

# Memorandum

Prepared For: City of Half Moon Bay  
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Date: December 31, 2020  
Subject: Smoke Testing Progress Report

The City of Half Moon Bay has requested Total Flow Inc. (TFI) to smoke test a portion of the sanitary sewer system. The goal of this test is to discover cracks, brakes and illicit connections to reduce inflow and infiltration (I/I). The selected drainage basin 57,000 linear feet of sanitary sewer main pipe, including the 2000 feet that delayed for Caltrans permitting.

Smoke testing is a quick method of detecting infiltration/inflow (I/I) sources in the sanitary sewer system. It is intended to detect specific inflow points such as storm sewer cross-connections and point source inflow leaks in drainage paths or ponding areas, roof leaders, yard and area drains, fountain drains, abandoned building sewers, and faulty service connections.

The portable, gasoline-powered smoke blower placed over the manhole, smoke was forced through the sewer lines. The smoke travels through the isolated sewer sections and escapes through sewer defects that could allow rainwater and groundwater to enter the sewer system. The smoke is water-soluble, non-toxic, odorless, non-staining, and dissipates soon after the blower is turned off. Smoke testing was performed only when weather conditions allowed accurate testing results. Each smoke source was recorded on data forms and was digitally photographed for permanent documentation. Data forms were then added to a Microsoft Access database. Sketches of the setups and defects were scanned in and linked to the database. The setup and defect data are attached in the section Associated Forms.

## **Smoke Testing Project Technical Approach**

TFI's approach was designed to provide the City of Half Moon Bay with responsive service that is cost-effective in the long term. Each task is broken out as follows:

- Task 1 – Collect Sewer System Maps
- Task 2 – Prepare Smoke Testing Notices
- Task 3 – Pre-Smoke Testing Notification
- Task 4 – Smoke Testing
- Task 5 – Data Organization
- Task 6 – Results and Report Preparation
- Task 7 – Project Management

### ***Task 1 – Collect Sewer Maps***

Prior to the start of smoke testing, Half Moon Bay provided TFI with copies of its sanitary sewer maps showing the streets and boundaries of the areas to be smoke tested (Figure 1).

Area outlined in red was removed for completion later. This was due to permitting issues.

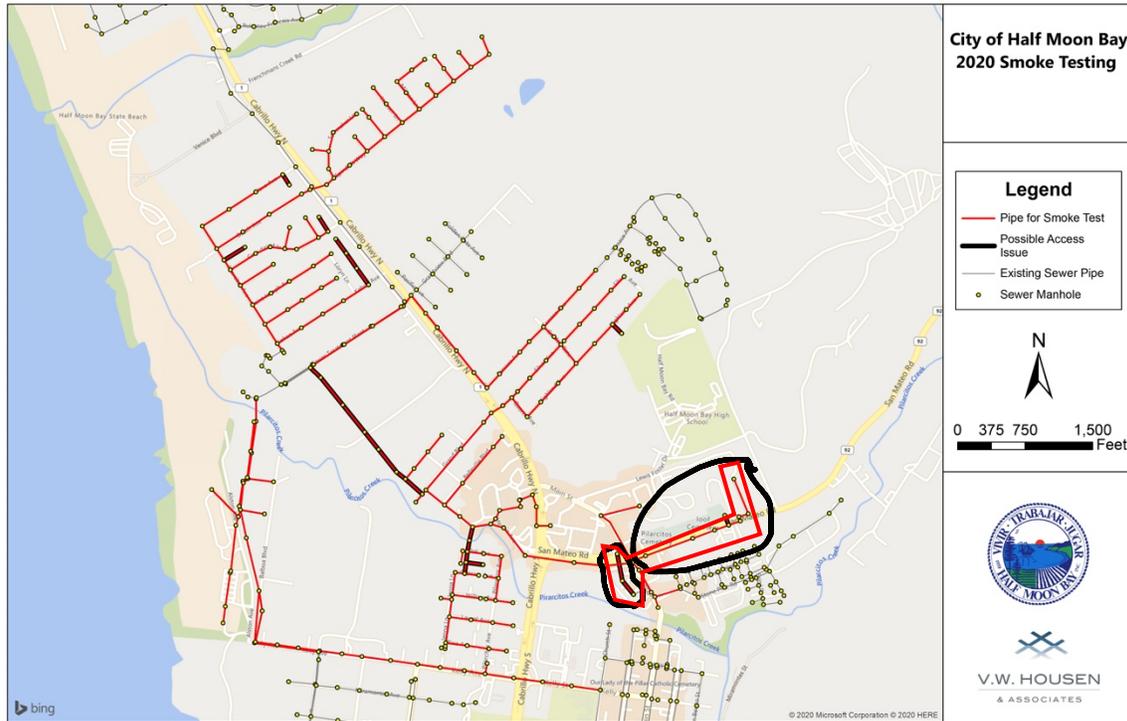


Figure 1

### ***Task 2 – Prepare Smoke Testing Notices***

TFI understands that notification is very important to the San Andreas Sanitary District Half Moon Bay. Half Moon Bay approved notices and TFI distributed notices two weeks and one week prior to testing. A public relations process and public notification process was prepared prior to and during the smoke testing program. The notification package consisted of several types of fact sheets and forms as described below:

- **Two Week Notice** An initial notice to be distributed two weeks in advance of the smoke testing work. Commonly asked questions are addressed on this form, and a **HOTLINE** number is provided. Notices are included in the tab 'Sample Forms'.
- **48-Hour Advance Smoke Test Notice** A second notice to be distributed 24 to 48 hours in advance of the smoke testing work. Commonly asked questions are addressed on this form, and the same **HOTLINE** number is provided.
- **Homeowner/Building Contact Form** This form is completed by the smoke testing team when they encounter persons asking questions. The form contains the

name, address, telephone number, and comments, for the interested person.

