CONFERENCE PROCEEDINGS

THE IMPACT ON INDUSTRY OF THE CLEAN WATER ACT OF 1977 and COST EFFECTIVE WASTEWATER TREATMENT TECHNOLOGIES IN PUERTO RICO

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INSTITUTE OF CHEMICAL ENGINEERS

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UNIVERSITY OF PUERTO RICO

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NOTE:

Presentation made by Dr. Rafael Muñoz Candelario and Mr. A. Heres were not included because are not authorized to be published at this moment. If you interested, please contact them at 832-4040 and 725-9030 respectively for specific information to when are going to be available to the public.

INTRODUCCION

El programa de permisos bajo el sistema nacional de eliminación de descarga contaminantes ("NPDES") establecido bajo la Sección 402 de la Ley Fedral de Agua Limpia es el mecanismo mediante el cual en toda la nación se hacen aplicables las limitaciones y los estándares de calidad de agua a los puntos individuales de descarga. Todos los puntos de descarga bien fueran federales, municipales o industriales, tenían por ley que obtener un permiso NPDES en o antes del 31 de diciembre de 1974 (Sección 402 (k). (Las referencias en paréntesis son las secciones de la Ley Federal de Agua Limpia.)

Debido a que los permisos NPDES no son válidos por más de cinco (5) años, la gran mayoría de las fuentes están al presente envueltas en el proceso de negociar la segunda generación de permisos. Y la reglamentación que cubre este proceso se encuentra codificada en el Título 40 del Código de Reglamentos Federales, Partes 124 y 125 (1977).

Cabe señalar, sin embargo, antes de entrar en materia, que el 10 de agosto del 1978, la Agencia Federal para la Protección Ambiental (EPA) propuso revisiones extensas a la reglamentación existente que gobierna el mecanismo de permisos y la misma se publicó el 21 de agosto de 1978 en el Federal Register, Tomo 43, página 37,078.

INSTITUTE OF CHEMICAL ENGINEERS
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PROCEEDINGS OF CONFERENCE ON THE IMPACT OF INDUSTRY OF THE CLEAN WATER ACT OF 1977 COST-EFFECTIVE WASTEWATER TREATMENT TECHNOLOGIES IN PUERTO RICO

LEGAL ASPECTS OF NPDES PERMITS

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JANUARY 26, 1979

CONTENIDO Y CONDICIONES DE UN PERMISO

Un permiso NPDES incorpora las limitaciones de descargas y estándares promulgados bajo las secciones 301, 304, 306 y 307, así como las limitaciones sobre calidad de agua establecidas bajo la sección 302 a las fuentes individuales. A pesar de que el Congreso contempló como cuestión general que las limitaciones de decargas se pusiesen en vigor antes de que se emitieran permisos, la Ley provee para la situación inversa. Es decir, los permisos NPDES pueden ser expedidos "sujetos a la condición que dicha descarga cumpla, bien sea con todos los requisitos aplicables bajo las secciones 301, 302, 306, 307, 308 y 403 de la Ley o antes de que se tomen las acciones de implementación necesarias relativas a todos dichos requerimientos a aquellas condiciones que el Administrador determine sean necesarias para llevar a cabo las disposiciones de esta Ley. "(Sección 402 (a) (1)).

Por lo tanto, antes de la adopción de limitaciones de descargas para la industria, EPA puede emitir permisos individuales conteniendo "aquellas condiciones que el Administrador determine sean necesarias para llevar a cabo las disposiciones de" esta Ley.

Un permiso normalmente contiene un sinnúmero de otras condiciones en adición a indicar que cantidad de un contaminante puede ser descargada. Contiene, por ejemplo, fechas finales para cumplir con limitaciones y estándares, fechas interinas para la sumisión de planos a la Agencia, fechas

de comienzo de construcción y aquellos otros pasos relacionados con la instalación de equipo para el control de la contaminación (40 CFR 124.44, 125.23 (1977)). En adición, en virtud de la sección 308 (a), el permiso puede requerir que la industria que instale equipo de muestreo, tome muestras de las descargas, mantega récords y ofrezca información a EPA o al Estado (40 CFR 124, Subparte g (1977), 40 CFR 125.27 (1977)).

PROCEDIMIENTO PARA OBTENER UN PERMISO NPDES

El procedimiento mediante el cual se obtiene un permiso NPDES puede dividirse en varios pasos cada uno de los cuales describo a continuación:

(a) Solicitud: El proceso comienza con la solicitud para un permiso NPDES, bien sea en su forma standard o en su forma corta (40 CFR 125.2 (1977)). La solicitud que se someta por una corporación debe de estar firmada por el principal oficial ejecutivo, al menos a nivel de vice-presidente o su representante autorizado (40 CFR 125.12 (f) (1977)). El tenedor de un permiso que desea continuar descargando luego que expira el permiso debe de solicitar su reexpedición no menos de 180 días antes de su fecha de expiración (40 CFR 125.12 (j) (1977)). Finalmente, en cuanto a la solicitud se refiere, deben tener presente que recientemente el asesor legal de la EPA en Washington determinó que la información que se somete en una solicitud o aquella que forma parte de un permiso NPDES no es confidencial (General Counsel's Class Determination 1 - 78).

Para el caso de Puerto Rico, hay que solicitar de la Junta de Calidad Ambiental un Certificado de Calidad de Agua. La Sección 401 (a) (1) de la Ley de Agua Limpia requiere que el estado, en este caso Puerto Rico certifique que la descarga propuesta no viola el Reglamento de Estándares de Calidad de Agua de Puerto Rico, aprobados en 1973 y subsiguientemente enmendados en 1976. (Nota: Standard de Calidad de Agua - En la declaración de política pública contenida por la Sección 101 (b) de la Ley, el Congreso reconoció la responsabilidad y el derecho en primera instancia de los estados para prevenir, reducir y eliminar la contaminación. Antes de 1972 la gran mayoría de los estados habían adoptado normas de calidad de agua basadas en el impacto de la descarga en aguas navegables. El Congreso decidió conservar el derecho de los estados a establecer dichos estándares de calidad de agua y en 1972 requirió que cualquier permiso incluyese limitaciones a las descargas suficientes para asegurar el cumplimiento con dichos estándares. (Sección 301 (b) (1) (c) y 402 (a) (1)). Los estándares de calidad de agua se derivan del nivel de descarga de contaminantes que pueda ser asimilados por un cuerpo de agua sin que se deteriore su uso designado. La disponibilidad de tecnología de control no es un factor relevante a pesar de que los factores tecnológicos se consideran en determinar los requerimientos mínimos necesarios para conservar el uso deseado de un cuerpo de agua. Normalmente los estándares de calidad de agua para cualquier cuerpo de agua contienen dos elementos. Un uso o usos designados y una concentración máxima para un contaminante específico.

La Sección 303 (a) conserva los estándares de calidad de agua que estaban

en efecto antes de 1972. El procedimiento para cambiar los estándares que no eran consistentes con la Ley se dispuso en la Sección 303 (a). En adición cualquier estado que no había adoptado estándares de calidad de agua antes de las enmiendas del 1972 se le concedió seis meses para doptar y someter dichos estándares.

