old cast-iron main in Allentown, Pa., caused a blast that killed five people.² There are many other examples of damages, injuries and fatalities related to natural gas pipeline ruptures and we recommend that these factors be taken into consideration by The City if they plan to proceed with the Southwest BRT.

The City of Calgary Has Not Addressed These Issues

The City of Calgary Planning Group working on the 14th Street SW expansion have not addressed the pipeline issue. Relocation or replacement of these lines would create major cost and time impacts to the project. 14th Street is not simply a transportation corridor but a major utility corridor with critical infrastructure (water & natural gas lines) that supply the majority of residents and businesses in southwest Calgary. It would be an unmitigated disaster to lose either of their services and construction of roadways over these utilities could pose significant danger to the integrity of these pipelines.

When City and Stantec engineers were asked at the Information Sessions on October 27 & 29, 2015 about their plans for dealing with existing utilities, they replied that they had not spoken with the utility owners but were planning on doing so in the near future. On December 1, 2015, The City and Stantec project managers were questioned again about these issues. They replied that they were in discussions with the utility owners, but that The City is not prepared to alter its plan with respect to the Southwest BRT. It is not clear to us why The City of Calgary has approved the budget for the Southwest Transitway and BRT without addressing these fundamental and crucial issues.

² "Beneath Cities, a Decaying Tangle of Gas Pipes", *The New York Times*, March 23, 2014.
http://www.nytimes.com/2014/03/24/nyregion/beneath-cities-a-decaying-tangle-of-gas-pipes.html?_r=0