WILL YOUR FACILITY MONITORING DATA SURVIVE A LAWSUIT?

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ABSTRACT

In a relatively brief period of time, monitoring programs at solid waste management facilities (SWMF) have gone from non-existent, through implementation, to being considered largely routine. Frequently, SWMF operators consider monitoring services to be a commodity and contracts are often awarded to the lowest bidder. However, these monitoring programs can generate large quantities of data that are used to prepare monitoring reports submitted to regulatory agencies. It is generally assumed that if the regulatory agencies are satisfied with the reports, everything must be satisfactory with the monitoring approach and data. In the event of litigation against the facility, this may not be the case.

Landfills and other waste management facilities are generally regarding by neighbors as having a potential for environmental impacts. So what happens if a neighbor files an environmental impairment suit against your facility? The facility's historic monitoring dataset becomes essential in being able to defend facility environmental compliance. But if your monitoring dataset contains unidentified errors or irregularities, it may be used against you in court, weakening your defense.

This paper examines what solid waste facility operators can do to help ensure that the historic monitoring dataset for a facility, and ongoing environmental data collection programs, can withstand examination under a lawsuit. A lawsuit filed against a landfill operator in California is used to demonstrate the need for proper data collection and documentation.

INTRODUCTION

For millennia, humans disposed of their waste materials in generally unmanaged pits or piles. Although the concept of the sanitary landfill existed prior to World War II (Hickman, 2003), it did not see widespread usage until several decades later. The passage of the Resource Conservation and Recovery Act (RCRA), which was signed into law October 21, 1976, essentially established a national policy to eliminate the open dump (ibid).

Environmental monitoring programs for landfills came even later. At the Federal level, Solid Waste Disposal Facility Criteria (40 CFR Part 258), also known as Subtitle D, was promulgated on October 9, 1991. Subpart E – Groundwater Monitoring and Corrective Action, established the minimum groundwater monitoring requirements to be implemented by various compliance dates in the early to mid-1990s. (40CFR258). However, some states moved forward with their own programs and requirements prior to the Federal deadlines. As an example, California passed a law in 1984 requiring testing of water and air media at all solid waste disposal sites. This program, known as the Solid Waste Assessment Test (SWAT), required initial testing and reporting to be completed during various years, depending on how a facility was ranked based on perceived water quality threat. Most major landfills in the State completed their SWAT reporting in the late 1980s, which marked the start of many ongoing groundwater monitoring programs.

In addition to groundwater monitoring and compliance at solid waste facilities, environmental monitoring programs for landfill gas (LFG) subsurface migration, LFG emissions, surface water discharges, and other programs have been added to the requirements for SWMFs. Together, these programs have, in a relatively short period of time, amassed a substantial amount of historic data. As an example, if it is assumed that a landfill has been monitoring groundwater for 25 years (1986-present), at an average of 20 monitoring points per event, averaging semi-annual sampling, and testing for approximately 70 field and laboratory constituents each time, the historic groundwater database would be approximately 70,000 lines of data (individually unique results). This conservative estimate does not include analyzing for an extended list of constituents every five years, inclusion of quality assurance/quality control (QA/QC) sample results, or other monitoring programs such as LFG or surface water. It is not uncommon for the water quality monitoring database, for a moderate to large landfill, to have a quarter million lines of historic data, and growing by thousands of lines of data for each monitoring event.

One critical question about all this environmental data is, "Is it defensible if my facility was to be sued for environmental impact?"

EXAMPLE LITIGATION BACKGROUND

The Highway 59 Landfill, located in the County of Merced, California, has been in operation since 1973. It was operated by the County of Merced, and the incorporated cities within the County, as a regional waste management authority. It is now managed under a Joint Powers Authority. The site is approximately 609 acres and includes four unlined units (89 acres); one composite-lined unit (23 acres); a 200-acre expansion area; a lined leachate management pond; several unlined storm water management ponds; and a wetland preserve (168 acres). The landfill accepts an average waste stream of about 450 tons per day. Groundwater monitoring began at the site in 1988 with 31 wells in the system over that time (some are no longer in service), and LFG monitoring began in 1998 with 24 multi-zone gas probes (SCS Engineers, 2011).

In June 2008, a local family that had lived in the County for several generations, and had land holdings in the thousands of acres, including large tracks of undeveloped land across the highway from the landfill, filed a complaint against the County claiming (among other things) diminution of property values due to contamination beneath their property, caused by the landfill. At the time the initial complaint was filed, the plaintiffs had collected no data on their property to support their claim, but based the claim on documents available in the public record, including the historic monitoring data for the landfill. Between August 2008 and August 2010, the plaintiffs' environmental consultant collected a few samples of soil gas and groundwater from under their plaintiffs' property, across the highway from the landfill, using various methods.