La agencia estatal (en nuestro caso la Junta de Calidad Ambiental) tiene tres alternativas: aprobar, denegar o renunciar a la certificación. La propia ley impone una renuncia si no se expide el Certificado de Calidad de Agua dentro de un "período razonable (que no excederá de un año"). Desde el punto de vista de ingeniería o más bien desde el punto de vista que concierne a los ingenieros, deben tener presente que los reglamentos de standards de calidad de agua de Puerto Rico recogen unos stándares sumamente estrictos. Desde el punto de vista legal, deben tener presentes dos aspectos: (1) que si la agencia estatal deniega el permiso, la agencia federal está impedida de expedir un permiso NPDES y (2) que la negociación y la revisión judicial de un Certificado de Calidad de Agua tiene que hacerse en las cortes estatales. Es decir, que a pesar de que más adelante en el procedimiento pueden hacerse comentarios sobre el Certificado de Calidad de Agua, si una fuente no está conteste con el contenido del Certificado de Calidad de Agua, el foro apropiado para dilucidar dicha controversia es el tribunal local y no la agencia federal.

(b) Determinación Preliminar: EPA hace entonces una determinación preliminar sobre si va a expedir o va denegar el permiso. Si decide expedir el permiso, se prepara un borrador de permiso que contiene las limitaciones propuestas, los schedules de cumplimiento y cualquier otra condición (40 CFR 125.31 (1977)).

(c) Aviso y Participación del Publico: Se publica un aviso sobre la determinación preliminar a las agencias de gobierno (40 CFR 125.14 (1977)) y a todas las personas interesadas (40 CFR 125.32 (a) (1977)). El público tiene entonces 30 días siguientes a la publicación del aviso para someter comentarios por escrito sobre el permiso preliminar o para solicitar que se celebre una vista (40 CFR 125.32 (b) (1977)). La vista pública tiene por obligación que celebrase si la agencia determina que existe un grado significativo de interés público sobre el permiso propuesto (40 CFR 125.34 (a) (1977))

(d) Otorgamiento del Permiso: El Administrador Regional está facultado para hacer una determinación final sobre la solicitud no menos de 30 días luego de publicado el aviso de su decisión preliminar (40 CFR 125.35 (1977)). El otorgamiento del permiso constituye una determinación administrativa final a menos que se solicite y se conceda una vista adjudicativa (40 CFR 125.35 (c) (1977)).

(e) Vista Adjudicativa: Cuando el otorgamiento del permiso está en manos de EPA, como es el caso de Puerto Rico, cualquier persona con interés puede solicitar del Administrador Regional que se celebre una vista adjudicativa si se solicita dentro de los diez (10) días siguientes a de la determinación final para emitir o denegar un permiso (40 CFR 125.36 (b) (1977)).

La solicitud tiene por obligación que ser concedida si se hace en la forma apropiada y si contiene hechos meteriales relevantes a si el permiso debe ser expedido, denegado o modificado (40 CFR 125.36 (c) (1977)). Si la solicitud se concede, el efecto de aquellas partes del permiso que son objeto de la vista se pospone hasta que haya una determinación final de la EPA (40 CFR 125.35 (d) (2) (1977)).

La vista adjudicativa es presidida por un oficial examinador quien es nombrado por EPA. Y se recibe testimonio oral y escrito. Se permite el contrainterrogatorio y se lleva un récord (40 CFR 125.36 (i) (1977)).

Al finalizar la vista el oficial examinador certifica el récord conjuntamente con sus determinaciones de hecho propuestas al administrador Regional. Si existen cuestiones de derecho planteadas, el Examinador las certifica al Sub-Administrador a cargo de "enforcement" y al Asesor Legal General. El Sub-Administrador Regional entonces considera el récord y emite una decisión inicial sobre los puntos objeto de disputa que no sean cuestiones de derecho. Las cuestiones de derecho se deciden por el Sub-Administrador a cargo de "enforcement" y el Asesor Legal General (40 CFR 125.36 (1) (2), (1977)). La decisión del Sub-Administrador a cargo de "enforcement" y del Asesor Legal General sobre cuestiones de derecho se convierte en final después de haberlas comunicado al Administrador Regional, al oficial examinador y a las partes. La decisión inicial del Administrador Regional es final a menos que dentro de los 10 días de su emisión una de las partes en la vista apele la decisión al Administrador. Dicha apelación es un pre-requisito

para la revisión judicial de la decisión final del Administrador (40 CFR 125.36 (n) (6) (1977)). El Administrador puede confirmar, modificar, dejar sin efecto o devolver para procedimientos ulteriores la decisión inicial del Administrador Regional.

RASGOS SOBRESALIENTES DE LA REGLAMENTACION PROPUESTA SOBRE EL PROGRAMA NPDES

Como mencioné anteriormente, EPA ha propuesto revisiones sustanciales a la reglamentación existente con miras a facilitar el trámite para obtener permisos NPDES. Los cambios más significativos propuestos son como siguen:

1. Definición de Aguas Navegables - El término se redefiniría en su forma más amplia para incluir cualquier cuerpo de agua o aguas 'que afectaran o pudieran afectar el comercio interestatal". 40 CFR 122.3 (s) (4).

2. Definición de "nuevas fuentes" - Una fuente de descarga que comienza construcción antes de la adopción de un nuevo standard bajo la Sección 306 se consideraría una nueva fuente si (1) la construcción continúa luego de propuesto dicho standard; y (2) los standards finales se promulgan dentro de los 120 días de la propuesta (40 CFR 122.3 (t).

3. Relación con la Sección 404 - Descargas de materiales de dragado y relleno estarían cubiertos por el programa NPDES en vez del programa bajo la Sección 404 si su fin primordial es "la disposi-

ción de material de desperdicio más bien que el cambio de la elevación o de la profundidad de un cuerpo de agua (40 CFR 122.4).

4. Firmantes de las Solicitudes - Las solicitudes de permisos sometidas por una corporación tendrían que ser firmadas por el oficial ejecutivo principal o al menos a nivel de vice-presidente. Por tanto, las solicitudes no podrían ser firmadas por los representantes autorizados de oficiales. En adición, el que firma debe certificar que la información es correcta. (40 CFR 122.5).

5. Condiciones que son de Aplicación a Todos los Permisos - La reglamentación existente requiere que estos términos y condiciones ("boiler plate") se incorporen expresamente en cualquier permiso NPDES. Sin embargo, bajo la Sección 122.14 popuesta estas condiciones ya establecidas, así como cuatro nuevas y significativas condiciones serían obligatorias a todos los tenedores de permisos independientes de que se incluyeran o no en el permiso. Las nuevas propuestas son las siguientes:

   (a) El tenedor del permiso estaría limitado a niveles de descarga de contaminantes informados en la solicitud si el contaminante no se limita en otra forma en el permiso.

   (b) El tenedor del permiso estaría impedido de descargar

cualquier contaminante para el cual se solicitó información en la solicitud a menos que expresamente lo autorizase el permiso.

(c) El tenedor del permiso estaría impedido de "by-pass" de las facilidades de tratamiento a menos que el "by-pass" fuese necesario para impedir pérdida de vida, daños serios o graves daños a la propiedad y en el caso donde no existan alternativas viables y aviso sobre dicho "by-pass" sea dado con anterioridad.

(d) El tenedor del permiso podría justificar un incumplimiento a las condiciones del permiso si dicho incumplimiento se causa por un "upset"; es decir, factores que están más allá del control razonable del tenedor del permiso a pesar de tener diseños, operación y prácticas de mantenimiento adecuados.

