



DEVELOPING A NEW REGULATORY PARADIGM TO ADDRESS THE IMPACTS OF DIFFUSE POLLUTION ATTRIBUTABLE TO AGRICULTURE

Jan McNitt and Ron Kefford

*Texas Institute for Applied Environmental Research (TIAER), Tarleton State
University, Box T-0410, Stephenville, Texas 76402, USA*

ABSTRACT

To control pollution attributable to livestock operations, the statutory and regulatory scheme of the US Clean Water Act focuses on implementing structural controls to contain animal waste. While the United States Environmental Protection Agency (USEPA) is empowered only to regulate point sources, existing authority may be extended to regulate diffuse runoff associated with certain livestock facilities. Current water pollution abatement programs, however, have not responded to the differences inherent in diffuse pollution and the land management strategies necessary to control and abate its impacts. The Planned Intervention Micro-watershed Approach (PIMA) recognizes this distinction, offering a method of refining land management strategies while keeping existing point source pollution regulation and enforcement mechanisms in place. Within a limited time frame, producers have flexibility to develop and implement cost-effective management practices that achieve environmental goals. Planned intervention is integrated with a micro-watershed approach to watershed management which uses small, hydrologically discrete areas to target diffuse pollution sources and direct intervention efforts. This approach utilizes local stakeholder input and participation to create a bottom-up, community-based institutional framework for addressing diffuse pollution from agricultural sources that satisfies water quality objectives. © 1999 Published by Elsevier Science Ltd on behalf of the IAWQ. All rights reserved

KEYWORDS

Agriculture; Clean Water Act; livestock; watershed approaches.

INTRODUCTION

The Clean Water Act (CWA) makes the discharge of any pollutant by any person unlawful, absent a permit and subject to certain limitations. (33 U.S.C.A. § 1311(a), 1986). A discharge is defined as "any addition of any pollutant to navigable waters from any point source." (33 U.S.C.A. § 1362(12)(A), 1986). These provisions give the United States Environmental Protection Agency (USEPA) authority to regulate any discernible, confined and discrete conveyance, including but not limited to any concentrated animal feeding operation (CAFOs), "from which pollutants are or may be discharged." (33 U.S.C.A. § 1362(14), 1986). In formulating its regulations for CAFOs, USEPA specified that adequate discharge prevention would be to construct structural controls (to collect and hold runoff and process water from production and animal confinement areas, or any water coming into contact with animal waste) and to apply collected solid and liquid waste to crop fields at prescribed agronomic rates. The use of animal waste as plant fertilizer would

apparently prevent direct discharges from livestock production areas and prevent runoff of polluted storm flows from application fields (Frarey and Jones, 1994).

Continuing to manage animal waste as a crop nutrient, however, may no longer be a sustainable approach to waste management. The livestock industry has become increasingly concentrated; as the number of producers declines, the ones that remain are raising more livestock resulting in fewer farms with larger numbers of animals. Responding to public concern about livestock waste, the United States Department of Agriculture and USEPA are coordinating efforts aimed at addressing runoff from livestock operations (Browner and Glickman, 1998). As part of that effort, USEPA has prepared a draft strategy for addressing water pollution attributable to livestock operations which contemplates making fuller use of its regulatory authority. This paper suggests that while treating runoff from the fields of some CAFOs as point source discharges may be legitimate under the current regulatory authority, it is questionable whether this is the best management strategy or, more importantly, the best policy for achieving improved water quality. To properly address diffuse pollution attributable to agriculture, it may be preferable to develop alternative regulatory paradigms rather than imposing traditional command and control approaches.

