UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TEXAS 75202-2733

MAY 1 9 2017

MEMORANDUM

SUBJECT: Request for a Ceiling Increase and Continued Removal Action at the Donna Canal and Reservoir Site, Donna, Hidalgo County, Texas

FROM: Mike McAteer, On-Scene Coordinator
Readiness and Emergency Response Team (6SF-ER)

TO: Carl E. Edlund, P.E., Director
Superfund Division (6SF)

THRU: Ronnie D. Crossland, Branch Chief
Emergency Management Branch (6SF-E)

I. PURPOSE

This memorandum requests approval for an increase to the funding ceiling in the amount of $400,000 pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§9601 et seq., at the Donna Reservoir and Canal System Site (Site), Donna, Hidalgo County, Texas. Approval of this request will bring the total approved removal action ceiling to $1,087,500. This memorandum also amends the August 6, 2008 time-critical removal action memorandum. The continuation of the previously approved removal action involves the removal and offsite disposal of fish contaminated with polychlorinated biphenyls (PCBs) that are actively being caught and consumed by local residents.

A Time-Critical Removal Action was previously approved in an Action Memo dated August 6, 2008, and a consistency Exemption to the one-year statutory limitation was subsequently approved on September 6, 2012 per Delegation of Authority 14-2 and Regional Delegation of Authority R6-14-2. Conditions continue to exist from the same source at the Site warranting a continuation of the originally approved removal action. This action meets the criteria for initiating a removal action under the National Contingency Plan (NCP), 40 CFR §300.415.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS #	TX0000605363
Category of removal:	Time Critical
Site ID #	06NS
Latitude:	26.096547 N
Longitude:	98.072556 W

A. Site Description

1. Removal Site Evaluation

Please refer to the initial Action Memorandum dated August 6, 2008 (See Attachment 2) for a description of the site and its conditions. The EPA-lead removal actions were completed at the Donna Reservoir and Canal System Site, Donna, Hidalgo County, Texas. The action was approved by the EPA Superfund Division Director in an Action Memoranda dated August 6, 2008 and July 7, 2009. Continuation of the August 6, 2008 removal action was approved under An Exemption to the One-Year Statutory Limitation approved by the Superfund Division Director on September 6, 2012 (See Attachment 4).

2. Site Characteristics

The Donna Canal System and Reservoir, located in Donna, Texas (Hidalgo County) consists of an 11.3 kilometer (km) canal and water supply system (approx. 400-acre reservoir). Water is pumped from the Rio Grande and flows north, via gravity, to Donna Reservoir, a drinking water supply to the cities of Donna and North Alamo. The canal itself is an earthen ditch with certain segments lined with concrete. The average depth is 1 to 2 meters (m). Both the canal and reservoir are popular fishing and recreational areas.

3. Releases or threatened release into the environment of a hazardous substance, pollutant or contaminant

During the previous EPA lead removal activities in 2008, 2009, and 2012, limited sampling of PCB contaminated fish was conducted along with the removal and offsite disposal. The whole body and fillet fish samples were analyzed for PCBs as Aroclors using EPA method 8082. Fish samples were also analyzed for percent lipids. PCB congener analysis (19 congeners) was conducted on the fish samples containing the highest concentrations of Aroclors using EPA method 8082. Aroclor 1524 was the predominant Aroclor detected in the fish samples, Aroclor 1260 was detected in one sample, as a mixture with Aroclor 1254. PCBs were detected ranging from 26 to 3000 ug/kg. No PCBs were detected in any of the fish collected from the reservoirs. In addition to fish samples, surface water samples were collected at various locations along the Donna Canal to confirm the presence or absence of PCBs. All surface water samples were

analyzed for PCBs as Aroclors using EPA method 8082. No PCBs were detected in any of the surface water samples collected. All these are hazardous substances as designated in Section 101(14) of CERCLA, 42 U.S.C. §9601(14), and 40 CFR §302.4.