6. Limitaciones y Condiciones - La reglamentación y los requerimientos aplicables al permiso NPDES serían aquellos que estuviesen en vigor antes de la expedición del permiso por EPA. Las reglas propuestas clarifican las condiciones que deben incluirse en un permiso si fuese necesario, incluyendo limitaciones más estrictas que aquellas basadas en guías tecnológicas; la opción de las mejores

practicas de administración bajo la Sección 304 (e) y los standards de pretratamiento bajo la Sección 307 EPA además requiriría que las limitaciones y condiciones de un nuevo permiso fuesen al menos tan estrictas como aquellas que contiene el permiso que expiró aún cuando dichas condiciones fuesen más estrictas que las guías de descargas subsiguientemente promulgadas (40 122.15 (i)).

7. El Cálculo y las Especificaciones de Limitaciones de Descargas- EPA propone que las limitaciones o los standards a ser incluidos en un permiso se calculen en base a producción real de la facilidad más bien que en base a la capacidad y diseño de la facilidad. (40 CFR 122.16 (a)). Adicionalmente, las limitaciones de descarga serían calculadas para cada punto de descarga y se concedería crédito por contaminantes que se encontraran en las aguas servidas a las plantas bajo ciertas condiciones. (40 CFR 122.16 (s).

VIOLACIONES

Finalmente, los poseedores de permisos NPDES deben estar conscientes de que dicho permiso se trata de un contrato entre el pos edor del permiso y la EPA y que para hacer cumplir dicho contrato, la Ley de Agua Limpia en su Sección 309 recoge un sinnúmero de mecanismos para hacer que se cumpla con sus condiciones y dichos mecanismos pueden tomar la forma de una orden administrativa notificando una violación, así como de una acción civil en corte con penalidades de $10,000 diarios por cada día de violación. Finalmente, la Sección 309 (c) (1) de la Ley permite que se

radiquen acciones criminales por violaciones "willful" o negligentes de la Ley y que pueden resultar en prisión por un año o multas de $25,000 diarios para primeras violaciones y de hasta $50,000 y dos años de prisión para violaciones subsiguientes. El otro mecanismo que existe es el de incluir a la facilidad en una lista negra ("black listing") cuyo resultado sería el excluir a la facilidad que está violando de recibir contratos del gobierno federal.

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THE NPDES PROGRAM AND THE WATER QUALITY CERTIFICATE IN PUERTO RICO

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WATER QUALITY BUREAU
ENVIRONMENTAL QUALITY BOARD

JANUARY 26, 1979

The National Discharge Elimination System (NPDES) is a permit program to control the discharge of pollutants into surface and coastal waters; and coastalwaters; and constitutes the legal mechanism in which state and federal agencies rest upon for the abatement of water pollution. This permit program replaces and improves the old permit system under the 1899 Refuse Act administrated by the U. S. Corps of Engineers. Today this program is administrated by the federal government throught the U. S. Environmental Protection Agency (EPA) and co-administrated by the corresponding state environmental agency the Environmental Quality Board (EQB). The NPDES permit is implemented as a mechanism to assure that effluent limits are met, the necessary technology is applied, and that all requirements of the Clean Water Act and applicable Water Quality Standards are met on schedule. Under this law it is illegal to discharge any pollutant into the nation's water without an approved NPDES permit.

Many people have identified the NPDES permit as a license to pollute, but on the contrary, the permit regulates qualitatively and quantitatively what may be discharged. Such permit sets specific limits on the effluent from each point source. It commits each discharger to comply with all applicable provisions of the Federal Clean Water Act and Water Quality Standards Regulation. If an existing discharger cannot comply immediately, the permit sets targets dates to achieve compliance. The permit commits such discharger to reduce or eliminate its discharges in an ordely fashion, in specified steps at specified dates. The commitments are legally enforceable.

If a permit contains a compliance schedule, each step can be enforced without waitting for final compliance, and clear limits are put on discharges while the polluter is moving toward compliance.

A guarantee that a permit is not a license to pollute is that the entire process must be carried out in the glare of public scrutiny. Under the Clean Water Act, the permit applications and the proposed permits are available to the public. There is an opportunity for a public hearing before a permit is issued or denied. The permit itself, with all conditions and requirements, is also a public document. The monitoring information that permit holders must report is also available to the public.

The NPDES permit, in essence, is a contract between a discharger and the government. If a discharger violates the conditions of the permit or makes illegal discharges without a permit, such discharger is subject to be fined and may even be subject to prison.

Both, EPA and EQB can require compliance with permit conditions by issuing administrative orders, that are enforceable in State and Federal courts or by seeking administrative or court actions.

After receiving the permit application, both agencies evaluate it. To comply with section 401 of the Act, before EPA can issue an NPDES permit a Water Quality Certification must be received from the state in which the discharge takes place, so that such discharge will not violate national effluent limitations and to assure that applicable water quality standards applied to the receiving body of water may not be exceed as

consequence of the discharge.

In order to comply with this section, EPA proposes a draft permit and request from EQB a Water Quality Certificate (WQC). In the Commonwealth of Puerto Rico, the Environmental Quality Board is the agency responsible to issue such certification. As a first limitation is reviewed. The limitations imposed in the draft permit are compared with applicable Water Quality Standards Regulations, and then EQB modifies such limitations to insure compliance with local regulations. It also sets special conditions to assure compliance with the state continuous planning process and state strategy to abate water pollution* (3c, 205b and 208). In the analysis and development of the draft water quality certificate, EQB utilizes the most recently technics of mathematical modeling in order to impose the discharge limitations in such a wat that the applicable Water Quality Standards of the receiving waters can be reasonable assured and maintained. At the end of the analysis, the Board prepares a draft Water Quality Certificate, a draft NPDES permit, preliminary determinations, and intent to issue a Water Quality Certificate, and a Public Notice.

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* 3c The Comprehensive Water Quality Management Plan for Puerto Rico --- 1970-2020

205b Goals and Progress of Statewide Water Quality Management Planning

208 Water Quality Management Plan for the Island of Puerto Rico

In some cases there is reasonable assurance that the discharge will not comply with applicable Water Quality Standards, in such cases the certification is denied. The intent to issue or deny a certification is published after due evaluation of the information concerning the discharge and through field inspections to the sites.

To insure public participation in the process of issuing the Water Quality Certification, the appropriate public notice is published in the local news media, and allow 30 days to receive comments from the general public and/or from the applicant. After such period of public participation, if no comments or opposition is received, the Board automatically issues the final Water Quality Certificate to the applicant and to EPA. During the public participation period a public hearing may be requested, EQB would consider the reasons for such request and upon EQB discretion such hearing is granted to consider the draft Water Quality Certificate, EQB deisgnates the hearing panel and notifies the general public with 30 days in advance by publishing in the news media the appropriate public notice. After the public hearing is held, the hearing panel submits its recommendations to the Board for the final determination. The Board then issues the final Water Quality Certification to the applicant and to EPA.

As soon as the federal agency receives the final Water Quality Certificate, EPA is in the position to finalize their procedure to issue

the final permit to the applicant. Some of the powers that the permit system bring to the state in the case of Puerto Rico are the right of entry to permittee's premises, inspect, and monitor sources of pollution and the authority to require polluters to install monitoring equipment, keep records, and file reports. In addition this Board has the right to immediately stop discharges that represent imminent or substantional danger to public health.