Using the few sample results obtained from their property, and the large historic set of monitoring data from the landfill, the plaintiffs argued that their data showed environmental impairment caused by the landfill. The case was tried in United States District Court, Eastern District of California, in January 2011. The decision was rendered by the Court in February 2011.

This case is used as an example of how publicly available monitoring data from a SWMF can be used by a plaintiff to claim environmental impairment, and how the validity of environmental data can questioned in court, and have a significant influence on the court's decision.

DEFENSIBLE DATA SETS

What makes a set of environmental data defensible? Although there is no definitive answer, it could be defined as; (1) samples were collected in a manner that is appropriate for the media being sampled and in keeping with established procedures or methods; (2) proper QA/QC was implemented to validate the results obtained; and (3) the results are essentially free of significant errors and inconsistencies.

Even if the regulatory agencies accept data in the routine monitoring reports, this does not mean the data is defensible in court. Attorneys and their expert witnesses can examine the large dataset closely and if they find unidentified errors, inconsistencies, or other problems, they could argue that all data results are suspect. It may not take very many errors, for which you have no explanation, to convince a court that if you cannot defend some of the data, then all of the data may be suspect.

What steps should be taken to help ensure your environmental monitoring data are defensible? There are several, which can be divided into data collection planning and sampling, existing data assessment, and contracting for monitoring services.

DATA COLLECTION

Planning

Planning for collection of field measurements and environmental samples is as important as the actual data collection itself. If your monitoring data are attacked in a lawsuit, attorneys and expert witnesses will review your existing plans, such as the Sampling and Analysis Plan (SAP), for consistency with your sampling methods. If the SAP is not sufficiently complete, or field methods for collection of data and samples deviate from the SAP (as is often the case when there are monitoring system changes), then your data collection methods can be called into question. For this reason, your SAP should be reviewed and updated at least annually. These updates should be completed in collaboration with the field crews and analysis laboratory so that what is outlined in the SAP is actually what is being performed. If at the time of an SAP review no changes are necessary, the document should still be updated with the review date and a statement or certification attesting to the completion of the review.

It is also recommended that the SAP contain more than just the sampling and analysis methods to be performed. It should contain procedures for virtually every aspect of the monitoring program. This will include pre-sampling procedures such as equipment checklists, equipment decontamination, equipment calibration, bottle ordering, etc. Sampling procedures should include detailed information such as the order in which samples are to be collected (generally cleanest to most impacted locations), depth of pump settings if using a portable system, all field measurement and decontamination procedures, collection of QA/QC samples, and sample handling and transport.

Laboratory methods should be specified including maximum acceptable detection limits and holding times. Other important sections to be included are data quality objectives (DQOs), data evaluation procedures, and recordkeeping.

This level of completeness for a SAP is more than typically contained in a landfill monitoring SAP. However, it is good practice to have more detailed plans rather than a SAP that can be attacked as being incomplete. A good model to follow for the SAP would be a Quality Assurance Project Plan (QAPP), which is typically used in hazardous waste site investigations conducted under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). A template for a QAPP is provided by the U.S. EPA at: http://www.epa.gov/greatlakes/quality/training/handouts/HO_QAPP_template_062310.pdf.

Sampling

Obviously, once a detailed SAP is in place, it is critical to follow the details precisely. If field or laboratory procedures, QA/QC, data validation, or other procedures are not followed, the data collection methods may be questioned as to their validity. One of the easiest ways to attack the validity of environmental data during litigation is to show that a detailed procedure exists (SAP), but was not followed.

When it is necessary for field sampling or other procedures to deviate from the existing, detailed SAP, it is imperative that there is documentation that discusses the reasons for the deviation.

Part of any environmental monitoring program includes collection of QA/QC samples. These samples are needed for data validation because, if QA/QC samples are not collected to measure the precision and accuracy of the sampling and analysis program, the results obtained are less defensible. These QA/QC samples must be described in the detailed SAP, including the number and types of samples, how they are to be collected to properly meet the data validation needs, and how QA/QC results are to be analyzed and utilized.