CAFOS: CURRENT REGULATORY AUTHORITY AND MANAGEMENT STRATEGIES

The USEPA's CAFO definition is a two-step process (40 C.F.R. § 122.23(b), 1998). First, one must determine whether the facility is an "animal feeding operation" (AFO). An AFO is a lot or facility where animals "have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period," and, "crops, vegetation forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility" (40 C.F.R. § 122.23(b)(1)(i)(ii), 1998). Under current law, a facility that does not meet these criteria is not an AFO and, generally, is not subject regulatory point source oversight. If a facility meets the AFO definition, the second step is to determine whether the facility is a CAFO. This typically requires ascertaining the number of animals, expressed as animal units, confined in that facility. Regulations currently stipulate that each head of slaughter or feeder cattle is equal to one animal unit. Other animals are either more or less than one animal unit; the difference seems to be the amount of waste each generates. A facility that raises livestock or poultry could be classified as a CAFO if it supports over 1000 animal units; supports between 301 and 1000 animal units and discharges pollutants directly into navigable waters through some man-made device; or supports less than 1000 animal units and it is determined to be a significant or potentially significant contributor of pollutants (40 C.F.R. § 122, App.B, 1998). This definitional system reinforces the notion that "large" facilities are believed to be more significant pollution sources. Farms with more than 1,000 animal units, are automatically deemed CAFOs while there must be some indication of polluting activity to capture facilities with fewer animals under the regulatory definition. Federal regulations also reserve an unqualified power to designate any facility a CAFO based upon its potential to pollute or actual pollution. (*Id.*).

The USEPA controls pollution from point sources through use of effluent limitations (33 U.S.C.A. § 1311(b)(2)(A), 1986). An effluent limitation specifies restrictions on the "quantities, rates, and concentrations" of substances discharged from point sources (33 U.S.C.A. § 1362(11), 1986). When USEPA established the effluent guideline for CAFOs in 1974, it promulgated a performance standard of "no discharge" of any waste water used directly or indirectly in the operation of the facility and any precipitation which comes into contact with any manure (40 C.F.R. §§ 412.12(a) and 412.13(a), 1998; 40 CFR § 412.11 (c) and (d), 1998). The agency did not, however, specify a design standard for waste control facilities, electing instead to give producers the flexibility to select facilities that were appropriate for local conditions (39 Fed. Reg. 5704, 1974). The no discharge standard has two exceptions which provide protection from liability for unusual rainfall events. First, no AFO will be deemed a CAFO if it discharges only in the event of a 25-year, 24-hour storm event (40 C.F.R. § 122, App.B, 1998). USEPA's interpretation of this provision is sketchy especially given the fact that a discharge can include the potential to discharge (33 U.S.C.A. § 1362(14), 1986; USEPA, 1995b). Second, the effluent guidelines, which are incorporated into CAFO permits, will allow the discharge of process waste pollutants from a permitted facility, if a chronic or catastrophic rainfall event causes an overflow of process waste from a facility designed, constructed and operated to contain all the water used in the operation of the feedlot plus the runoff from a 25-year, 24-hour storm event (40 C.F.R. § 412.12, 1998).

Discharges due to chronic or catastrophic rainfall present the most striking and visible demonstration of the pollution potential of livestock waste. However, all livestock producers are faced, on a daily basis, with managing their animal waste and effluent from structural controls in order to prevent adverse water quality impacts. USEPA has stated that permitted CAFOs can comply with the effluent limitation by removing the waste stored in structural controls. Methods include using the waste for irrigation purposes and land utilization that conforms with "accepted agricultural practices." (39 Fed. Reg. 5705, 1974). Accordingly, the agency has stipulated waste application rates in CAFO permits based upon crop nutrient needs, believing this management strategy will ensure that runoff from fields would not degrade water quality in receiving waters (58 Fed. Reg. 7610, 1993). In this way, USEPA has specified land management practices which govern use of livestock waste by CAFOs to prevent discharges that would violate the agency's effluent standard for CAFOs.

REACHING THE FRONTIERS OF USEPA'S REGULATORY AUTHORITY

Despite USEPA's CAFO management strategy, there is evidence to suggest that detrimental runoff-induced nutrient loads from application fields continue to reach receiving waters. (McFarland and Hauck, 1995; USEPA, 1995a). USEPA has expressed a desire to use all its regulatory authority to address pollution from CAFO waste application fields. (USEPA, 1998). However, precipitation-induced runoff from fields would appear to be a form of diffuse pollution that falls outside the regulatory jurisdiction of USEPA and the purview of the CWA. Whether rainfall driven runoff from livestock waste application fields is diffuse pollution or is subject to USEPA's regulatory authority arose in the case of *Concerned Area Residents for the Environment v. Southview Farm* (Southview, 1994). The defendant, Southview Farm, a dairy with approximately 1200 mature cows located in upstate New York, had applied liquid effluent to crop fields adjacent to the dairy. Witnesses testified they saw effluent flowing from an application field into a swale which led to a pipe that fed into a stream. In a different field, a liquid waste spreading truck was observed depositing large volumes of effluent which were also seen to run off the parcel. Testimony was given that the waste in both instances eventually reached a creek that flows into the Genessee River, a water of the United States. Although it had rained during both events, however, there was no evidence before the court that the instances reached a level of a 25-year, 24-hour storm event.