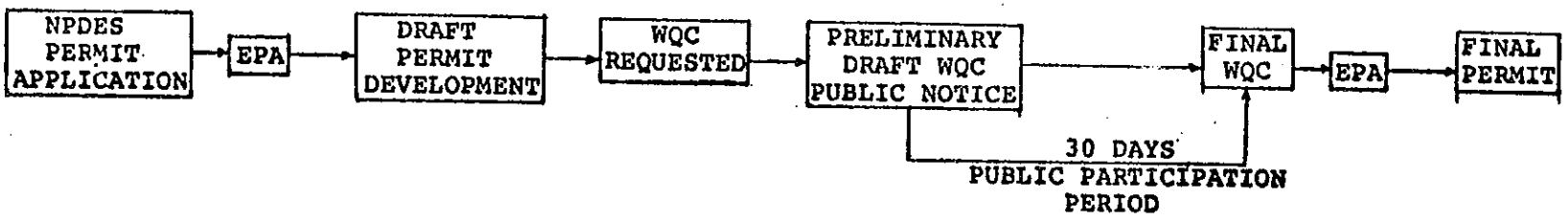
As part of the permit, discharges are required to continously monitor their waste and to report the amount and nature of all waste components. The report is known as discharge monitoring reports. These reports are evaluated upon submittal by EQB and EPA staff to secure that reported values are within the limits of the permit. If any violation is reported in the discharge monitoring report, the permit holder should include a non-compliance notice to explain the reasons for the non-compliance. This non-compliance notification is evaluated to determine further action. If any discharger continously violate the conditions of the permit, EQB or EPA may require to stop said discharge until necessary changes or adjustments are made in order to achieve compliance with the limits specified in the permit. EQB also performs compliance and sampling inspections to those industries of facilities that have NPDES permits, in order to determine if the information submitted to EQB in the self-monitoring report is correct and if the

discharger is in compliance with the conditions of the permit.

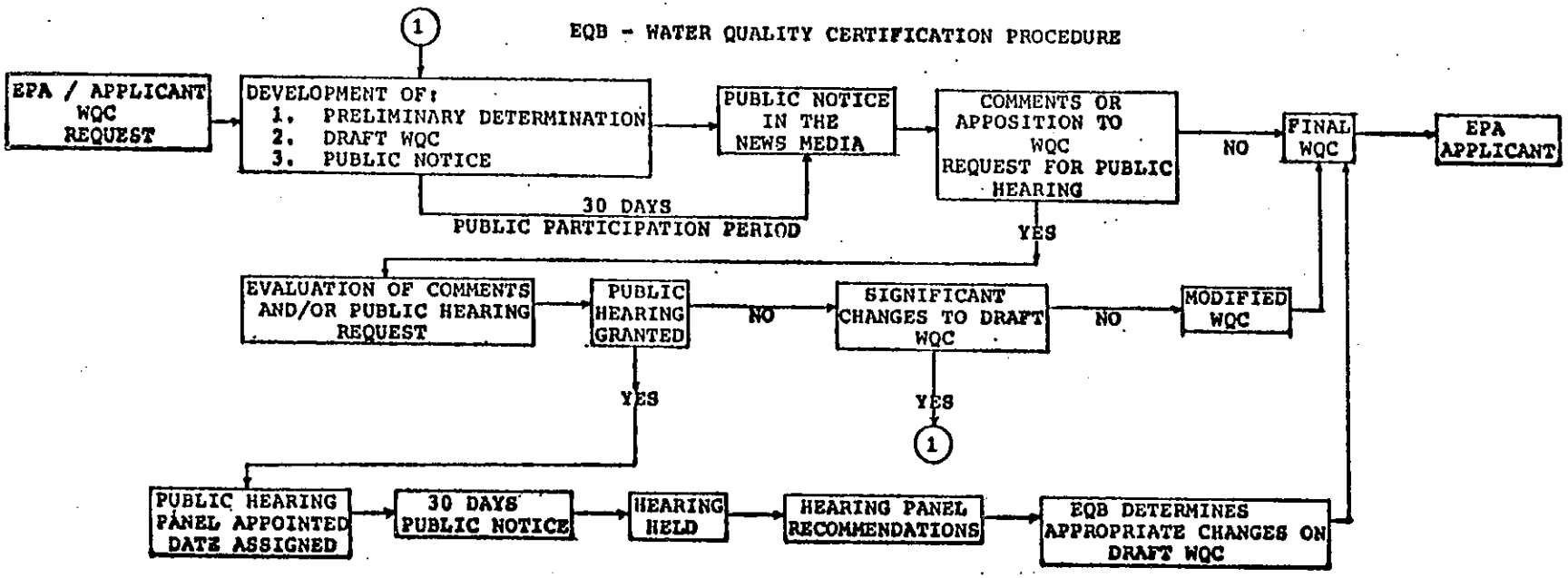
At present, as stated before, the NPDES permit is issued by EPA but through the Water Quality Certification process the participation of EQB is guaranteed in the development of all permits within the jurisdiction of Puerto Rico. In the near future, EQB intends to apply and receive delegation of NPDES permit programa to issue and administrate the whole program. Toward such delegation in this comprehensive Water Quality Standard Regulations to assure proper mechanism to implement such program in accordance with EPA's requirements.

As a conclusion, the NPDES permit program has the objective to restore and maintain the chemical physical and biological integrity of the surface and coastal waters of Puerto Rico. Both, the federal and state laws provides us with formidable tools to reach that objective. The Board needs and looks foward to the support and cooperation of industry, other government agencies and of the general public to help us to apply those tools and implement the permit program and to carry out our responsibilities to protect our public health and our environment.

NPDES DEVELOPMENT
(SIMPLIFIED)



EQB - WATER QUALITY CERTIFICATION PROCEDURE



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THE CLEAN WATER ACT
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JANUARY 26, 1979

I am here to talk to you about the 1977 Amendments to the Federal Water Pollutant Control Act or - - as we now know it - - the Clean Water Act Most of our discussions today will focus on new industrial requirements. With the amendments - - Congress has made some very significant changes to the original Act. One of the most important is the emphasis now placed on the control of toxic substances . Another is the elimination of the requirement that industry build treatment systems when there is apparently no environmental benefit for doing so. The Act establishes new classes of pollutant limitations for industrial discharges and - - in addition - - extends the deadlines for meeting those limits. It also provides and incentive for industry to develop inovative technology to treat its wastewater discharges.

Now - lets discuss these changes in more detail. The new Act establishes three classes of pollutants - - conventional - - non-conventional - - and toxic. Conventional pollutants are those that have commonly been regulated in the past. These are BOD, TSS, fecal coliforms and pH. I believe COD and Oil & Grease have recently been added to the conventional list. Under the old Act - - effluent limits for conventional pollutants were to be met in two steps The first step required the installation of best practical treatment systems - - or BPT - - no later than July 1, 1977. The second step involved a higher level of treatment - - which we have termed BAT - - for best available treatment. Compliance with BAT standards was required by July 1, 1983.

The new Act creates a new level of treatment for the control of conventional pollutants - - namely - - best conventional treatment - - or BCT.

Compliance with this new standard has been extended until July 1, 1984. In terms of comparison with BPT and BAT - - BCT is likely to lie somewhere in between. BCT was established so that industries which have already complied with BPT standards would not have to unnecessarily install additional treatment facilities. The way in which this necessity is determined is simply based on economics. Specifically - - the cost for industry to go from BPT to BAT is compared with municipal treatment cost to achieve a similar reduction in pollutants. If the industrial cost is higher - - the BAT standard is eliminated - - and the industry is only required to comply with the first step BPT standard. At the current time - - EPA is re - evaluating almost all of its previously issued effluent guidelines. New BPT standars are expected to be published in the Federal Register momentarily.