The definition of these QA/QC samples, and the recommended minimum for QA/QC sample collection, are defined in SW-846 (USEPA, July 1992) as:

- Field Duplicates – Independent samples which are collected as close as possible to the same point in time and space. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision of the sampling process. Note: Field duplicates should be field labeled with independent sample numbers/locations, so they are "blind" to the laboratory as far as the origin of the sample. Field duplicates should be collected at the rate of at least one per day per matrix type sampled.

- Equipment Blanks – A sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment. Note: Equipment blanks may not be required if there is dedicated sampling equipment, such as dedicated pumps in each well, which do not require decontamination after sampling. Equipment blanks should be collected at the rate of at least one per day per media sampled.

- Trip Blanks (also called Travel Blanks) – A sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field sampling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Note: Trip blanks are typically analyzed for volatile organic compounds (VOCs) only. Although SW-846 recommends that trip blanks are collected at the rate of one per day, it is better to have one trip blank per day for each ice chest in which VOC samples are stored and transported.

- Matrix spike and matrix spike duplicate – An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to the sample preparation and analysis. Matrix spikes and matrix spike duplicates are used to document the bias and precision of a method in a given sample matrix. Note: Although these samples are prepared in the laboratory, not in the field, sufficient quantity of sample matrix must be provided for the analysis. These spiked samples should be completed at the rate of no less than one per 20 samples of each matrix type.

In addition to the QA/QC samples defined in SW-846, field blanks should also be collected. A field blank is a sample of analyte-free media which is placed directly in sample containers during sampling activities. This is used to determine if VOCs are being introduced to the samples due to conditions encountered during sampling. For instance, if VOCs could be introduced to water samples from an airborne source, this may not be detected in the trip blanks, which are unopened in the field. If an airborne source of VOCs impacts water samples and a field blank is not collected, there is no way to tell if the VOCs originated in the water or from the outside source. It is especially important to collect a field blank of the media used for equipment decontamination. It is not uncommon to have trace concentrations of some VOCs, especially trihalomethanes, in water used for decontamination. Field blanks should be collected at least once per day per media, although if a VOC source is suspected, additional field blanks should be collected at individual sampling locations. Field blanks are typically analyzed for VOCs only.

Field duplicate samples, described above, are typically collected at the minimum rate of one per day, and analyzed for all analytes (not just VOCs). However, additional duplicate sampling may be worthwhile for VOCs. Most monitoring requirements state that VOCs must be analyzed and reported to the method detection limit (MDL). This is typically less than one part per billion. To visualize how small this is, one microgram/liter (essentially one part per billion) is the equivalent of about three seconds of time in a century. At these extremely low concentrations approaching the MDL, the laboratory has a "gray area" where the instruments can detect a VOC, but not accurately quantify it. It is not uncommon to have these trace-level VOCs detected inconsistently, but detection of two or more trace-level VOCs can trigger some additional investigation requirements. For this reason, if VOCs near the detection limit are a concern, it may be cost-effective to collect duplicate VOC samples for every sampling point. The laboratory costs for this analysis method (EPA Method 8260B) have come down significantly at some laboratories. In some cases, a duplicate VOC sample will cost as little as $50/sample. This is relatively little to pay for sample confirmation compared to the cost of having to remobilize and collect new confirmation samples after the analysis results are obtained.

It is important to note that collection and laboratory analysis of QA/QC samples is not the end point in the process. There must be an assessment of the data, such as calculation and documentation of relative percent difference (RPD) for duplicate samples, which needs to occur for each monitoring event.

EXISTING DATA ASSESSMENT

As discussed previously, environmental monitoring datasets can be quite large and it is not uncommon for there to be errors in the data. This can be caused by incorrect notation of field data, laboratory errors, evidence of field or laboratory QA/QC problems, transposition of numbers or misplaced decimal points during data entry, data entered with the wrong units, and more. If data errors exist and are ignored, an opposing attorney or expert witness may use this to discredit your entire dataset. This may seriously jeopardize your defense.

The process of analyzing your existing data is known as data validation and can have several components including the identification of intuitively obvious errors, evaluation of data outliers, and assessment of QA/QC results. These steps are often overlooked and are almost never included in the scope of work for a monitoring contractor. If data evaluation is not completed and maintained, the ever-growing dataset may become less and less defensible.