Southview Farm prevailed at trial in the U.S. District Court, and the plaintiffs, an environmental citizens group, appealed to the U.S. Circuit Court. (*Id.*) The USEPA filed a friend of the court brief on appeal, in support of the plaintiffs. (*Id.*) In deciding the case, the Second Circuit Court of Appeals held that because Southview Farm itself was a concentrated animal feeding operation, and a point source under the CWA, the effluent spreading operations were point sources and that the farm could not avail itself of the agricultural stormwater exception (Southview, 1994). The court made two additional pertinent determinations. First, although it was raining at the time both violations occurred, there was sufficient evidence presented at trial to support the jury finding that the discharges were not the result of precipitation, but were due to the over-application of animal waste (*Id.*). Second, that both the effluent flowing from the swale and the waste application truck were point source discharges due to the means of conveyance (*Id.*). Importantly, the court did not address the issue of whether precipitation-induced runoff from application fields fits within the agricultural stormwater discharge exclusion or whether an application field associated with a CAFO is itself a point source.

In their briefs to the Appeals court, Southview Farm, and the USEPA presented arguments offering additional insight into the problems with the existing regulatory scheme. Southview Farm claimed because the runoff from its fields did not occur via a man-made conveyance but "naturally flowed to and through the lowest areas of the field," and discharge from the truck reached the stream "in too diffuse a manner to create a point source discharge" that they were not point source discharges. (Southview Brief, 1994). Defendants also claimed protection of the "agricultural storm water discharge" exclusion (*Id.*). This provision, added by Congress in 1986, modifies the definition of "point source" by excluding "agricultural storm water discharges" from the purview of the CWA (33 U.S.C.A. § 1362(14), 1986). This language, Southview argued, indicated Congress wanted to prevent runoff from agricultural fields being considered point source discharges (Southview Brief, 1994). Because the discharges occurred while it was raining Southview

concluded they were due to collected or channeled storm water flow from crop fields, and therefore, qualified as exempt agricultural storm water discharges (*Id.*).

USEPA countered Southview's arguments with two points. First, CAFOs with more than 1000 animal units, which includes Southview Farm, are defined as point sources solely by the number of animal units they house. As such, the entire facility, both confinement/process areas and waste application fields, are a point source to which the effluent guidelines apply (USDOJ and USEPA, 1994). Therefore, any precipitation-induced polluted runoff from CAFO application fields is subject to the effluent standard. This follows USEPA's statement that the CAFO point source is not a traditional point source like pipes, ditches, channels, tunnel, etc. (USEPA, 1995b). Thus, whether a discharge is carried by a man-made conveyance, such as tank trucks, is irrelevant for determining liability for a discharge by a "large" CAFO under the Act. A discharge attributable to a large CAFO, even if traceable to land application, is a point source discharge, and if the CAFO is unpermitted, as Southview was, the discharge is unlawful (*Id.*).

Second, the agricultural storm water exception did not apply to Southview because, as a CAFO, the farm was a point source and that definition specifically excludes "agricultural storm water discharges." While agricultural stormwater discharges are not defined, the CWA does allow discharges without a permit from "non point-source agricultural and silvicultural activities, including storm water runoff from orchards, cultivated crops, pastures, range lands, and forest lands, but not . . . from concentrated animal feeding operations" (40 C.F.R. § 122.3(e), 1998). Therefore, while agricultural stormwater discharges do not require a permit, the discharge of pollutants from a CAFO does (USDOJ and USEPA, 1994). Thus, USEPA concluded that it is possible to have an addition of pollutants from a crop field which is not an agricultural stormwater discharge (*Id.*). The agency reasoned that if precipitation-induced runoff from CAFO application fields is considered an agricultural stormwater discharge, it would allow application of CAFO process wastewater to agricultural fields at rates in excess of accepted agricultural practice. This would provide, in effect, a haven for CAFO operators to evade the CWA (*Id.*). To avoid this result, the agency concluded that runoff from CAFO application fields, traditionally considered diffuse pollution, does not fit within the agricultural stormwater discharge exclusion (USDOJ and USEPA, 1994; 40 C.F.R. § 122.3(e), 1998).

