



## BUSTR COMPLIANCE GUIDANCE FOR STATISTICAL INVENTORY RECONCILIATION (SIR)

The purpose of this guidance document is to assist the regulated community, statistical inventory reconciliation (SIR) vendors, and other interested parties in understanding the policies of the Bureau of Underground Storage Tank Regulations (BUSTR) for satisfactory utilization of SIR as a monthly monitoring method for underground storage tanks (USTs). Paragraph (D)(1)(e) of rule 1301:7-9-07 of the Ohio Administrative Code provides:

*(e) Statistical inventory reconciliation (SIR) shall comply with the following requirements:*

*(i) Report a quantitative result with a calculated leak rate at least monthly;*

*(ii) Be capable of detecting a leak rate of 0.2 gallon per hour or release of one hundred fifty gallons within thirty days;*

*(iii) Use a threshold that does not exceed one-half the minimum detectible leak rate. In order to have confidence in the ability of SIR to detect a leak rate of 0.2 gallon per hour, the threshold for declaring a leak shall be 0.1 gallon per hour;*

*(iv) A release is suspected and subject to the reporting requirements of sections 3737.88 and 3737.882 of the Revised Code and this chapter of the Administrative Code if the SIR analysis indicates a threshold leak rate from the UST which is equal to or greater than 0.1 gallon per hour;*

*(v) Inconclusive SIR results or any analysis that is anything other than pass or fail shall be investigated as a suspected release pursuant to paragraph (C)(35)(a) of rule 1301:7-9-13 of the Administrative Code;*

*(vi) SIR may not be used to meet release detection requirements for piping described in paragraph (D)(2) of this rule;*

*(vii) SIR may not be used to meet tightness testing requirements described in paragraph (F) of this rule; and*

*(viii) Equipment for SIR, including gauging sticks and charts used in the performance of daily product inventory control as described in paragraph (D)(1)(a) of this rule, shall be designed for the UST being measured and shall be maintained in working order. Other probes, sensors, and monitoring units shall be evaluated annually to confirm proper calibration and operation in accordance with the manufacturer's requirements. If the manufacturer is no longer in business, then the equipment shall be evaluated in accordance with paragraph (G) of this rule.*



## OVERVIEW

SIR analyzes inventory, delivery and dispensing data collected over a period of time to determine if the UST is leaking. Each operating day, the UST owner/operator (O/O) measures the product level using a gauge stick or other tank level monitor. The O/O also keeps complete records of all withdrawals and all deliveries to the UST. After data has been collected for a specified period of time (not to exceed thirty days), the O/O provides the data to the SIR vendor for processing. The SIR vendor processes the data and provides the O/O with monthly results showing the status of the UST system. Computer software is used to conduct a statistical analysis of the data to determine if the UST system is leaking.

A SIR method may report results in terms of a numerical, calculated leak rate based on characteristics of the data set or as pass, fail or inconclusive based on a comparison of data set characteristics with a predetermined threshold.

“Stand-Alone” SIR software systems are available whereby the O/O gathers the data, analyzes the data once per month and maintains the results in their leak detection records. These SIR software systems must also have an independent third-party evaluation/certification indicating that the system meets the requirements of paragraph (D)(1)(e) of rule 1301:7-9-07 of the Ohio Administrative Code. The owner/operator must maintain a copy of the third-party evaluation.

## TERMINOLOGY

**Performance Standards (PS):** To qualify as a leak detection method, SIR must be able to meet the performance standards of being able to detect a 0.2 GPH leak rate. The method is expected to detect a 0.2 GPH leak rate with a probability of detection of at least 0.95 and a probability of false alarm of no more than 0.05.

**Threshold for Declaring a Leak (TH):** The TH is an action level leak rate. If the calculated leak rate exceeds the TH then the SIR vendor will declare a “fail,” indicating that a leak exists. The TH is not a fixed number, varying according to the data being analyzed. As of Sept. 1, 2017, BUSTR set the TH to 0.1 GPH.

Since leakage is progressive and generally commences at very small rates, it should be identified as soon as possible after it has begun. The ability of a SIR procedure to identify loss at a very small threshold enables the UST owner/operator to take corrective action before a sustained loss ensues. Often these losses are due to broken seals or worn gaskets in the dispenser, and can be corrected following a cursory examination of the UST system by the owner.

**Minimum Detectable Leak Rate (MDL):** MDL is a calculated value per data set obtained from a specific number of days of reconciled inventory data (gauge stick readings, deliveries, sales, meter readings, etc.) and is an indication of how reliable the results are (data quality). To be in compliance with leak detection regulations, the MDL must be less than or equal to the performance standard for a SIR analysis to provide conclusive results. In other words, if the quality of the set of data is so poor that a leak of 0.2 GPH cannot be detected with at least 95% accuracy, then the performance standard has not been met and the test result must be inconclusive or fail.



**Calculated Leak Rate (CLR):** The actual leak value for a given data set, always expressed in GPH. To obtain the most accurate calculated leak rate, the SIR analysis must account for discrepancies and conversion errors caused by tank tilt and/or deformation, mechanical problems and temperature fluctuations prior to analysis. Once all discrepancies are taken into account, the residual cumulative over/short becomes the estimated leak rate for a given data set.