According to the Agency for Toxic Substances and Disease Control (ATSDR) and the Centers for Disease Control and Prevention (CDC), these substances are associated with various health-affects that attack different bodily systems. The major hazards from exposure to PCBs relate to their toxicological properties. As a group they are generally thought to be carcinogenic by ingestion, and readily accumulated in the body. There is evidence to suggest that PCBs also may cause reproductive disorders and behavioral defects in newborns and infants. The primary target organ is the liver. Effects of overexposure may include skin acne and cancer. Effects on animals and marine life are thought to be similar, and food and other aquatic organism bioaccumulate PCBs and pass them up to consumers, including larger predators and humans.

4. NPL Status

This Site was listed on the National Priorities List (NPL) in March 2008.

5. Maps, Pictures and other graphic representations

Attachment 1 Enforcement Addendum
Attachment 2 Action Memorandum, Approval of Removal Action at Donna Reservoir and Canal System Site, 08/06/2008.
Attachment 3 Action Memorandum, Approval of Removal Action at Donna Reservoir Site, 07/07/2009
Attachment 4 Action Memorandum Addendum, Approval of an Exemption from the One-Year Statutory Limitation at the Donna Reservoir and Canal System Site, 9/06/2012

B. Other Actions to Date

1. Previous actions

In August 6, 2008, an action memorandum was signed and approved by EPA Region 6 for the removal of contaminated fish in the Donna Reservoir and Canal System Site. The contaminated fish have been identified to have concentrations of PCBs above the 2.0 parts per million safe consumption Food and Drug Administration level. The removal action involved the depopulation of edible size PCB-contaminated fish from the canal area. The removal was conducted in a two-phase event.

The first phase of the fish removal event began on August 23, 2008. The second phase began on February 16, 2009, to ensure that response action goals were being met. The collected fish were sampled as needed for hazardous waste categorization. A total of approximately 7,800 fish were collected, 22 different species were identified by U.S. Fish

and Wildlife Service (USFWS), the smallest fish caught was a mosquito fish (2.8 cm in length, weighing <1 gram) and the largest fish was a Smallmouth Buffalo (76 cm in length, weighing approximately 7 kilograms or 15.4 lb.). Of the 22 different species identified, a total of 22 whole body and 19 fillets from 9 different species of fish were sent to a laboratory for analysis of PCBs. The samples of fish were taken from three separate areas along the entire length of a 5 km stretch of the canal. On September 19, 2008, a roll off box (10 fish, 1 Personal Protective Equipment [PPE], 6 trash) containing 17 55-gallon drums of non-hazardous PCB-contaminated fish were disposed of at an EPA-approved landfill whose plans were for immediate burial to minimize odor.

On February 16, 2009, the EPA, USFWS, and EPA contractors re-mobilized to the Site to conduct Phase 2 of the fish depopulation work. This phase mirrored the work done in Phase 1 and was conducted to remove fish missed during the first phase. A total of approximately 15,182 fish were collected and 25 different species identified by USFWS during the Phase 2 work. Whole body and fillet samples collected from several different edible species of fish were sent to a laboratory for analysis of PCBs and % Lipids (Whole body only). Three surface water samples from Donna Canal and one drinking water sample from the City of Donna Water Treatment Plant were also collected and submitted to the laboratory for analysis.

Another removal action was conducted in August of 2009, under a separate Action Memorandum signed on July 7, 2009. This action was conducted exclusively in the West Donna Reservoir, and the activities conducted were similar to the activities conducted in the canal system (fish removal, fish sampling, final disposal) under the August 6, 2008 action memorandum (See Attachments 2 and 3).

In April of 2011, the EPA installed warning signs at 10 locations along the length of the canal and around both reservoirs. The signs, written in English and Spanish, warn of the risks to public health from ingesting fish contaminated with PCBs as well as to notify the public of a State-issued ban on the possession of fish originating from the canal and reservoirs.

A fourth removal action was conducted at the Site beginning on October 15, 2012 and involved the removal of 2,315 fish from the Lower West Main Canal Unlined. This action was conducted after approval of an addendum to the 2008 Action Memo for an exemption to the one-year statutory limitation (see Attachment 4).

