

Air Treatment Facility Technical Memorandum
Comments by the Independent Odor Expert – Dirk Apgar
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Introduction

This paper is intended to provide a constructive critique of the City of Los Angeles' Air Treatment Facility Technical Memorandum (Tech Memo) that is part of the ongoing Air Treatment Facility (ATF) Review. The Tech Memo was produced to justify the selection of future air treatment facility locations, technologies and foul air treatment volumes. The Tech Memo is based on earlier work reported in other technical memoranda on sewer drop structures air pressure studies, airflow modeling, and analytical testing of non-methane hydrocarbons and inorganic odorous compounds such as hydrogen sulfide (H₂S). Critiques of those earlier technical memoranda were prepared, presented, and distributed at prior Odor Advisory Board meetings and the reader will be referred to them when appropriate in this paper.

Under the original Collection System Settlement Agreement (CSSA), the City had planned to construct seven new ATFs to help control odors from the wastewater conveyance system. Of these seven, two have almost been completed, but design and construction of the remaining five was placed on hold pending the outcome of the ATF Review. The City has continued to treat foul air from the sewers with interim ATFs based on carbon filtration while the ATF Review has been conducted. As a result of the work reported on in the Tech Memo, the City is recommending proceeding with only one of the originally planned but yet un-built ATFs. This paper will explore the topics discussed in the Tech Memo, the rationale leading to the decision, and provide comments on the conclusions.

Field Testing of Sewer Air Pressure

The City has conducted what could be considered a very large scale set of tests to characterize the air pressure within its sewer system. This work was covered in the technical memorandum on Differential Air Pressure Study at Drop Structures. In that memo, the City described the measurement of sewer air pressure and how it was influenced by the changing of wastewater flows through and around drop structures, installation of airflow blocking devices in and near drop structures, and the operation of existing interim ATFs. The pressure data collected provided some insight to how each of these influenced air pressure in and around the drop structures. While the City was able to draw some general conclusions about how each of these might influence air pressures, there was no one clear solution that would lower sewer air pressure to the point that odor emissions would be completely eliminated. This should not be viewed as an unreasonable result. Due to the complex network of sewer connections and the dynamic character of wastewater flow, air pressures vary widely and significantly within sewers. It would indeed be the rare case where any sewer operator could completely eliminate the potential for odor emissions.

Sewer Airflow Modeling

The City developed a model to estimate where odor emissions from the sewers might occur. The model used by the City to predict wastewater flows was used to estimate the velocity and depth of water in connecting segments of the sewers. Based on the information provided by this model, a second model was developed to predict where changes in the air space geometry from one segment to another indicated a reduction in the amount of air that could be conveyed from an

upstream to a downstream segment. Where this occurred, the potential for odor emission was predicted. This was a reasonable method of arriving at a first estimate of odor emission locations. That said, the modeling of airflow in sewers and the points of emissions has proven to be difficult and at best only a rough estimate of each can be expected.

The odor emission locations are overlaid on a map in the Tech Memo with the location of odor complaints received between the months of October 2008 to September 2009. There appeared to be some correlation between the predicted points of emissions and the registered odor complaints. However, not all clusters of complaints corresponded to predicted emission points. Also, it is not possible to show how all real odor emissions and impacts correlate to the predicted emission points because not all true impacts result in complaints formally registered with the City.

ATF Locations Recommendations

Based on the results of the airflow modeling discussed above, the City developed recommendations on the methods of reducing air pressure within the various sewers in the vicinity of drop structures. Of the four ATFs originally recommended for installation at drop structures, only the ATF at the Mission and Jesse site is now being recommended for construction by the City. No mention of the originally planned ATF at NORS/ECIS is made in the draft Tech Memo.

In addition to the ATF at the Mission and Jesse site, modifications in the drop structures and adjacent sewers are being recommended. These include the use of flow diversion devices known as stop logs to modify the flow patterns in the sewers to minimize pressure in and around the drop structures. They also include the installation of airflow prevention devices that would be installed in the drop structure air return lines and plastic curtains in the sewers to prevent pressurization of the air spaces downstream of the drop structures.