Now that we've discussed conventional pollutants - - lets talk a little about another of the three classes of pollutants established by the new Act - - namely toxic pollutants. Toxic pollutans are defined in Section 307 of the Clean Water Act At the present time - - they include the 65 classes of pollutants listed in the NRDC consent agreement. For those of you not familar with NRDC consent agreement - - it resulted from a suit against EPA by the Natural Resources Defense

Council. The suit involved EPA's failure to establish standards for the discharge of toxic pollutants - - both into waterways directly - - and also into municipal sewage treatment plants. An agreement was eventually reached whereby EPA would develop standards for 65 toxic pollutants as discharged by 21 industries. These 21 industries - - which we refer to as primary industries - - were selected due to the nature of their operations and their high potential to discharge one or more of the 65 toxic pollutants. EPA does have the responsibility to periodically review the list of pollutants and industries and make changes when appropriate.

When Congress amended the Act - - it virtually incorporated the entire NRDC consent agreement into the new amendments. The new Act also established that BAT or best available treatment would form the basis for effluent limitations for toxic pollutants. It did however extend the date for compliance with BAT standards from July 1, 1983, to July 1, 1984. One added point - - EPA will be developing standards for the 65 toxic pollutants and 21 primary industries - - both for direct dischargers - - or those that need NPDES permits - - and also for those industries that discharge wastes into municipal sewage treatment plants. In this latter case - - the limits will be expressed in terms of concentration and will be designated pretreatment standards.

As usual for direct dischargers - - effluent limits will be expressed in terms of mass loading per unit of production. Pretreatment standards will be expressed in concentration terms to make enforcement by local

authorities easier. However - - the same BAT thecnology will be the basis for both sets of effluent requirements. As you know - - EPA's pretreatment strategy places primary responsibility for enforcement of industrial standards at the local level with federal backup when necessary.

The final class of pollutants established by the new amendments are nonconventional. Nonconventional pollutants include everything but conventional and toxic pollutants. While this may seem like a lot of pollutants to be regulated - - I don't believe that EPA will be devoting very much time to the development of effluent limits for pollutants in this class - - except in some very rare or specific cases. As I initially stated - - the major focus of the new amendments is on the control of toxic pollutants. When limits are developed for nonconventional pollutants - - they will be based on a consideration of a BAT level of technology - - similar to the technology employed for toxic pollutants. Again - - I do not believe that there will be much Agency activity in this area. And - - if standards are developed - - there are all kinds of environmental and economic variances.

In summary - - I think the new amendments are both significant and beneficial. By placing the emphasis on the control of toxic substances and eliminating the neeed for unnecessary waste treatment facilities - - the new Act is more compatible with todays problems.

Now what does it all mean to you? We've discussed the types of pollutants - - levels of treatment - - and deadlines for compliance. The mechanism for achieving treatment objectives is - - as usual - - thru the NPDES permit programa.

If you represent an industry which discharges wastes directly into some waterway - - you very likely already have a NPDES permit. In fact - - that permit was probably issued some time ago and will be expiring soon. You are required to submit a renewal application at least 180 days or 6 months before your current permit expires - - although - - I would suggest that you not wait that long. We do want to be sure that a new permit is issued before the old one expires.

The type of permit that EPA will reissue will depend on the nature of your business - - or specifically - - whether or non you represent one of the 21 primary industries. If so - - a short term permit of approximately 2 years duration will be issued. During the next 2 years - - EPA will be developing guidelines for the 21 primary industries. Until these new guidelines are published - - we will simply be extending the terms of your present permit. When appropriate - - we will adjust some of the limits to more accurately reflect current operating conditions In approximately 2 years - - a new permit of 5 years duration will be issued base on the new guidelines and requiring compliance by 1984.

If your business is not included in the 21 primary industry categories -- then we would - - in general - - not expect to be concerned about toxic pollutants. In these cases - - EPA would not be developing BAT standards for toxic pollutants. However - - these so called secondary industries would be required to comply with BCT standards no later than July 1, 1984. If you will recall - - BCT or best conventional treatment is the new level of technology established for the control of conventional pollutants. A secondary industry would be expected to discharge conventional pollutants and - - therefore - - would be required to comply with BCT standards. In this case - - a 5 year permit will be issued with BCT requirements as soon as your old permit expires.

As a final case - - if you represent an industry discharges all wastes to a municipal sewage treatment plant - - you are subject to pretreatment standards. While general pretreatment standards will apply to all industries in municipal systems - - specific numerial limitations will only be developed for 65 toxic pollutants and 21 primary industries. If you are included in this primary industry category - - a pretreatment standard will be established which must be complied with - - within 3 years of the date it is published - - but in no event - - later than July 1, 1984 If you represent a secondary industry and are curently complying with your sewer use ordinance - - it is likely that additional requirements will not be imposed by EPA. This - - of course - - is

left to the discretion of the local authority. To repeat one poing - - it is our intention that the responsibility for the enforcement of pretreatment standards be placed at the local level. All efforts will be made to assure that local authorities have the capability to administer pretreatment programs to the thousands of industries in their systems. This will minimize the resource requirements on EPA - - and at the same time - - allow the Agency to provide backup to local authorities when necessary.

This. - - in general - - summarizes the amendments to the Act--particulary as it relates to the industrial sector - - and also gives you some idea on how the Region II office intends to proceed with permit reissuance activities. If you have any questions at this time - - I shall be happy to try to answer them.

Levels of Control Applicable to Existing Sources Under 1977 Amendments to FWPCA

POLLUTANT	CONVENTIONAL	NONCONVENTIONAL	TOXIC		
Name	Best Concentional Pollutant Control Technology	Best Available Technology Economically Achievable	Best Available Technology Economically Achievable	Effluent Standards (or Prohibitions)	Best Management Practices
Abbreviation	BCT	BAT	BAT		BMP's
Statutory Deadline	July 1, 1984	July 1, 1984/ as appropriate 1 Never later than July 1, 1987	July 1, 1984/ as appropriate 2	Up to one year after promulgation as appropriate 3	None
301 (c) Economic Variance	No	Yes	No	No	No
301 (g) Environmental Variance	No	Yes	No	No	No

1/ July 1, 1984, or three years after limitations are established, whichever is later. Never later than July 1, 1987.

2/ July 1, 1984 for those 129 toxic pollutants which appreared at 43 Federal Register 4108 (January 30, 1978), which is reproduced as Appendix A. For other pollutants which may be added to the toxics list, three years after limitations for such pollutants are established.

3/ The affective date for an effluent standard for a toxic pollutant may be extended to three years after the standard is promulgated if earlier compliance is technically infeasible.