In reaching its decision, the Second Circuit following the principal of judicial restraint, decided the case on narrow grounds based on the facts presented. The court could have adopted USEPA's view that application fields associated with a CAFO are point sources in order to hold Southview liable for its discharges. The court's decision to not adopt that argument may reflect ambivalence toward the agency's position or reluctance to decide an issue that was not essential to the resolution of the case. By basing its decision on narrow grounds, the Second Circuit left open the issue of whether runoff from waste application fields is a point source discharge – subject to USEPA's regulatory authority – or exempt agricultural stormwater runoff. At the same time, USEPA has articulated a colorable argument that it has existing regulatory authority to take enforcement action against CAFO operators who over apply process wastewater. USEPA's CAFO Guidance has distinguished the Second Circuit's *Southview Farms* decision on the facts, interpreting the federal regulations and the CWA as supporting the view that waste application fields of "large" CAFOs are themselves point sources and therefore "the means of conveyance . . . [is] irrelevant for determining whether there was a point source discharge" (USEPA, 1995b).

ISSUES WITH USEPA'S APPROACH TO WASTE APPLICATION FIELDS

While the CWA gives USEPA authority to regulate point sources, it delegates regulatory authority over sources of diffuse pollution to the states. The states generally have not demonstrated an enthusiastic response to addressing diffuse sources of pollution (USEPA, 1997). However, USEPA's approach toward CAFO application fields, while based on legitimate authority, creates tension with what has traditionally been viewed as a matter of state authority – land management activities. The agency position also signals more command and control regulatory activity and oversight of physical areas commonly failing under state police power control. As the United States begins to confront diffuse pollution attributable to agriculture, imposing command and control programs may be an understandable reaction to the problems associated with application fields. From a policy perspective, however, it may not be the most appropriate overall approach.

USEPA's approach to diffuse runoff from application fields may provide only paper compliance. One purpose of the permitting process for point source discharges is to allow the agency to assure that the applicable effluent limitations are met (40 C.F.R. § 122.44, 1998). The USEPA CAFO Guidance states that operator compliance with the land application provisions contained within a permit will act as a "shield" against enforcement for any addition of pollutants to waters (USEPA, 1995b). This implicitly recognizes that land application of livestock waste may not fully capture potential runoff. In fact, scientific evidence is gathering which indicates that the land application of livestock waste at agronomic rates (i.e., in compliance with land application provisions) may, in some cases, be insufficient to prevent harmful levels of polluted, rainfall driven runoff (McFarland and Hauck, 1995). Thus, a regulation that seeks to control nutrient loads to streams attributable to application fields through agronomic application rates may only provide paper compliance.

Moreover, the methods employed by command and control programs, while adequate to control discharges from traditional point sources, will likely prove insufficient for controlling runoff due to precipitation (Frarey and Jones, 1994). Point source control programs typically assure compliance with effluent limitations through inspection, monitoring, and reporting requirements. In this manner, direct discharges may be traced to individual facilities and processes. However, the number and distribution of livestock operations and application fields within a watershed make it difficult for regulators using traditional point source programs, to accurately and efficiently identify and hold livestock producers accountable, whether CAFOs or not, for precipitation-induced runoff from application fields. As governments begin to more actively address the environmental effects of livestock operations, it may be necessary to move beyond point/non-point source distinctions and develop new paradigms for addressing pollution impacts.

THE PLANNED INTERVENTION MICRO-WATERSHED APPROACH: A NEW REGULATORY PARADIGM

The Planned Intervention Micro-Watershed Approach (PIMA), developed by the Texas Institute for Applied Environmental Research (TIAER), acknowledges the functional and pragmatic distinction between diffuse and point source pollution, and provides an alternative approach for addressing precipitation-induced pollution attributable to agriculture. Environmental agencies typically respond to pollution problems after they arise, often imposing command and control strategies to awaken the regulated community. (Frarey and Jones, 1994). In contrast, voluntary programs offer greater flexibility and avoid many of the problems associated with regulating and enforcing traditional command and control regulatory regimes in a landscape-based context. In practice, however, they have failed to produce significant reductions in diffuse pollution attributable to agriculture (*Id.*). PIMA offers a proactive method of employing voluntary approaches to refine land management strategies, while keeping existing enforcement mechanisms in place.

