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Using Mass Balances to Identify *Functional Equivalents of Direct Discharges*

What is the *Functional Equivalent of a Direct Discharge?*

One of the more intriguing environmental issues that courts and regulators have been grappling with for at least a half-decade now is the extent to which the Clean Water Act's NPDES permitting program can be applied to regulate discharges of wastewater to underlying groundwater networks. A core component of the Clean Water Act is the prohibition of the discharge of pollutants to "navigable waters" without a discharge permit. The Act provided the authority for the establishment of a program for the issuance of such discharge permits - the National Permit Discharge Elimination System, or *NPDES* for short.

The application of the unpermitted discharge prohibition to "navigable waters" meant that the Nation's extensive networks of groundwater were not covered. Groundwater is a significant source of freshwater in the U.S. Approximately one quarter of the approximately 350 billion gallons of freshwater drawn each day comes from groundwater networks. And, while most treated municipal, sanitary, and industrial wastewaters are discharged to surface waterbodies, some wastewaters are discharged directly or indirectly to underlying groundwater networks. For example, in some areas, municipal or industrial wastewaters rich in nutrient content are applied to farmlands and other fertile territories via spray irrigation systems to provide such nutrients for the soils. In addition, some municipal wastewater treatment facilities discharge their treated effluent streams directly to underlying groundwater networks. Historically though, because these groundwater networks are not "navigable," NPDES permits were not required. (State permits are usually required for such discharges.)

More than a decade ago, challenges to the notion that NPDES permits were not required for groundwater discharges began to emerge. Environmental groups and political entities pushing these challenges argued that in some instances, the receiving groundwater was merely a "conduit," or a "conveyance," of pollutants from the discharging facility to a surface waterbody connected to the groundwater network. In other words, the receiving groundwater network was akin to a discharge pipe or ditch conveying treated effluent from a wastewater treatment plant to a river, lake, stream, or ocean.

When the U.S. Supreme Court finally weighed in on this issue nearly four years ago, it agreed that under certain circumstances, a groundwater network receiving discharges from a wastewater treatment facility may be a mere conduit to a connected navigable surface water. In *County of Maui v. Hawaii Wildlife Federation*, the Supreme Court held that in such cases, the navigable surface water would be considered as the receiving waterbody, and a NPDES permit would be required for the discharge. In the Supreme Court's view, such discharges are the "functional equivalent of a direct discharge."

Functional Equivalents: Time & Distance *Versus* Mass & Concentration

In its *County of Maui* opinion, the Supreme Court stated that time and distance are the two most important factors to consider in determining whether a particular discharge is the functional equivalent of a direct discharge. Discharged pollutants that only travel one-half mile for several days through a groundwater network before entering a navigable water would likely be considered as the functional equivalent of a direct discharge. On the other hand, discharged pollutants that traveled 20-plus miles over a period of a year or more may not be considered as such a functional equivalent.

EPA's recent guidance, *Applying the Supreme Court's County of Maui v. Hawaii Wildlife Fund Decision* (referred to herein as the "Functional Equivalency Guidance"), reiterates the importance of time and distance when conducting a functional equivalency analysis. However, a close examination of the Functional Equivalency Guidance suggests that in cases where considerations of time and distance cannot yield a clear answer, a robust analysis of the mass balances of pollutants exiting from a wastewater treatment system, passing through a groundwater network, and finally entering a receiving surface waterbody may be critical.

The Supreme Court's *County of Maui* opinion hints at this in the following key passage in the text of the majority opinion: "Whether pollutants that arrive at navigable waters after traveling through groundwater are 'from' a point source depends on how similar to (or different from) the particular source discharge is to a direct discharge." The Functional Equivalency Guidance expands upon this passage by noting that potentially relevant factors other than time and distance include "the amount of pollutant entering the navigable waters relative to the amount of the pollutant that leaves the point source," and "the extent to which the pollutant is diluted or chemically changed as it travels." Additionally, in describing the information that should be included in a NPDES permit application requesting coverage for functionally equivalent direct discharge, the Functional Equivalency Guidance recommends the inclusion of the measured or estimated mass and concentration of the pollutants leaving the point source, as well as the measured or estimated mass and concentration of pollutants entering the navigable water from the point source - in other words, include a mass balance of pollutants around the groundwater network in question.

Putting It All Together:
Analyzing Mass Balances Around Groundwater Networks

So, in cases where considerations of time and distance cannot yield a clear answer as to whether a municipal or industrial discharge to a groundwater network is the functional equivalent of a direct discharge to a surface water, a robust mass balance is necessary. However, what would be the purpose of such a mass balance? The article immediately above touches upon some of the information that should be included in an NPDES permit application where functional equivalent discharges might be an issue. However, even if the goal is to document why a NPDES permit is not required, an industrial or municipal wastewater operator discharging to a groundwater network may want to use a mass balance to demonstrate that it is a relatively minor contributor of a particular pollutant. Alternatively, the discharger may want to use a mass balance to demonstrate that the chemical character of its discharge is completely altered by the time it reaches a navigable waterbody from a connected groundwater network. The complexity of a mass balance analysis will likely vary depending on, among other factors, the number of other potential sources of the pollutants in question, and the nature of any chemical transformations taking place as the pollutants travel through the groundwater network.

