



## **CITY OF FORT BRAGG**

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### **COUNCIL COMMITTEE ITEM SUMMARY REPORT**

**MEETING DATE:** April 10, 2019  
**TO:** Public Works & Facilities Committee  
**FROM:** Diane O'Connor, Engineering Technician  
**AGENDA ITEM TITLE:** Receive Report Regarding The Use Of Styrene-Based Resin For Cure-In-Place-Pipe (Cipp) Project, City Project 2019-03

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#### **ISSUE:**

The majority of the City's sewer collection system is very old, and many areas are in need of refurbishment. Standard construction methods involve digging up the streets to remove and replace the pipe. To avoid the major public disruptions caused by standard trenching, CIPP pipe lining has become an industry standard for trenchless construction. The City successfully completed CIPP projects in 2013, refurbishing 850 feet of pipe in Alder and Main, and in 2016, refurbishing approximately 3200 feet of pipe, including sections of Bush and Alder. The Department will be issuing a Notice Inviting Bids (NIB) on April 11, 2019 for the 2019 CIPP project. The project will refurbish 5000-7000 LF of existing 6", 8" and 12" sewer mains in portions of Chestnut, Sanderson, Oak and Cedar.

CIPP methods are used in about 50% of all sewer rehabilitation projects, and the resins have been used for more than 45 years. While new "durable" pipes will last 30-40 years, the resin of the CIPP liners will last 50-60 years. The CIPP process involves pulling a fabric tube impregnated with resin through the old pipes and then "curing" it with steam or hot water. The existing sewer laterals will be cut off from the main by the liner during the curing process. Once curing is complete, the contractor will enter the pipe with a remote controlled cutting device that will reestablish the lateral connections.

Concerns have been raised regarding the CIPP method and the possibility of residual chemical releases during the CIPP process, particularly during curing. The primary vapor of concern is styrene. A 2011 report on Carcinogens by the Department of Health and

Human Services (DHHS), National Toxicology Program (NTP) listed styrene as “reasonably anticipated to be a human carcinogen.”

According to the guidelines put out by the National Association of Sewer Service Companies (NASSO) in 2017, “the risk associated with styrene’s use in CIPP is minimal and well within the Clean Water Act’s original intent of keeping the environment as free as possible of chemical pollutants”. They further state, “CIPP installation sites managed with good housekeeping will present little opportunity for human health risks and/or environmental risks”. A 1992 study by the European Center for Ecotoxicology and Toxicology of Chemicals (ECETOC) concluded that “the carcinogenic potential of styrene, if one exists at all, is rated so low that occupational or environmental exposure to styrene is unlikely to present any carcinogenic hazard to man”.

Small amounts of styrene are produced naturally by plants, bacteria and fungi. Low levels of styrene occur naturally in a variety of foods, such as fruits, vegetables, nuts, beverages, and meats. Styrene is also present in combustion products such as cigarette smoke and automobile exhaust, and is released during the use of home copiers. Indoor air often contains higher levels of styrene than outdoor air.

The primary exposure to styrene is by breathing air containing it. When you breathe air containing styrene, most of the styrene will rapidly enter your body through your lungs. Once in your body, styrene is broken down into other chemicals, which leave your body in the urine within a few days. The most common health problems in workers exposed to styrene involve the nervous system. The styrene concentrations that cause these effects are more than 1,000 times higher than levels normally found in the environment. Styrene releases do not always lead to exposure, as you must come in contact with the substance to become exposed.

According to the Center for Disease Control (CDC) the Recommended Exposure Limit (REL) for styrene is **50 ppm**, with a Short Term Exposure Limit (STEL) of 100 ppm. The Immediate Danger to Life and Health (IDLH) is 700 ppm. The Occupational Safety and Health Association (OSHA) limit is 100 ppm with a 600 ppm 5-minute peak in any 3 hours. The Agency for Toxic Substance and Disease Registry (ATSDR) has determined the acute-duration (1-14 days) inhalation Minimum Risk Level (MRL) is 5 ppm, based on a No Observed Adverse Effects Level (NOAEL) level of 49 ppm for 6 hours. **Moderate eye irritation occurs between 200-400 ppm.**

Styrene has an extremely low odor threshold and for most humans it can be detected at **0.4-0.75 ppm**, well below any hazardous quantity. The most common complaint during CIPP projects is the odor, which is described as smelling like plastic or glue. While the individual sewer laterals will be cut off from the center of the liner during the process, and not likely to encounter the vapors, there is still a very small possibility that vapors can enter buildings during the process. To insure the safety inside of buildings, residents should make sure all the plumbing traps are full of water. Simply running water into sinks and basins should fill the traps, which will prevent ordinary sewer gasses from entering. Regular ordinary use of sink or anything else with a drain automatically accomplishes this. During the project, the City recommends covering any

floor drains that may not have traps by placing a plastic bag filled with water over the drain or taping over it. These measures will prevent the backflow of odors.

**If you are not smelling sewer gasses currently, there should be no issue with the styrene.** If odor is detected, ventilate the area, leaving doors or windows open to the outside until the smell clears.

A 2001 study in Toronto measured styrene levels of **0.1 to 0.2 ppm in homes with traps left dry as a worst-case scenario**. Styrene emissions measured from **manholes during the process ranged from 0.16 to 3.2 ppm**. Exposure of installation personnel in the breathing zone ranged from 0.08 to 0.5 ppm, well below the 50 ppm recommendation of the CDC.

The project specifications require the contractor to designate an employee to monitor the volatile organic compounds (VOCs), including styrene, released during all phases of construction. The VOC monitoring device will be located within ten (10) feet of manholes (insertion points) and read every half hour. The VOC levels will be documented in a logbook for City review at completion of each liner installation. Operations will be ceased immediately and the area ventilated should the level exceed the CAL/OSHA permissible levels. A reportable spill of styrene is 1000 lbs, or about 2500 lbs of resin. Anything less is to be handled expeditiously by the contractor but does not require reporting.

#### **SUMMARY:**

The 2019 CIPP Project will rehabilitate 5,000-7,000 LF of old sewer mains within the City Limits using CIPP technology, which allows for the rehabilitation of pipes without digging them up. A potential hazard associated with the CIPP process is release of styrene vapors, although anticipated exposure levels are well below any harmful threshold. Any risk of encountering harmful vapors in buildings will be minimized by informing residents of the importance of properly functioning sink and toilet traps within their homes or businesses, and by requiring the contractor will monitor vapors throughout the project.

#### **RECOMMENDATION:**

We recommend that the committee approve the release of the NIB with the condition that the contractor monitor for VOC's and have an appropriate response plan.

#### **ATTACHMENTS:**

CIPP Safety Information flyer

#### **REFERENCES:**

Center for Disease Control (CDC) Websites:

Styrene: <https://www.cdc.gov/niosh/idlh/100425.html>

ToxProfiles: <https://www.atsdr.cdc.gov/ToxProfiles/tp53-a.pdf>

Public Health Statement Styrene (2012):

<https://www.atsdr.cdc.gov/phs/phs.asp?id=419&tid=74>

National Association of Sewer Service Companies (NASSCO) Guideline for the Safe Use and Handling of Styrene Based Resins in Cured-In-Place-Pipe (CIPP), 2017  
National Library of Medicine website:

<https://pubchem.ncbi.nlm.nih.gov/compound/styrene#section=Clinical-Laboratory-Methods>

Science Direct Website: <https://www.sciencedirect.com/topics/chemistry/styrene>