Planned intervention inserts a voluntary compliance loop into a deadline-driven command and control regulatory regime, and envisions cooperation between agricultural and natural resource agencies to provide technical expertise and facilitate behavioral changes among producers. Producers can choose among approved practices as part of an overall pollution abatement plan. Participants are given a reasonable period of time, education, and, if applicable, cost-share financial assistance to implement land management approaches to comply with in-stream water quality standards established by an environmental agency. Those who do not follow their plans, or fail to address non-compliance issues, are subject to mandatory referral to the environmental agency with regulatory jurisdiction for enforcement action. This allows producers the opportunity to work with agricultural and natural resource agencies to choose and tailor land management practices to site-specific conditions. In this manner, PIMA shifts primary responsibility for planning, designing and implementing land-use strategies away from environmental regulatory agencies to agencies and individuals who have an intimate knowledge of land management and agricultural operations.

At the same time, the environmental agency retains and can exercise its regulatory authority if: a producer fails to implement or manage pollution controls, there is evidence of actual discharges, or pollution continues unabated. Hence, planned intervention provides CAFO operators with the flexibility to develop and implement cost-effective management practices that achieve environmental goals. Planned intervention also offers a pragmatic approach for environmental agencies charged with enforcement of landscape-based pollution programs attributable to agriculture. It allows agencies to focus enforcement resources where they

are needed most, insuring that non-compliant producers do not pollute indefinitely and will be held accountable. PIMA offers producers, regulators, and the general public an approach to realize benefits by addressing an environmental problem which has largely evaded existing command and control approaches.

While planned intervention provides an alternative method of developing and enforcing landscape-based pollution abatement strategies, the micro-watershed approach offers an alternative watershed management tool for landscape-based pollution concerns. Traditional approaches to watershed management usually require extensive and costly water quality monitoring programs to quantify the amount of nutrient runoff from individual fields. Centralized downstream monitoring, capturing larger drainage areas, is less costly, but would not provide a direct connection to the behavior of CAFO operators. An approach unable to hold individuals accountable will have little deterrent effect. Unless each livestock operation is monitored, producers lack the objective, quantitative information needed to determine the success of their efforts or prove compliance with permit requirements. Furthermore, the stochastic nature of rainfall events or runoff from non-compliant neighbors could frustrate or taint the efforts of operators within a watershed who incur the expense needed to meet or exceed the standards specified in their permits. If traditional approaches to watershed management are unable to credit efforts of compliant operators or deter non-compliant ones, there is little incentive for responsible operators to act responsibly. Even if successful efforts could be acknowledged and non-compliant operators identified, a traditional inspection and enforcement regime would require maintaining sufficient presence in rural areas to pursue complaints related to manure management and application practices.

In contrast, a micro-watershed approach seeks to isolate landscape-based pollution problems in discrete areas with identifiable hydrologic boundaries, and involve landowners in developing strategies for controlling landscape-based pollution and improving water quality. This approach provides a means of targeting control strategies and devoting enforcement resources. Regulators can respond to factors specific to each sub- or micro-watershed, such as its size, number of landowners, land uses, soil types, and the number of receiving water bodies within the watershed. By focusing on discrete areas with identified diffuse pollution problems, this strategy can maximize the amount of pollution reduction possible, given the thousands of acres of land and the activities in a particular watershed which contribute landscape-based pollutants. As a result, regulatory agencies can more closely monitor the efficacy of control and abatement programs without compromising water quality standards.

The micro-watershed approach also utilizes landowner councils, which work to achieve water quality that meets or exceeds state criteria and standards. Employing existing state-based conservation programs, natural resource agency representatives can help the council tailor land use and waste management plans to fit local watershed conditions while they assist agricultural producers in developing individual management plans. Through the council, operators have a forum to coordinate plans to maximize the efficiency of their efforts and achieve water quality goals. Landowners can prioritize areas within the micro-watershed and target control strategies and applicable cost-share funds. Livestock producers and council members can explore joint initiatives that meet the operational needs of other CAFO operators and the water quality goals of the micro-watershed as a whole. The council also provides a forum for confronting recalcitrant individuals. Since the success of the council will be linked to measurable improvements in water quality, this will generate a form of positive community peer pressure that can be used in deliberations. Landowners or animal producers who are reluctant to participate, may be more inclined to change management practices than face potential censure from neighbors for thwarting their attempts to improve water quality. In the end, this may enhance the potential for more innovative council initiatives. Meanwhile, the principles of planned intervention will continue to apply to all landowners, with the promise of regulatory backup if water leaving the micro-watershed fails to meet established water quality criteria. The micro-watershed approach can increase regulatory efficiency and create economies of scale which would allow agencies to redirect personnel and resources to police remaining non-compliant individuals using planned intervention strategies, or to pursue other environmental problems.