- Phone Contact Form This form will gather similar data to the homeowner/ building contact form. This form is used only for those calling in for information.
- Frequently asked Questions (FAQ) The person answering the telephone calls will be provided with this form to assist with responses to commonly asked questions.
- Smoke Testing Air Quality Facts This fact sheet provides detailed information of the smoke composition.
- Sewer Basin Drainage Maps Provided by the City, these maps will show the boundaries of the areas to be smoke tested.
- Street Boundary Description A detailed listing of the street names which border or identify the area being smoke tested.
- Sewer Line Smoke Testing Facts This form provides general information, describing who is conducting the testing work, where the test areas are located, what is involved, and what the presence of smoke indicates.
- Smoke Test Setup Form This form is used by TFI when smoke testing a sewer line. It documents the manhole location, street address, sewer number, date, and time of the smoke test.
- Smoke Test Defect Form TFI uses them to identify defects found during smoke testing.

### ***Task 3 – Pre-Smoke Testing Notification***

Prior to commencing smoke testing, the District prepared smoke test area distribution maps.

### ***Task 4 – Smoke Testing December 1 thru December 8, 2020***

Prior to beginning smoke testing, and daily, the local police and fire departments of the smoke testing location were notified. In addition, the public works department is notified of the smoke testing location each day. Only areas that have been leafleted with notices were smoke tested.

The safety of residents and the TFI field-crew is of the utmost importance. Caution was used always when working in high traffic areas. Proper traffic control devices were used to divert traffic in a safe way around open manholes and field equipment. The field-crew wears orange safety vests to alert drivers of their presence. Proper safety equipment is always used. The TFI field-crew is fully aware of the dangers associated with entry into the sewer runs, including the possibility of atmospheres deficient in oxygen or containing high levels of carbon monoxide, hydrogen sulfide, or methane gas. When atmospheric conditions become deficient, the crew does have a supplied air system for safety. This plan details the method of performing work, operational and rescue procedures, and the necessary formalities for planning and approving confined space entry.

The manhole used for the setup is opened, and after allowing it to vent for a short time, the opening was covered with a ripcord gasoline-powered smoke blower. Directional plugging in the sewer lines may be used. The sanitary flow was not blocked because of the possibility of surcharging and overflows. The smoke blower was started and allowed to run for a couple of minutes prior to adding smoke.

Superior liquid smoke was used to generate smoke. The field-crew walks all the way around each building, wherever possible, to check for defects. Each field-crew member was equipped with an iPad, flagged stakes, a camera (part of iPad), and Smoke Test Defect forms (also in iPad). A photograph is taken at each defect. A stake was left at the defect location to allow the crew to move rapidly through the neighborhood. They then returned to each location to further document the defect in detail.

Observations regarding each defect identified by smoke were documented using an iPad. Once the smoke return is specified, the technician records the date, time, address, and type of defect. Pictures are taken of the house, house address, a distant shot of the return, and a close. A sketch is drawn. The sketch includes location, address or house number, data, and a schematic layout of the manhole and sewer line under testing. Measurements from at least two permanent reference points to the smoke emission point are included on the sketch.

Following each setup, the field crew chief reviewed the setup with the crew and noted the total number of defects found on the setup form. The field crew chief marks on the sewer map the area that was smoke tested. All data sheets were handed to the field crew chief at the end of each setup.

### ***Task 5 – Data Organization***

After the smoke testing field services have been completed, all collected field data was reviewed:

- A source defect analysis for the defects detected by the smoke testing which assigns a potential leak rate for each defect to develop a ranking based on the severity of the defect. An estimated breakdown of the percentage of leakage attributable to public property and private property defects shall also be provided, and recommendations for corrective action shall be made.
- One (1) copy of all field inspection forms for the District's system. The field inspection forms shall include all field observations, photographs and inspection notes and will be color copied and provided.
- One (1) copy of the sewer system map for District, annotated to cross-reference each defect's location described in the field inspection forms.
- Also, TFI will provide one additional copy of the field inspection forms and the annotated sewer map not bound into the report.

All field logs are in the last section Appendix. The following Tables contain the defects found. Each table is the same but sorted differently. The first table is sorted by index number, a designation associated with each defect's index forms. The second table is

sorted alphabetically by street name. The third table is sorted by defect type, the fourth by the technical location of the defect, and the last by Inflow and Infiltration. The tables are provided on the attached Digital files in excel format and can be sorted under different criteria as required.

**Task 6 – Results and Report Preparation**

The smoke testing data were collected at the end of the day. The forms are verified to ensure that they have the correct MH number, date, etc. All digital photographs are uploaded to an electronic forms database for storage and later printing. A defect database was created and updated daily.

City of Half Moon Bay Defect Summary Table	
Type	Amount
Number of smoke returns found	13
Inflow defect	7
Infiltration defects	5
Area Drain	1
Catch Basin	0
Downspout	0
Hole	0
Lower Cleanout	0
Lower Lateral	0
Other	0
Open Sewer	0
Plumbing (Smoke in House)	1
Sanitary Manhole	9
Sewer Main	0
Upper Cleanout	0
Upper Lateral	2

There is an estimated drainage area of 205 square ft from smoke returns.

# Appendix