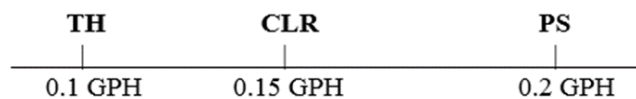
**Pass:** The SIR analysis indicates that the UST tank and piping system is operating within the regulatory release detection standard of less than 0.2 GPH with a probability of detection of 0.95 or more and the probability of false alarm of 0.05 or less.

*Example:* If the CLR (e.g., 0.05 GPH) does not exceed the Threshold Level (i.e., 0.1 GPH), and the Minimum Detectable Leak Rate (e.g., 0.15 GPH) is less than or equal to the Performance Standard (i.e., 0.2 GPH), the test will be a **“PASS.”**



**Fail:** The SIR analysis indicates a leak rate from the UST tank and/or piping systems which is equal to or greater than the threshold for declaring a leak (i.e., 0.1 GPH).

*Example:* If the CLR (e.g., 0.15 GPH) is greater than the leak rate Threshold Level (i.e., 0.1 GPH), the test result will be a **“FAIL”**, even if the CLR is less than the Performance Standard (i.e., 0.2 GPH).

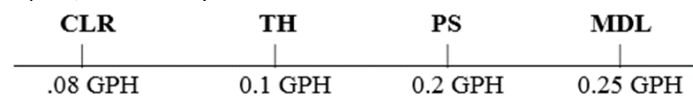


**NOTE: A loss or gain of product in excess of the threshold is a fail.**

**Inconclusive:** A SIR test result is inconclusive when it does not meet the criteria for a “pass” or a “fail.” A result of “inconclusive” may indicate that the inventory records are too poor, have too much variability, or are of insufficient length such that the data could not be analyzed with reliable results.

An inconclusive result will be interpreted by BUSTR as noncompliance with the leak detection requirements for the period of time on which the inconclusive was based.

*Example:* A SIR test result is inconclusive when it produces a Minimum Detectable Leak Rate (e.g., 0.25 GPH) that exceeds the Performance Standard (i.e., 0.2 GPH), and a CLR (e.g., 0.08 GPH) that is less than the Threshold Level (i.e., 0.1 GPH).





**NOTE: In determining whether a result is inconclusive, the absolute value of the MDL should be compared to the PS.**

## **DATA COLLECTION AND REPORTING**

(1) For any SIR method to be an acceptable release detection method, it must be provided by a vendor that has received a third-party evaluation and subsequent certification that the method can detect leaks at the required level and with the appropriate probabilities of detection and false alarm as outlined above. For a listing of the methods that have been evaluated please go to <http://www.nwglde.org/> and review the SIR vendors found in sub-link called "Testing Methods."

(2) It is critical to follow the instructions of the SIR vendor when collecting inventory information. Conclusive SIR analysis results are contingent upon proper and sound inventory practices.

(3) The procedures specified in paragraph (D)(1)(a) of rule 1301:7-9-07 of the Administrative Code for daily product inventory control may be used to gather data for SIR.

(4) The results reported must specifically state the results for each tank as: "**pass, fail, or inconclusive.**"

(5) All reported results shall state the threshold level, calculated leak rate, minimum detectable leak rate, tank capacity, the number of data points analyzed for a given month, number of days submitted by the O/O and the results of the month.

(6) Monthly reports consisting of raw inventory data, plus the resulting SIR determination must be maintained by the O/O for at least twelve months.

(7) SIR shall be implemented in a manner that produces a quantitative result with a calculated leak rate at least monthly. It may be necessary to increase the frequency of analysis to achieve a monthly result in a timely manner.

(8) If the results of a SIR monthly analysis indicate a failure, the O/O must:

(a) Report a suspected release to BUSTR within 24 hours of receipt of the vendor's report or their own report if a stand alone system is used.

(b) Investigate the suspected release in accordance with paragraph (F) of Rule 1301:7-9-13 of the Administrative Code. This includes the requirement to perform a tank tightness test within seven days of discovery of the suspected release. Within twenty-four (24) hours of the receipt of the tightness test results, the O/O shall notify BUSTR of the results of the test by telephone, electronic mail or the like. Test results and supporting data shall be submitted to BUSTR within seven (7) days of receipt by the O/O.

(c) If the result of a SIR analysis is a failure and the calculated leak rate is negative, the O/O must check the tank immediately for the presence of water. A negative calculated leak rate means that



you are gaining product. Increase in product may be due to water entering the tank, or mis-calibrated meters.

(9) If the results of a SIR monthly analysis are inconclusive, unusable or anything other than “pass” or “fail,” the O/O shall collect a second month of data. If discrepancies persist or cannot be explained, the O/O shall investigate the discrepancy as a suspected release in accordance with paragraph (F) of rule 1301:7-9-13 of the Administrative Code. This includes the requirement to report a suspected release to BUSTR and to perform a tank tightness test.

**Bureau of Underground Storage Tank Regulations**

8895 East Main Street  
Reynoldsburg, Ohio 43068  
614-752-7938

<http://www.com.ohio.gov/fire/BUSTRResources.aspx>