INTERIM PRETREATMENT STANDARDS FOR FIRST EIGHT INDUSTRIES

INDUSTRY	STATUS	ESTIMATED INDUSTRY TOTAL INVESTMENT (MILLION OF DOLLARS)	POLLUTANTS COVERED (IN ADDITION TO PROHIBITED DISCHARGE AND pH)
Timber Products	Published 12-9-76 Interim Final	5.0	Oil & Grease
Non-Ferrous Metals	Published 12-15-76 Interim Final	0.9	Oil & Grease, Ammonia Copper, Cadmium
Petroleum Refining	Published 3-23-77 Interim Final	7.4	Oil & Grease, Ammonia
Steam Electric Power Generation	Published 3-23-77 Interim Final	0	PCB's, Copper, Oil & Grease
Leather Tanning and Finishing	Published 3-23-77 Final	0	Prohibition of discharge and pH only
Textile	Published 5-26-77 Final	0	Prohibition of discharge and pH only
Inorganic Chemicals	Published 7-20-77 Interim Final	0.5	Silver, Chrome (VI), Chrome (III), Lead, Nickel, Zinc, Copper, Fluoride
Electroplating Phase I Phase II	Published 7-12-77 Published 2-14-78	38.0	Cyanide, Chrome (VI) Cadmium, Copper, Nickel, Zinc Chrome (III)

SCHEDULE FOR NEW PRETREATMENT AND BAT GUIDELINES

INDUSTRY*	PROPOSAL DATE
1. Timber Products Processing	9/30/78
2. Steam Electric Power Plants	8/31/79
3. Leather Tanning & Finishing	12/30/78
4. Iron and Steel Manufacturing	6/30/79
5. Petroleum Refining	4/9/79
6. Nonferrous Metals Manufacturing	5/7/79
7. Paving and Roofing (Tars and Asphalt)	12/31/78
8. Paint and Ink Formulation and Printing	5/31/79 - 5/1/80*
9. Coal Mining	8/31/79
10. Ore Mining and Dressing	12/31/78
11. Inorganic Chemical Manufacturing	5/31/79
12. Organic Chemical Manufacturing	9/30/79
13. Textile Mills	3/31/79
14. Plastic and Synthetic Materials Manufacturing	9/30/79
15. Pulp and Paperboard Mills and Converted Paper Products	6/30/79
16. Rubber Processing	6/30/79
17. Auto and Other Laundries	6/30/79
18. Soap and Detergent Manufacturing	9/30/79

INDUSTRY*	PROPOSAL DATE
19. Machinery and Mechanical Products Manufacturing	6/22/79 - 11/30/80**
20. Miscellaneous Chemicals	6/30/79 - 10/31/79**
21. Electroplating	12/15/79

*Each industry is defined by SIC at 43 Federal Register 22160 (May 23, 1978).

**Date depends on industrial sub-category.

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PROCEEDINGS OF CONFERENCE ON THE IMPACT OF INDUSTRY OF THE CLEAN WATER ACT OF 1977 AND COST-EFFECTIVE WASTEWATER TREATMENT TECHNOLOGIES IN PUERTO RICO

PRETREATMENT PROGRAM IN PUERTO RICO
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SAN JUAN FIELD OFFICE

JANUARY 26, 1979

As many of you are aware EPA has been working on a national pretreatment policy for several years. Because of concern over the environmental problems caused by industrial discharges to POTW'S in addition to the large number of industries that would be affected by pretreatment standards the Agency has devoted a great deal of time and effort in developing a national policy. More than in any other case EPA encouraged a maximum degree of public involvement.

In February 1977 the Agency proposed four pretreatment strategy options to the public for consideration and comment. Four public hearings and a number of public meetings were held on the four proposals and over 375 sets of written comments were received.

In addition to the public's input there was major congressional consideration of pretreatment in the 1977 amendments to the Water Pollution Control Act the Clean Water Act as it is now known. On June 26 of last year, EPA put is all together and published general pretreatment regulations establishing the mechanisms and procedures for controlling the discharge of industrial waste into POTW'S.

Delivered at the Impact on Industry of the Clean Water Act of 1977 and Cost-Effective Wastewater Treatment Technologies in Puerto Rico, Colegio de Ingenieros y Agrimensores de P. R., January 26, 1979, Caribe Hilton Hotel, San Juan, Puerto Rico.

The objectives of the National Pretreatment Regulation are:

1. To prevent the discharge of pollutions which will interfere with the operation of POTW'S by upsetting the biological treatment process, damaging plant equipment and sewers, or in extreme cases endangering plant employees.
2. To prevent the discharge of pollutions which are not suseptable to treatment in sewage treatment plants and can pass right through the plant into the environment in quantities which would be unacceptable if discharged directly.
3. To ptevent the discharge of pollutants which contaminate the POWT's sludge and make it unfit for such beneficial uses as application to crop land.

The final strategy selected by EPA involves the establishment of national pretreatment standards for 65 toxic pollutants which may be discharged by 21 industrial categories. Standards on these toxic pollutants will be set on an industry by industry basis.

Although the initial focus will be on coverage of the 65 pollutants and 21 industries additional pollutants and industries may be added at a later date. In other cases where incompatable pollutants are discharged EPA will issue guidance to state and local governments on how best to control these pollutants.

Where national standards are set for a specific pollutant dischage limits will reflect the application of best available treatment.

Pretreatment standards will express discharge limits in easier to enforce concentration limits but where possible will provide an equivalent mass limit which may be used by enforcement authority if it desires.

Compliance dates for pretreatment standards will normally be three years after promulgation.

The agency will initially encourage POTW'S to enforce National pretreatment standards and POTW'S receiving new construction grants will have to develop enforcement programs as part of their grants. The costs of developing local pretreatment programs are grant elligible in PRASA.

Municipalities with flows of over 5 MGD which receive industrial waste will be required to have a pretreatment program in effect within 3 years of the NPDES permit reissuance or modification but in no case later than July 1, 1983. Since we are in the process of modifing the permits to these municipalities we expect many local pretreatment programs to be developed well before the 1983 deadline.

Where POTW'S Authorities have not established local pretreatment programs EPA will enforce violations of pretreatment standards directly against industry. Where a local program was required but not developed enforcement actions will be taken against the owner as well as against the industry.

In order to prevent industry from having to install unnecessary treatment for regulated pollutants the regulation provides for modification of the national standards to reflect the capability of the POTW to remove these pollutants.

To obtain such a modification the POTW must develop an approved local pretreatment program. Secondly the POTW must consistently remove the pollutants at the level claimed and thirdly show that the modification of the standards will not create problems for disposal of the sludge.

En Puerto Rico, por suerte, no existen las Autoridades por municipio que hay en los estados. De forma que, aquí, el programa de pretratamiento será la "obra y arte" de la AAA; a desarrollarse con la asistencia de la JCA y la EPA. En estos día hemos recibido el plan para desarrollar el programa de pre-tratamiento en Puerto Rico. El mismo está basado en la reglamentación federal del 26 de junio de 1978, efectiva el 25 de agosto del mismo año y propone la estrategia para desarrollar, implementar y mantener en efecto el programa de pre-tratamiento en toda la isla. Actualmente estamos revisándolos y comentaremos próximamente a la AAA, de forma que esperamos tener para las próximas semanas un plan de trabajo con la participación federal de 75% de los fondos necesarios para desarrollar el programa en Puerto Rico.

Pero, ¿qué significa todo esto para las industrias y establecimientos comerciales que descargan efluentes a las plantas de tratamiento de

de la AAA ahora? Y para las que podrían escoger hacerlo en el futuro utilizando las nuevas facilidades que se construyen actualmente bajo el Programa de Construcción de Plantas de Tratamiento con fondos EPA?

Básicamente significa que cualquier descarga de algún "contaminante", industrial o comercial, a plantas de tratamiento de AAA que (i) interfiera con la operación de la planta (ii) o pase "de largo" y pueda salir al ambiente en cantidades no aceptables por los límites de calidad de agua o (iii) que de alguna forma interfiera con la posible utilización y/o disposición de los cienos, tendrá, la industria, que proveer el pre-tratamiento necesario para evitar dicha consecuencia.