In 2011 and February 2012, respectively, the EPA met with officials from the cities of Donna and Alamo to discuss the door-to-door campaigns and the status of the investigation of the Site. The EPA held community meetings on March 27 and March 29, 2012, in Donna and Alamo, Texas, respectively, to inform the residents about the contaminated fish and the activities for the Remedial Investigation and Feasibility Study (RI/FS). The meeting in Alamo was conducted in Spanish.

The EPA has met and continues to meet with local non-governmental organizations to discuss the ongoing RI/FS and the planned Proposed Plan and Record of Decision. Fact sheets have been prepared, and will continue to be prepared, as necessary. These fact sheets have been filed at the Site's repository and distributed to people on the mailing list.

2. Current actions

The EPA completed a RI/FS for the Site in early 2016. As part of the RI/FS process, the EPA also conducted a Human Health Risk Assessment and an Ecological Risk Assessment. These assessments show that the PCB-contaminated fish in the canal system and West Reservoir continue to pose a risk to public health. The RI/FS describes the nature and extent of contamination and provides sufficient information about the Site to support an informed risk management decision regarding which remedy is the most appropriate for the Site. The EPA is currently working on a proposed plan for a final site remedy.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Threats to the public health or welfare are documented in the previous Action Memoranda (Attachment 2 and Attachment 3). The magnitude of the threat has been reduced significantly as a result of the removal actions. However, the threats still exist from the contaminated fish that have repopulated in the canal since the previous removal actions conducted in 2008, 2009, and 2012. Consultation with fisheries biologists with the USFW service has confirmed that certain species of fish, such as tilapia, carp, drum, and gar, will be potential human health threats because of human consumption due to their edible size and bioaccumulation of contaminated sediment from the canal. Based on the recent results of the human health risk assessment, the current levels of PCBs in fish in Donna Canal System and West Donna Reservoir pose an unacceptable risk from both a carcinogenic and non-carcinogenic standpoint to people who consume these fish.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances, pollutants, or contaminants from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Consistency Exemption:

The proposed removal and offsite disposal of PCB-contaminated fish continue to meet the criteria for the CERCLA Section 104(c) consistency exemption granted on September 6, 2012. The removal and offsite disposal of fish contaminated with PCBs from the Donna Canal System

and Reservoir will not interfere with or foreclose the likely remedial alternatives that will address the source of contamination found at the Site. The proposed continued response action is appropriate and consistent with potential remedial action to be taken and will contribute to the efficient performance of any long-term remedial action. The removal action is also appropriate because despite best efforts by the EPA, state, and local agencies to raise awareness about the hazards associated with the consumption of the contaminated fish, local residents continue to ignore warning signs and the active Texas Department of State Health Services fish ban by continuing to catch and consume fish at the Donna Canal site. Moreover, proposed fish removal will minimize the scope of the cleanup and the potential for harm to human health and the environment.

VI. ACTIONS AND ESTIMATED COSTS

A. Action Description

Based on the results of fish sampling during the RI , canal segments 2 and 3 contain the highest concentration of contaminated fish along the entire length of canal. The West Reservoir, which is fed by waters from Segment 3 of the canal, also contains fish with varying levels of PCBs. The West Reservoir is also a very popular fishing location for locals. Therefore, this removal action will focus its fish de-population efforts (i.e., electroshocking of fish, netting of fish, anesthetizing the netted fish, and disposal of fish in an approved landfill location) along these two segments of the canal as well as the West Reservoir. Also, any of the warning signs installed by the EPA in 2011 that have either been removed or damaged will be repaired or replaced as part of this phase of removal activities.

1. Project Schedule

The duration of activities is expected to be approximately 14 days. The schedule for the depopulation event will be contingent upon weather conditions, personnel scheduling, availability of disposal options, condition of the canal in terms of water levels, and contractor support.

B. Estimated Costs

Extramural Costs	Current Ceiling	Proposed Ceiling
USFW	$ 150,000	$ 250,000
Cleanup Contractor. (ERRS)	$ 350,000	$ 500,000
START	$ 125,000	$ 200,000
Extramural Contingency	$ 62,500	$ 137,500
Total Extramural	$ 687,500	$ 1,087,500
TOTAL CEILING		**$ 1,087,500**

VII. OUTSTANDING POLICY ISSUES

There are no known outstanding policy issues associated with this site.