CONCLUSION

Diffuse pollution attributable to agriculture, particularly nutrient loads attributable to livestock operations, has attracted the attention of the public and regulatory agencies. USEPA has argued that regulating the

application fields associated with CAFOs is a legitimate exercise of its authority under the CWA. That approach, however, might be inappropriate. PIMA offers a viable proactive regulatory paradigm for organizing regulatory and natural resource agencies, local governments, and landowners to implement water pollution control and abatement programs in areas where land use activities have an effect on water quality. PIMA facilitates compliance by providing a realistic time frame for achieving environmental goals, it provides feedback to producers on the success of their efforts, and allows agencies to isolate pollution hot spots and allocate agency resources more efficiently. By organizing the landowners in impacted watersheds into councils, agencies can adapt existing conservation programs in order to identify and implement cost-effective pollution control strategies. By combining these voluntary and regulatory elements in a micro-watershed context, PIMA provides a conceptually different, yet pragmatic, institutional strategy for addressing landscape-based pollution from livestock operations and other agricultural activities.

REFERENCES

- 39 Fed. Reg. 5703, 5705 (Feb. 14, 1974).
58 Fed. Reg. 7620 (Feb. 8, 1993).
33 U.S.C.A. § 1311(a)(West 1986).
33 U.S.C.A. § 1311(b)(2)(a)(West 1986).
33 U.S.C.A. § 1342(p)(West Supp. 1998).
33 U.S.C.A. § 1362(11)(West 1986).
33 U.S.C.A. § 1362(12)(A)(West 1986).
33 U.S.C.A. § 1362(14)(West 1986).
40 C.F.R. § 122, App.B(1998).
40 C.F.R. § 122.3(e)(1998).
40 C.F.R. § 122.23(b)(1998).
40 C.F.R. § 122.23(b)(1)(i)(ii)(1998).
40 C.F.R. § 122.44(1998).
40 C.F.R. § 412.11(c)(1998).
40 C.F.R. § 412.11(d)(1998).
40 C.F.R. § 412.12(a)(1998).
40 C.F.R. § 412.13(a)(1998).
Browner, C. and Glickman D. (1998). *Clean Water Action Plan: Restoring and Protecting America's Waters*. United States Environmental Protection Agency and the United States Department of Agriculture, Washington, D.C.
Concerned Area Residents for the Environment v. Southview Farm, 34 F.3d 114, (2nd Cir. 1994) [referred to herein as Southview].
Frarey, L. and Jones R. (1994). *Dimensions of Planned Intervention*. Texas Institute for Applied Environmental Research, Stephenville, Texas.
McFarland, A. and Hauck L. (1995). *Livestock and the Environment: Scientific Underpinnings for Policy Analysis*. Texas Institute for Applied Environmental Research, Stephenville, Texas.
Southview Farm and Richard Popp, *Brief for Defendants-Appellees. Concerned Area Residents for the Environment v. Southview Farm*, 34 F. 3d 114 (2nd Cir. 1994)(No. 93-9229)[referred to herein as Southview Brief].
US Department of Justice (DOJ) and USEPA, 1994, *Brief for the United States as Amicus Curiae. Concerned Area Residents for the Environment v. Southview Farm*, 34 F.3d 114 (2nd Cir. 1994)(No. 93-9229).
USEPA (1995a). *National Water Quality Inventory: 1994 Report to Congress*. EPA841-R-95-005. United States Environmental Protection Agency, Office of Water, Washington, D.C.
USEPA (1995b). *Guide Manual on NPDES Regulations for Concentrated Animal Feeding Operations*. EPA 833-B-95-001. United States Environmental Protection Agency, Office of Water, Washington, D.C.
USEPA (1997). *Animal Waste Disposal Issues*. Audit Report No. EIXWF7-13-0085-7100142. United States Environmental Protection Agency, Office of Inspector General, Washington, D.C.
USEPA (1998). *Draft Strategy for Addressing Environmental and Public Health Impact Animal Feeding Operations*. United States Environmental Protection Agency, Washington, D.C.

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