En cuanto al estudio para desarrollar el programa de pre-tratamiento se contemplan entre otras las siguientes actividades:

1. La identificación de las áreas de estudio.
2. Preparación de un inventario de industrias, incluyendo las que no descargan actualmente a plantas de AAA.
3. Identificación de aquellas industrias que requieren "monitoría".
4. Identificación de los parámentos a estudiarse.
5. Desarrollo y estudio de los resultados del programa de monitoría.
6. Deslinéación de las regiones y
7. Desarrollo del programa de pre-tratamiento por regiones.

Algunas actividades que se desarrollarán concurrentemente incluyen: evaluar la autoridad legal existente en la AAA para controlar y poner en vigor este programa, evaluar las fuentes de financiamiento para su fase operacional, determinar los niveles de tolerancia y de remoción de las plantas existentes y futuras, cambios en los requisitos de los permisos NPDES y analizar los recursos necesarios para implementar y mantener en vigor el programa.

Todo esto no es nada más que la implementación de un requisito federal indispensable para lograr una eficiente operación de nuestras plantas y así mejorar la calidad de las aguas de Puerto Rico.

Por su parte la AAA ha estado implementando su Reglamentación para el Uso del Servicio Sanitario Doméstico e Industrial, mediante el cual se requieren algunas medidas de pre-tratamiento.

Ejemplos de industrias que actualmente están prestando sus efluentes son la Du Pont, la Digital de San Germán que ha bajado la descarga de Cu, y la Pamco de Río Piedras dedicada al "electroplating".

Ahora bien, quiero presentarles en esta mañana un caso de lo que algunas veces significa en "dólares y centavos" el control de contaminación. Según la primera ley de masa en ingeniería química "todo lo que entre - sale o se acumula. Lo que sucede es que en muchos casos estamos dejando "voluntariamente" que se nos salgan las ganancias por el efluente líquido. Es el caso de una fábrica de tintes de Aguas Buenas que al recibir notificación de AAA que le impondrían un sobre cargo por el "Color" decidió neutralizar el mismo

con más químicos y así consiguió aumentar el BOD a más de 20,000 mg/l. Cuando AAA se dió cuenta decidió imponerle un sobre cargo de 49 por lo normal. Esto precipitó un estudio de procesos y producción, encontrándose que se estaba saliendo dinero por la descarga. De forma que con una pequeña inversión y algunas medidas correctivas de operación lograron economizar considerablemente y a largo plazo en materia prima y sobre cargos. La moraleja es clara, busquemos primero la solución al control de contaminación donde se produce, en los procesos y en la operación.

Podría seguir e intentar presentarles los requisitos y peculiaridades de la reglamentación del programa de pre-tratamiento, pero solo lograría confundirlos. Y como todo está escrito, los invito a solicitar copia de la reglamentación a nuestra oficina en Puerta de Tierra y así nos podrán brindar la cooperación que necesitamos.

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PROCEEDINGS OF CONFERENCE ON THE IMPACT OF INDUSTRY OF THE CLEAN WATER ACT OF 1977 COST-EFFECTIVE WASTEWATER TREATMENT TECHNOLOGIES IN PUERTO RICO

LAND TREATMENT OF INDUSTRIAL WASTES

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Introduction

Land treatment systems involve the use of plants and the soil to remove previously unwanted contaminats from wastewaters. This treatment is capable of achieving removal levels comparable to the best available advanced wastewater treatment technologies while achieving some addtional benefits. The recovery and beneficial reuse of wastewater and its nutrient resources through crop production, as well as wastewater treatment and reclamation, allow land treatment systems to accoplish far more than most conventional treatment and discharge alternatives.

EPA's policy on the treatment of municipal wastewaters by land application is clear: land treatment processes should be preferentially considered as an alternative wastewater management technology. The advantages are obvious:

1. There will be a significant improvement in the quality of the receiving waters.
2. Nutrients such as nitrogen and phosphorus will be recirculated for a beneficial use.
3. A new water source for the agricultural sector is created.
4. Land treatment has favorable characteristics in terms of energy use and cost.

It is then likely that an increase in land treatment systems will take place in Puerto Rico.

The discussion that follows is of importance to the industrial sector because of two reasons:

1. An industry currently using or planning to use a publicly owned treatment work (POTW) for disposal of its wastewaters might find that its pretreatment standards are different if the POTW has a land treatment system.
2. An industry with available land or with a high strength waste will probably find a land treatment system as the most economical alternative. This will also result in being exempted from the NPDES system since no discharge is made to navigable waters.

Land Treatment Systems

There are three types of land aplication systems commonly in use: slow rate, rapid infiltration, and overland flow. The emphasis in the discussion that follows will be on slow rate processes, commonly known as irrigation , since these systems are most likely to be used in Puerto Rico.

1. Slow rate processes

Commonly known as irrigation, these processes refer to the application of treated wastewaters to land in order to both apply further treatment and

to grow crops. The applied wastewater is treated as it flows through the soil matrix and a portion of the flow percolates to the groundwater. Surface runoff is not allowed, since its discharge into a surface water would require an NPDES permit. Both surface and sprinkler application techniques can be used. Surface application can be done by either ridge-and-furrow or border strip flooding techniques. Impact sprinklers or fixed spray heads can be used for sprinkler application.

Slow rate systems can be Operated to achieve a number objectives. When wastewater treatment is the primary objective, the hydraulic loading is limited either by the infiltration capacity of the soil or the nitrogen removal capacity of the soil vegetation system. If the hydraulic capacity of the site is limited by a relatively impermeable subsurface layer or by a high groundwater table, an underdrain system can be installed to increase the allowable loading. This again brings in the problem of disposal of an effluent, but since this water is of good quality, it should not present a serious problem. The nitrogen removal capacity of the system can be increased by using grasses as vegetation, since they have a high nitrogen uptake capacity. If this is not a problem, a crop with a higher values is likely to be selected. In Puerto Rico a good compromise is sugar cane.

Treatment performance of slow rate systems is the best of all land treatment systems. Table 1 below shows the results that can be obtained with a well designed and well operated slow rate systm, assuming percolation of a municipal primary or secondary treated effluent through 5ft of soil.

TABLE 1

Treated water quality

Parameter	Concentration (mg/l) Average	Maximum
BOD	2	5
SS	1	5
NH_3-N	0.5	2
N (total)	3	8
P (total)	0.1	0.3

Performance at Muskeegon, Michigan, where 5350 acres of corn are grown is given in Table 2.

Organics, expressed as either BOD or COD, are substantially reduced by

TABLE 2

Muskeegon treatment performance

Parameter	Applied wastewater (mgl)	Treated water (mg/
BOD	13	3
COD	118	28
SS	20	7
P (total)	1.4	0.05
NH_3-N	2.4	0.6
NO_3-N	1.1	1.9

PARAMETER	Applied wastewater (mg/l)	Treated water (mg/l)
Zn	0.11	0.07
Fecal coliform	10^3/100 ml	10^2/100 ml

slow rate land treatment. Filtration and adsorption are the initial mechanisms in BOD removals, but biological oxidation is the ultimate treatment system. The system is so efficient for BOD removal that application rates of up to 5000 lb/ acre/d have been reported in the case of a vegetable processing industry. As a comparison, Muskeegon's application rate is about 0.5 lb/acre/day.