VIII. ENFORCEMENT

For administrative purposes, information concerning confidential enforcement strategy for this Site is contained in the Enforcement Addendum (*see* Attachment #1). The total cost for this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated to be $1,789,166.25

(Direct Costs)	+	(Indirect Costs)	= **Estimated EPA Cost for a Removal Action**
(Direct extramural + Direct intramural)	+	*[(Region-specific Indirect Cost Rate) x (Direct Costs)]*	

$1,087,500 + $20,000 + (.6155 x $1,107,500) = **$1,789,166.25**

Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2002. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only, and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor the deviation of actual total costs from this estimate will affect the right of the United States to seek cost recovery.

IX. RECOMMENDATION

This decision document represents the approval of a ceiling increase and continuation of the removal action at the Donna Reservoir and Canal System Site in Donna, Hidalgo County, Texas, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the criteria as defined by 40 CFR Section 300.415(b)(2) of the NCP for a removal, and I recommend your approval of the ceiling increase. The total project ceiling, if approved, will be $1,087,500.

APPROVED _____ DATE 05/19/17

Carl E. Edlund, P.E., Director
Superfund Division (6SF)

Attachment 1

Enforcement Addendum (Confidential)

ATTACHMENT 2

Request for Removal Action at the Donna Reservoir and Canal System Superfund Site. Action Memorandum of August 6, 2008

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

AUG 0 6 2008

MEMORANDUM

SUBJECT: Request for Removal Action at the Donna Reservoir and Canal System Site Donna, Hidalgo County, Texas

FROM: Valmichael Leos, Remedial Project Manager
Remedial Branch (6SF-RL)

TO: Samuel Coleman, P.E., Director
Superfund Division (6SF)

THRU: for Ragan Broyles, Associate Director
Prevention and Response Branch (6SF-P)

I. PURPOSE

This memorandum requests approval for a Removal Action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 et seq. at the Donna Reservoir and Canal System Site (hereinafter referred as the "Site") located in Donna, Hidalgo County, Texas. The proposed action involves the removal and offsite disposal of fish contaminated with polychlorinated biphenyls (PCBs) above the U.S. Food and Drug Administration (FDA) allowable levels that are actively being caught and consumed by local residents. This action meets the criteria for initiating a removal action under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR §300.415, and is expected to require less than twelve months and $500,000 to complete.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS #	TX0000605363
Category of removal:	Time Critical
Site ID #	06NS
Latitude:	26.096547 N
Longitude:	98.072556 W

A. Site Description

The Donna Reservoir and Canal System includes the 400-acre Donna Reservoir, the Donna Main Canal (First Main Lift Canal), which gravity-feeds the reservoir from the Rio Grande River, the west and east Main Canals, extending north from the reservoir, and a multitude of interconnecting lateral canals. Water is pumped from the Rio Grande River (Water Quality Segment 2302) into the Donna Main Canal through five pipes at a point approximately one mile downstream from Reynosa, Tamaulipas, Mexico. The Donna Main Canal also includes a siphon that passes water under the Arroyo Colorado River, which transects the canal approximately two miles north of the Rio Grande River. The reservoir has an average depth of five feet and storage of 1,200 acre-feet, sustained by pumping from the Donna Main Canal. Water from the system is used for the drinking water supply for the city of Donna, and for crop irrigation.