The first step in data validation is simply having a qualified person, familiar with environmental monitoring data, spend time looking over your historic data. Unfortunately, simply looking at a quarter-million lines of data will not provide a clear picture of your data. Analysis results need to be graphed (a picture is worth a thousand lines of data), and it is often intuitively obvious where errors occur. For instance, a decimal misplaced by one digit will give a sample result that is off by an order of magnitude (10X), compared to other data, and having the wrong units can result in three orders of magnitude (1000X) error compared to other data. The latter example is not uncommon, especially if different laboratories have been used over the monitoring history. Some inorganic analyses are reported either as milligrams/liter (parts per million), or micrograms/liter (parts per billion) and unless results are converted to match the database units, some results will be off by +/-1000 times. Likewise, some field monitoring equipment use different scales or units for reading results, such as Fahrenheit versus Centigrade, and failure to convert these units will result in database errors.

Errors like these are usually easy to spot when data are graphed in time-series charts, but what should be done if these errors are noted? If the source of the error can be confirmed, such as comparing the database numbers to the original laboratory reports to check the units, then the result should be corrected in the database. If an error is suspected but cannot be confirmed, such as a decimal point error for manually recorded field data (like electrical conductivity), the suspected error should be flagged in the database along with a notation regarding the suspected source of the error. The rule of thumb is, if you can document an error, change the data; if you cannot document a suspected error, leave the data alone but document the possibility it is an error.

The next step in data validation would be to evaluate outliers that may exist, but for which an error cannot be documented. An outlier is defined as a "Value unusually discrepant from [the] rest of a series of observations." (USEPA, 2009). Outliers may be caused by real environmental conditions (e.g., flushing of contaminants due to heavy precipitation), or may be due to errors in the data such as those stated above. It is important to identify outliers for two reasons. First, the presence of a statistical outlier means it is "A value originating from a different statistical population than the rest of the sample. Outliers or observations not derived from the same population as the rest of the sample violate the basic statistical assumption of identically-distributed measurements" (ibid). In other words, statistical analysis of the data should not be performed if an outlier is present. The second reason to identify outliers is that they are frequently outliers to the high side of environmental data, meaning they are a higher concentration than the other data. If a higher data point is not identified as a statistical outlier, then an opposing attorney or expert witness may use this high data point to help make their case. For instance, if historic compliance data for a downgradient monitoring well, located next to an adjacent landowner's property, typically has very low or no detections of arsenic in groundwater, but one sample shows a detection at a high concentration, it is likely that an opposing attorney will attempt to use this high concentration as evidence of impacts. You may be able to claim that it is a statistical outlier, but if that argument is made in court, it may appear you are hedging on your data. On the other hand, if your database is up to date and notes that the data point as a statistical outlier, that may keep the opposition from arguing their case using that outlier data point.

To test for outliers there are standard statistical tests that should be applied – you cannot identify a statistical outlier by simply looking at the data and concluding that a data point looks out of place compared to the other data. Outlier tests include Dixon's test for smaller data sets, and Rosner's test for larger data sets.

What should be done with data outliers identified through these statistical tests? Unless an outlier value is determined to be caused by a known error (in which case the data error is corrected), the outlier should not be removed from the dataset, but should be identified as a statistical outlier and not used in statistical data analysis. The reason the outlier is flagged but left in the dataset is that future data collection may produce similar values to the outlier, causing the existing outlier to become a non-outlier. Therefore, ongoing outlier testing needs to be performed as new data are generated (at least annually).

Another aspect of data validation involves confirming the results of QA/QC testing and flagging data that do not meet data quality objectives. Of course, if no DQOs are identified in the SAP, there exists no basis for comparison. One example is that duplicate field samples, collected with every monitoring event, should be compared with the original sample results. This is done by a simple calculation called Relative Percent Difference (RPD). If a duplicate sample result is outside the defined RPD limits (typically +/-20%), then the data should be flagged as having a QA/QC problem. Likewise, any QA/QC problems reported by the laboratory, such as contaminants in a lab blank sample, or low recovery of spiked compounds, should be flagged for the corresponding data. For some laboratory QA/QC samples that may be run at a frequency of one for every 20 samples, this means that you may have to flag up to 20 sets of sample results, all of which are subject to the questionable QA/QC result.

It is beyond the scope of this paper to detail all the data validation methods that should be applied, but the important point is that an operator of a SWMF should be proactive in identifying data errors, outliers, or QA/QC questions in their environmental monitoring database. If these are not identified, then the opposition in a lawsuit may use the unidentified problems to their advantage, calling the validity of your data into question.