The Tech Memo also recommends that air pressure tests be conducted in the sewer in the vicinity of the newly constructed ATF at Jefferson and La Cienega, which is treating air from the East Central Interceptor Sewer (ECIS) Jefferson Siphon. It is further recommended that if the operation of that ATF does not result in satisfactory pressure reductions along the North Outfall Relief Sewer (NORS) that the city should initiate a fan test along the NORS between the siphon at the Fox Hills Mall and the Culver City Park. The purpose of that test would be to determine how much air would need to be extracted from the NORS to reduce the air pressure within the sewer and thereby control odor emissions. Finally, the Tech memo recommends if that test proves successful, an additional ATF should be built on the upstream end of the ECIS Jefferson Siphon.

Determining ATF Airflows Required to Control Odor Emissions

The Tech Memo projects that it would be necessary to extract 20,000 cubic feet per minute (cfm) of air at Mission and Jesse to lower sewer air pressure and control odors at that location. It further recommends that the City conduct airflow tests on a scale model of a sewer drop structure in its hydraulics laboratory to better estimate the actual airflow necessary. This should provide a deeper understanding of what ATF airflows would be required and result in a more efficient ATF design to be developed.

Air Emissions Characterization and Identification of Control Technologies

The City conducted tests to characterize the sewer gases to better understand what compounds would or could be controlled by various odor control treatment technologies. In the technical memo Total Non-Methane Hydrocarbon Monitoring Results, the City reported the results of the monitoring and identified the chemical species in the air stream that could be emitted from the sewer or introduced to an ATF. A description of the work reported in that technical memo is provided in the Total Non-Methane Hydrocarbon Monitoring Results Technical Memorandum Comments by the Independent Odor Expert – Dirk Apgar August 2010.

Identification of Air Emission Control Technologies

The Tech Memo describes the commonly applied air pollution control devices used for controlling wastewater odors. These have previously been described in presentations by the Independent Odor Expert to the Odor Advisory Board. With the exception of biotrickling filters and carbon adsorbers, all of the technologies are eliminated from consideration as viable for the normally unstaffed wastewater conveyance facility locations such as the Mission and Jesse site.

Recommendations (of Tech Memo)

The Tech Memo recommendation is that a combination of a biotrickling filter and a carbon adsorber be used to control odors from the Mission and Jesse drop structure and surrounding sewers near that location. Information in the Tech Memo indicates that high levels of hydrogen (H₂S) sulfide gas can be present in the foul air from this part of the sewer. A biotrickling filter should be capable of removing virtually all of H₂S from the foul air stream. Use of a carbon adsorber to remove most of the residual odors that are not removed by the biotrickling filter should provide very good control of odors that are introduced to the ATF.

General Remarks and Conclusions

The City's engineering team has developed recommendations to construct one additional ATF at Mission and Jesse. Odor control technologies and methods for estimating foul air treatment volumes are also recommended for that single location that should provide good odor control. Of the remaining four sites originally proposed for ATFs, it has been recommended that only wastewater flow patterns be modified and air flow prevention devices be placed in the sewers to prevent the build-up of high air pressures.

With the information assembled by the City's team it is not possible to definitively state that the reduced number of ATFs will or will not adequately control odors from the sewers. One could not make such a definitive statement even if all five of the originally proposed ATFs were determined to be necessary by the City's team. The state of the art of odor control from sewers is not yet sufficient to make such strong conclusions even with the large amount of information and knowledge gained in the process of the City's ATF Review Study. However, it would be safe to say that five well designed, carefully located and adequately maintained ATFs would provide better odor control than a single ATF.

The City has constructed and is near final completion of ATFs at Jefferson and La Cienega and 6000 Jefferson. The City's team has recommended that sewer air pressure monitoring be conducted after these are completed to determine air pressures along the North Outfall Relief Sewer. This would be a prudent course of action to determine how much the high air pressures have been relieved in that sewer and how far away from the ATF the air pressures remain

acceptably low within the sewer. It would also be prudent to measure air pressures in the sewers connected to the new ATFs to obtain additional knowledge that could be used in the design of future ATFs.

Of the seven originally proposed conveyance system ATFs, two are nearing completion and one is being proposed. It will be possible to determine if these are adequate to control odors that have been impacting the surrounding communities after they are fully operational. Typical public works projects in the size range of the ATF design and installation can be expected to take between three and five years to move from initial authorization to completion. Because these timelines can be considered long, the City should move forward with design and installation of the recommended ATF at the Mission and Jesse site. With the completion of the two newly constructed ATFs, the City should quickly test how the airflow extracted from the sewers influences pressures in the conveyance system. This will allow the City to determine if an additional ATF at the upstream side of the Jefferson Siphon is necessary.