1. Removal site evaluation

Since the site was identified in 1993, the Texas Department of State Health Services (TDSHS and predecessor TDH) have conducted numerous fish and sediment sampling, water assessments, as well as searches for responsible parties and contamination sources. To date, neither sources nor responsible parties have been identified. However, environmental data since 1993 up to the most recent data collected in 2005 shows both the spread and increase in contamination throughout the local fish population within the Donna Canal and Reservoir. During a two-year (1993-1994) joint investigation by the TDH and the Texas Natural Resource Conservation Commission (TNRCC), PCB (primarily Aroclor 1254) concentrations ranging from 0.55 parts per million (ppm) to 24.0 ppm were detected in fillets from 12 of 23 fish collected in the Donna Main Canal, in three of 16 fish taken from Donna Reservoir, and eight of 11 fish from the adjacent reach of the Arroyo Colorado[2]. Additional fish fillet samples taken in 1997 confirmed the continued presence of PCBs in aquatic life with concentrations as high as 20.0 ppm within the area of concern (TNRCC Sept. 2001, pg. 27)[5]. Current fish sampling data collected by TDSHS in 2005 have confirmed concentrations as high 13.8 ppm of PCBs within the canal and according to the report "all fish species from the DIS [canal] continues to pose an apparent hazard to human health."[4] Moreover, the report concludes that based on current site data, the DSHS will continue to enforce a fish possession ban and collect future monitoring data until a decrease level of threat is documented. With PCB concentrations well above the FDA limit of 2.0 ppm for fish tissue, the TDH issued an aquatic life closure for the reservoir and contiguous waters effective June 24, 1993[6]. This closure prohibits the taking of all species of aquatic life[7].

In 1997, the Texas Commission of Environmental Quality (TCEQ) asked the U.S. Geological Survey (USGS) for assistance in detecting the source of the PCBs. Starting in February of 1999 thru April 2001 the USGS conducted a series of sediment sampling at various locations at the site. According to the USGS the source of contamination in the sediment is suspected to be located between the siphon outlet and the 90-degree bend in the Donna Canal[3].

A 2001 Screening Site Inspection Report prepared by TNRCC for the Environmental Protection Agency (EPA) noted that, "The Donna Reservoir and Canal System is a fishery with

documented human food chain consumption that is subject to actual contamination[1]." Although the TDH has repeatedly posted signs warning the public about the hazards of eating fish from the reservoir and contiguous waters, these signs quickly disappear, and fishing continues unabated.

2. Physical location

The site begins at the Donna Irrigation District #1 Pump Station located on the Rio Grande River, and extends north to Donna Reservoir, with irrigation canals extending to just south of La Blanc and San Carlos, Texas. Measured from the north side of the siphon (point of highest documented suspended sediment contamination), the Site is located at 26.096547 degrees north latitude and 98.072556 degrees west longitude (see Attachment 1), and is referenced on the U.S. Geological Survey (USGS) 7.5-minute San Juan SE and Donna Quadrangles.

3. Site characteristics

Donna Reservoir is a 400-acre impoundment located southwest of the city of Donna in southeast Hidalgo County, within the Arroyo Colorado watershed (see Attachment 1). Water for the Donna Reservoir is pumped from the Rio Grande, through a seven mile elevated earthen Main Canal, to the reservoir, which is used for water supply and irrigation storage by the city of Donna and surrounding areas. The area around the reservoir and canal is primarily irrigated crops and pastureland, with scattered residences.

4. NPL status

This Site was listed on the National Priorities List (NPL) in March 2008. EPA Region 6 is currently planning to begin a remedial investigation before January 2009.

5. Maps, Photographs and other graphic representations

Attachment 1	Enforcement Addendum (Enforcement Confidential/FOIA Exempt)
Attachment 2	Site Location Map
Attachment 3	TDH Aquatic Life Order
Attachment 4	TDH Health Report
Attachment 5	USGS Fact Sheet 016-02 (April 2002)
Attachment 6	ATSDR Public Health Statement for PCBs
Attachment 7	CDC International Chemical Safety Cards for PCBs

B. Other Actions to Date

1. Previous actions

In November of 2001, the TNRCC in coordination with EPA Region 6 initiated a Screening Site Inspection Report (SSI) for the Donna Reservoir and Canal System site[1]. The investigation included sampling data, historical site data, and observations of hazardous

materials releases. Analytical results from the SSI sampling event conducted on April 9 through 13, 2001, found concentrations of PCB Aroclor-1254 in suspended sediment samples ranging from 15 ug/Kg (.015 ppm) to 53 ug/Kg (.05ppm) over an approximate 5.75 mile distance in the Donna Reservoir and Canal System. A source of PCB contamination in the Donna Main Canal in suspended sediments were found, but has not been conclusively identified as the primary source. Although no PCBs were detected in surface water and bed sediment samples collected during the SSI sampling event, it is possible that PCBs can be present in bed sediment at levels below the Method Detection Limit (MDL) and still show up in fish tissue because of the affinity of lipids and high bioaccumulation / biomagnification potential. The conclusion of the SSI stated that concentrations of the hazardous substance Aroclor-1254 (PCB) met the observed release criteria. Since an observed release has been established for the watershed, and the watershed is subject to actual contamination from the sampling points SS-05 to SS-16, then the area of actual contamination is defined from the first Main Lift Canal below the Siphon to the Cross Over Canal at the intake to city of Donna Water Treatment Plant.