CONTRACTING

As stated previously, environmental monitoring at SWMFs has become fairly routine and is often viewed as a commodity services to be awarded to the lowest bidder. Although the act of collecting a sample and getting lab analysis results may be viewed as routine, many of the related data collection and validation activities are not necessarily routine, and are often overlooked. To ensure that the selected monitoring contractor is performing the needed services, make sure Requests for Bids (RFB) or Requests for Proposals (RFP) contain full requirements including QA/QC sample collection, QA/QC data evaluation, data management and validation, etc. If possible, always include the detailed SAP in the RFB/RFP.

Because QA/QC sampling and analysis is above and beyond the actual monitoring scope of work, it is important to make sure the QA/QC program is fully specified in the SAP, and is also in the scope of work to be implemented by the monitoring contractor. Potential contractors bidding on a monitoring project will obviously look for ways to cut costs in order to win the work. QA/QC samples can easily account for 20% additional laboratory costs alone, depending on the number of samples collected daily and the rigors of the QA/QC protocol. If these are not specified in the RFB/RFP, contractors will bid very little QA/QC sample collection or analysis, and probably no time at all for data validation.

Keep in mind that selecting the low bidder, may save in the short-term, but long-term losses may occur if the project is not completed properly and data are not defensible.

In addition to retaining the contractor that conducts the sampling, analysis and reporting activities, it is recommended that operators of SWMFs conduct audits of the monitoring procedures on a routine basis. Audits should be conducted either by SWMF personnel, or an independent contractor, and it is recommended that these be conducted at least once in every contracting cycle. While audits can play a critical role in correcting data collection errors, they are just as important as a means to document proper compliance with established procedures.

EXAMPLE LITIGATION RESULTS

In the case involving Merced County's Highway 59 Landfill (discussed above), the plaintiffs argued that sampling conducted on their property showed environmental impacts to groundwater and soil gas under their property, resulting in diminution of property value. However, they collected only a few samples, their sample collection methods were questionable, sample collection was not done in compliance with their documented standard operating procedures, and their QA/QC samples were not appropriate and/or failed QA/QC tests. The plaintiffs dropped the claim of groundwater impact after their data were unsupportive of that claim.

In this case, the plaintiffs did not attack the validity of the existing landfill monitoring data, but instead accepted it as evidence in support of their claim. The defense, on the other hand, recognized the problems with the plaintiffs' data collection procedures, QA/QC, and data results. Among other defense strategies, the validity of the plaintiffs' data was questioned.

In the Memorandum of Decision rendered by the court in February 2011, the judge stated, "Defense expert [name], a geologist for SCS Engineers, testified at length regarding problems with the testing performed in Lot 1 [Plaintiff's property]. He concluded that the tests performed by the plaintiffs were "indefensible" and could not be relied upon. His testimony on the subject was unimpeached." (U.S. District Court, 2011).

Although this was not the only point on which the case was decided, the indefensibility of the plaintiffs' data played a significant part in the court's decision. Without defensible environmental data to support their case, the Plaintiffs were unable to prove their case based on a preponderance of the evidence. The court found in favor of the County (defendant) and further found the case to be frivolous regarding damages. The case has been appealed.

Even though the landfill operator was successful in its defense, the cost of the defense was approximately $500,000, including in-house counsel and retained expert witnesses. The court has since awarded recovery of attorney fees, and a motion has been made to recover other associated costs of defense.

The lesson with this case, regarding validity of environmental data, is that data collected through inappropriate methods, not in keeping with established procedures, and lacking proper QA/QC procedures and documentation, can be successfully attacked in legal proceedings and may heavily influence the court's decision in such a case. If you are the operator of a SWMF, you do not want that to be the case with your environmental monitoring data.

CONCLUSIONS

"Routine" monitoring at solid waste management facilities generates large quantities of data and it is not uncommon for these historic datasets to contain errors. If a claim is filed against a SWMF for environmental impairment, the historic environmental dataset, which is typically public record, may be subject to intense scrutiny. If the dataset contains errors, procedures were not properly followed in the collection of the data, or QA/QC data were not collected to support the monitoring data, the validity of the dataset may be called into question. This may jeopardize the ability to argue the litigation.

Relatively easy steps can be taken to help ensure that the SWMF environmental dataset can withstand the scrutiny of litigation. These include upgrading the sampling and analysis plan and keeping it current through annual reviews; and performing sample collection in accordance with the SAP, including collection of appropriate QA/QC samples and analysis of the QA/QC results. Evaluation of the existing data should be completed to look for obvious errors, identify data outliers, and document errors or questionable data. Finally, operators of SWMFs contracting for environmental monitoring services need to take steps to ensure that retaining the lowest cost consultant does not result in data collection and evaluation short-cuts that could compromise data integrity.

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