Data on SS removal is not as well documented as BOD removals, but effluents down to 1 mg/l can generally be obtained. Physical removal by filtration is the mechanism to act, and then biological oxidation takes place. Once fixed, the mineral solids become part of the soil matrix.

Nitrogen removal from the wastewater is dependent on the type of crop grown and the crop yield. An effective removal requires a crop whose portion containing the nitrogen is physically removed from the field during harvesting. In some cases denitrification can be an effective removal mechanism, but this generally requires a high organic loading that would cause anaerobic conditions in the soil. In some cases where anaerobic conditions have not prevailed at all times, removals by denitrification of up to 32% of the applied nitrogen have been reported.

Adsorption and chemical precipitation are the main phosphorus removal mechanisms in the soil. Irrigation systems usually give high removal rates, independent of the crop used (which takes 15-30% of the

phosphorus) or the phosphorus concentration applied. Soil properties are the important parameters for this removal.

2. Rapid infiltration

This land treatment process refers to the application of wastewaters to rapidly permeable soils such as sands by spreading in basins or sprinkling. Most of the applied flow percolates through the soil to the groundwater. Treatment takes place during travel through the soil matrix. Vegetation is not normally required, but its presence is not harmfull.

Although treatment is the primary purpose of this system, other secondary benefits such as groundwater recharge and recovery of renovated water by wells or underdrains can readily be accomplished.

Treatment performance for this system is shown in Table 3, assumming the percolation of a primary or secondary municipal effluent through 15ft

TABLE 3

Treatment water quality

Parameter	Concentration mg /1) Average	Maximum
BOD	2	5
SS	2	5
NH_3-N	0.5	2

Parameter	Concentration (mg/l) Average	Maximum
N (total)	10	20
P (total)	1	5

of soil.

Removal of most pollutants is excellent. The filtering and straining action of the soil is excellent in removing BOD, SS and fecal coliforms. However, nitrogen removals are generally poor unless specific operating procedures are established to maximize denitrification. This can be done by adjusting application cycles, supplying an additional carbon source such as methanol for the denitrifiers, using a crop with high nitrogen requirement reducing application rates. Although total nitrogen removals may be low if this measures are not applied, rapid infiltration is an excellent method for achieving a nitrified effluent.

Phosphorus removals with this systm are generally high, again depending on the physical properties of the soil. The long term capacity is only limited by the mass of soil in contact with the wastewater.

3. Overland flow

Overland flow as a wastewater treatment process refers to the application of the waters over the upper reaches of slopped terraces and its subsequent flow across the vegetated surface to runoff collection ditches. The wastewater is treated by physical, chemical and biological

means as it flows in a thin film down the relatively impermeable slope ussually convered with grass.

This system is relatively new in the United States. Its objectives are wastewater treatment, and to a minor extend, crop porduction. Treatment objectives may be to achieve secondary or better quality from primary treated effluents, or to achieve high BOD and nitrogen removals comparable to advanced treatment systems. Treated water must be collected at the end of the slope and either reused or discharged to a surface water. This again brings up the problem of having to comply with NPDES regulations and paper-work.

There is very little data on treatment performance for this type of system. A pilot scale facility operated by EPA at its Ada Laboratories, and with an overland flow of about 150 ft, gives the results shown in Table 4.

TABLE 4

Treated water quality

	Concentration (mg/l)	
Parameter	Average	Maximum
BOD	10	15
SS	10	20
NH_3-N	0.8	2
N (total)	3	5
P (total)	4	6

Organic matter and suspended solids are removed by biological oxidation, sedimentation, and grass filtration. Nitrogen removal is due mainly to denitrification and phosphorus is removed by adsorption and precipitation in essentially the same way as with other hand treatment processes.

Process Design

The specific design of a land treatment system begins with the selection of the site and treatment process and then calculation of the required field area. The field are is calculated based on the required final effluent quality. This can be either the quality of the percolate that will reach groundwater in a slow rate systm, or the quality of the water that will end up in a river or lake if an overland flow system is used. The critical loading rates to be determined are the hydraulic and nitrogen rates. Once the area corresponding to the most critical of these two rates is selected, the loadings and removals of BOD, SS, phosphorus, trace elements and microorganisms usually fall into generally accepted ranges.

An excellent, detailled discussion on process design for the three systms mentioned here is give in Chapter 5 of Process Design Manual for Land Treatment of Municipal Wastewater, EPA 625/1-77-008. Although aimed at the municipal sector, the procedure is applicable to the treatment of industrial wastes.

The factors given below can be used as a general guide to design or for determining feasibility of a land treatment system for industrial purposes. They apply to a slow rate system and are obviously dependent on the type of crop used.

1. Wastewater quality

The quality of water used for irrigation can have significant variations depending on soil type, crop used, weather conditions, and agricultural practices used. However, the following table gives values of parameters generally accepted as reasonable for irrigation in general.

In the case of water quality of the percolate reaching the aquifer, EPA recommends that the quality of a wastewater that does not contain microbial contamination should be such that the contaminant levels given in Table 6 should not be exceeded in the groundwater.

TABLE 5

Water quality for irrigation

Parameter	Maximum concentration (mg/l)
TDS	1000
Al	5.0
As	0.10
Be	0.10
B	0.75
Cd	0.01

Parameter	Maximum concentration (mg/l)
Cr	0.10
Co	0.05
Cu	0.20
F^-	5.0
Fe	5.0
Pb	5.0
Li	2.5
Mn	0.20
Mo	0.01
Ni	0.20
Se	0.02
V	0.10
Zn	2.0
Cl^-	20 meq/l in the soil
ASR*	8 - 18
pH	4.5-9.0

*SAR= $\frac{na}{\sqrt{(ca+mg)/2}}$

TABLE 6

Contaminant levels in the groundwater

Parameter	Concentration (mg/l)
Turbidity	1 unit
As	0.05
Ba	1.0
Cd	0.01
Cr	0.05
F^-	1.4-2.4
Pb	0.05
Hg	0.002
NO_3-N	10
Se	0.01
Ag	0.05
Total coliforms	1/100 ml
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4 D	0.1
2,4,5 TP	0.01

This table assumes that the groundwater can potentially be used for drinking water supply. In Puerto Rico all groundwater is at least a potencial source of potable water.

2. General design parameter

   a. application: surface or sprinklers

   b. application rate (hydraulic): 2-20 ft/year, depending on crop. Sugarcane requires from 4-6 ft depending on location.

   c. area: 56-560 acres/MGD, without including buffer areas or roads. Sugarcane requires 186-280 acres/MGD.

   d. weekly application rate: 0.5-4 in

   e. pretreatment: wastewater quality roughly equivalent to that from a municipal primary treatment facility or better.

   f. terrain slope: less than 20%, as flat as possible

   g. permeability: ranging from moderately slow to moderately fast.

   h. depth to groundwater: 2-3ft minimum

Conclusions

1. Land treatment can be an effective process for treating industrial wastewaters, particularly those with a high organic content. Problems can be caused by the presence of heary metals or other toxics. Pretreatment would be required in this case.

2. Cost effectiveness of the process depends on the price of land and the magnitude of the problem. If the land is already available or cheap to acquire, the cash value of the crop is normally sufficient to offset most, if not all, of the treatment costs.
3. Exemption from the NPDES system is a major advantage of land treatment systems.
4. There is significant experience in the United States with land application of industrial wastewaters. There are several cases in Puerto Rico, including land application of wastes from a hotel, application of a very high organic strength effluent, adn a pilot study using domestic effluent for sugarcane grownth.