2. Current actions

There are no hazardous substance removal actions currently being performed at the site. EPA enforcement staff, continue to research potential party liability and viability issues.

C. State and Local Authorities/ Roles

1. State and local actions to date

As part of a multi-agency (i.e. including EPA) regional study in 1993, multi-media sampling was conducted in the homes of nine families in the Lower Rio Grande Valley. Of specific relevance to the current PCB issue, these samples included food and blood. Two persons in a single household were found to have elevated blood-PCB (TNRCC Oct. 1998, pg. 1)[2]. The source was identified as a carp, taken from the freezer of that home, which yielded a "dramatic" PCB concentration. It was said by the residents to have come from the Donna Canal, where at least one of them routinely fished. Sampling in the Donna Canal and Reservoir confirmed significant PCB fish contamination. The Texas Department of Health consultation determined that there was no safe consumption level of these fish, and promptly issued a possession ban in an attempt to prevent the taking of any fish from the area. This is well beyond the traditional "advisory" against eating certain fish over certain amounts. It is a complete ban. Subsequent fish studies conducted by TDH, most recently 2005, document the increase in both concentration and percentage of sampled fish contaminated now approaching 100%[4].

A 2004 Feasibility Study by the TCEQ focused only on the area previously identified as being contaminated with PCBs. The only alternative evaluated by TCEQ for this segment was to contain the sediments in-place. TCEQ estimated that this limited scope remediation would cost approximately $7 million.

The source of the PCB contamination is still unknown and now fish farther downstream in the Donna East Reservoir have been impacted. The results of the 2005 fish tissue collection by TDSHS shows PCBs in most of the 30 fish collected in the Main Canal and Reservoir at concentrations ranging from below detection limits (<.005 ug/kg) to 2,706.26 ug/kg (2.7 ppm).

Fish and suspended sediments have already been impacted, and residents continue to consume fish regardless of the ban. TDSHS concludes their 2005 report by stating that the "consumption of any of the...fish species from the DIS [Donna Irrigation System]...continues to pose an apparent hazard to human health."[4] The city of Donna drinking water supply lies within the contaminated sediment plume and without remediation, the contamination will spread, potentially contaminating more fish and the city's drinking water supply.

This site constitutes an imminent and substantial endangerment to human health. The Donna Reservoir is the source of irrigation water for local agricultural and drinking water for the city of Donna, although historical sampling found no PCBs in either the water treatment plant (WTP) intake or irrigated areas. TCEQ has referred the site to Region 6 EPA.

2. Potential for continued State/local response

Neither the state of Texas nor local governments have the resources to deal with this site. The city of Donna may only be able to contribute a limited amount of in-kind services, such as utilities and site security, to support the project.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Conditions at the site meet the following criteria, indicating that the site is a threat to the public health, welfare and the environment, and that a removal action is appropriate under § 300.415(b)(2) of the NCP. Any or all of these factors may be present at a site, and any one of these factors may determine the appropriateness of a removal action.

1. Actual or potential exposure to nearby human populations, animals or the food chain; NCP Section 300.415(b)(2)(i)

On a recent site visit conducted by EPA staff on July 10, 2007, with representatives from the TCEQ and the Donna Irrigation District (DID), local residents were observed actively fishing in the Donna Reservoir and Canal system. A family of four, with two young children below the age of 10, was observed fishing off the banks of the Reservoir. The local fisherman with his children had caught two fish at the time of the observation and reported frequently eating fish from the reservoir despite warning signs posted nearby. When asked as to why the locals continue to eat fish despite federal and state concerns about contamination in the fish, the Irrigation District representative responded that locals consider the danger similar to a bacteria or germ and that if "the fish are cooked the right way, it will not hurt them." PCBs are unlike a bacteria or germ which can be eliminated with heat and sterilization with soap and water. The chemical nature of PCBs allows it to have a natural resistance to heat. The chemical compounds in PCBs store in the fat tissue of fish and pose a threat to humans if consumed.