Even if considerations of time and distance cannot yield a clear answer as to whether a discharge to a groundwater network is the functional equivalent of a direct discharge to a navigable water, such considerations may impact the complexity of the mass balance analysis. For example, considerations of distance may impact how to define the "system" around which a mass balance analysis is to be conducted. Does it cover 10 square miles? Or 100 square miles? How will this impact the identification of other potential sources of pollutants to the receiving surface water? In addition, considerations of time may impact how to model the reaction kinetics associated with any chemical transformations to the pollutants as they traverse through the groundwater network. In these cases, considerations of time and distance, while not determinative in and of themselves, may still be critical to supporting a proper and robust mass balance analysis.

Management of Discarded and Re-used Lithium-Ion Batteries: Present & Future

The emergence of the lithium-ion battery ("LIB") nearly 20 years ago resulted in an explosion in the presence and usage of all sorts of consumer electronic products. Today, LIBs are used in everything from smartphones to laptops to headphones. And, with electric vehicles ("EVs") consuming an ever-growing share of the marketplace for automobiles, demand for lithium batteries continues to grow. This increase in demand has brought with it a number of environmental challenges.

One such challenge involves the current regulatory status and management of discarded and re-used lithium batteries. When is a used LIB considered to be discarded? Is a used LIB a RCRA hazardous waste? And, regardless of its regulatory status, how should a used LIB be managed prior to being recycled or discarded?

Perhaps an even more important issue is the flammability hazard associated with defective, damaged, and/or improperly stored used LIBs. A key reason why LIBs are so widely used in consumer electronics and EVs is that they have such high energy density. However, this high energy density, as well as the flammability of some of the materials currently used in LIBs, also increase the risk of combustion.

The regulatory status of discarded and re-used LIBs is quite closely linked to the combustion hazard associated with such batteries. Because of the susceptibility of damaged or defective LIBs to fires, any sign at all of damage to a LIB, a defect in the manufacturing or design of the LIB, or a defect in the manufacturing or design of the product into which the LIB has been incorporated will likely result in disposal of the LIB rather than re-use. This can result in increases in the volume of discarded LIBs, which in turn can lead to an increase in opportunities for such LIBs to combust due to poor management practices.

EPA is acutely aware of the combustion risk associated with discarded or re-used LIBs, and has been pursuing several policy and regulatory initiatives over the past several years to address this risk. According to the Agency, existing regulations designed to ensure the proper management and disposal of more traditional batteries currently apply to LIBs as well. At the same though, EPA has acknowledged that regulations addressing the unique combustion hazards associated with discarded and re-used LIBs are likely needed.

The two articles below address the present and future of LIB regulation. The present, of course, focuses on EPA's current stance regarding how, and to what extent, discarded and re-used LIBs are covered by existing waste management regulations. The future focuses on recent EPA activity to analyze the combustion risk of LIBs and to develop regulations specifically addressing this risk.

The Present: Managing Discarded LIBs as Universal Waste

According to a memorandum issued by EPA on May 24, 2023 entitled *Lithium Battery Recycling Regulatory Status and Frequently Asked Questions*, while discarded LIBs are likely to be considered as hazardous wastes under RCRA, they can in most instances be managed as so-called "universal

The Future: EPA's Plans to Fine Tune Universal Waste

wastes." (This memorandum is referred to herein as the "May 2023 Memorandum.") RCRA's universal waste regulations were first promulgated in the 1990s as part of an effort to ensure the proper management of common, but potentially hazardous, wastes. The idea behind these regulations is that a separate set of streamlined management standards for "universal wastes" would result in more such wastes being recycled, or at least separated from municipal solid waste landfill streams.

From the beginning, the universal waste regulations have applied to discarded batteries. The original intent was to ensure the proper management of more traditional types of batteries, such as lead-acid batteries in fossil fuel-fired vehicles. However, according to the May 2023 Memorandum, LIBs are also included within the scope of batteries covered by the universal waste regulations. As with other types of batteries, LIBs that have suffered significant damage cannot be managed as universal wastes, but rather must be managed as ordinary RCRA hazardous wastes.

EPA did also note in the May 2023 Memorandum that as with other types of batteries, LIBs that are re-used, repurposed, or repaired may not be considered as wastes at all, and thus would remain entirely outside of the reach of RCRA's hazardous waste regulations.

EPA acknowledged that the fire hazards associated with the management of used LIBs are greater than other types of batteries. The May 2023 Memorandum outlines several recommended best management practices for the management of used LIBs. These include: taking steps to prevent any damage to stored lithium batteries; storing damaged or defective lithium batteries separately in appropriate containers; and conducing frequent visual and thermal inspections

Regulations for LIBs

The unique fire hazards posed by the management of LIBs has prompted EPA in recent years to consider additional regulatory actions to address such concerns. As part of its contribution to the Biden Administration's most recent Unified Regulatory Agenda, EPA announced its intention to take such action. According to the Unified Agenda, EPA intends to propose universal waste standards that are specifically tailored for LIBs. According to EPA, such regulations would reduce incidences of fires from used lithium batteries, and generally improve safety standards, while continuing to promote responsible re-use, recycling, and repurposing of such batteries.

At this time, there are no specific proposals that are connected to EPA's planned regulatory activity for LIBs. However, it would not be unreasonable to expect EPA to propose some of the best management practices discussed in the May 2023 guidance. In addition, in its July 2021 report entitled *An Analysis of Lithium-Ion Battery Fires in Waste Management and Recycling,* EPA's Office of Resource Conservation and Recovery noted the different fire risks associated with EV LIBs, and LIBs in consumer electronics. Thus, one can reasonably expect EPA to propose a two-tiered set of standards for the management of LIBs as universal wastes, with one tier applying to LIBs originating from EVs, and another tier applying to LIBs originating from consumer of stored lithium batteries. Some of these best practices may ultimately be codified in forthcoming regulations.

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