Humans and animals may potentially be exposed by direct contact with hazardous substances, pollutants or contaminants at or from the site. PCB-contaminated fish from this

unsecured site are routinely caught and consumed by humans and wildlife. PCBs are a hazardous substance as defined at Section 101(14) of CERCLA, 42 U.S.C. § 9601(14) and further defined at 40 CFR § 302.4. Sediment or storm water at or discharging from the site could contain PCBs. The lack of physical security and evidence of ongoing consumption only increases concerns that persons, particularly children, known to consume the fish could be exposed. PCBs have a low solubility in water. Due to PCBs low solubility, historical surface water sampling has not found PCBs at drinking water intakes. The primary risk to human health from the PCBs is from suspended sediment in the water and the consumption of contaminated fish.

The major hazards from exposure to PCBs relate to their toxicological properties. As a group they are generally thought to be carcinogenic by ingestion, and readily accumulated in the body. There is evidence to suggest that PCBs also may cause reproductive disorders and behavioral defects in newborns and infants. The primary target organ is the liver. Effects of overexposure may include skin acne and cancer (Attachments 6 and 7). Effects on animals and marine life are thought to be similar, and food and other aquatic organism bioaccumulate PCBs and pass them up to consumers, including larger predators and humans.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances, pollutants or contaminants from this site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

This proposed removal action involves the depopulation of edible size PCB-contaminated fish from the canal and reservoir areas in a two part event. The first fish removal event will begin immediately upon the signing of this action memo with a second follow up removal event as needed within 6 months to ensure that response action goals have been met. The collected fish will be sampled as needed for hazardous waste categorization. This proposed action is being coordinated with USFW, ATSDR, TDSHS, TCEQ, TPW and DID. This action will not prevent long-term recontamination of the remaining fish as they grow in size, but it will assist in removing the immediate health threat to the public and allow EPA along with other state and local authorities the opportunity to continue work on a long term management and removal of the contamination source. All collected fish will be properly disposed of at an appropriate permitted facility.

2. Contribution to remedial performance

The proposed actions will be consistent with any conceivable remedial responses at this site. Eliminating potential sources of exposure (fish) will temporarily mitigate imminent threats

to health, welfare or the environment.

3. Description of alternative technologies

EPA will evaluate the use of various methods of collecting and removing contaminated fish at the site.

4. Applicable or relevant and appropriate requirements

This removal action will be conducted to eliminate the actual or potential release of a hazardous substance, pollutant, or contaminant to the environment, pursuant to CERCLA, 42 U.S.C. § 9601 et seq., and in a manner consistent with the National Contingency Plan, 40 CFR Part 300, as required at 33 U.S.C. § 1321(c)(2) and 42 U.S.C. § 9605. Pursuant to 40 CFR Part 300.415(j), fund-financed removal actions under CERCLA § 104 and removal actions pursuant to CERCLA § 106 shall, to the extent practicable considering the exigencies of the situation, attain the applicable or relevant and appropriate requirements under Federal environmental law.

5. Project schedule

The duration of activities is expected to be one to two months. The removal of edible size contaminated fish will be evaluated within 6 months from completion of the action. The schedule for the depopulation event will be contingent upon weather conditions, personnel scheduling, availability of disposal options, and contractor support.

B. Estimated Costs

Extramural Costs	
USFW	$150,000
ERRS	$250,000
START	$75,000
Extramural Costs Contingency	$25,000
TOTAL, Extramural Costs	$500,000
TOTAL PROJECT CEILING	**$500,000**

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Should this action not be taken at the site, the potential for human exposure to contaminants will remain unabated. Consumption of these contaminated fish is a documented and continuing source of exposure, particularly to children. This threat will only increase over time due to bioaccumulation of PCBs in the fish population.

VII. OUTSTANDING POLICY ISSUES

There are no known outstanding policy issues associated with this site.

VIII. ENFORCEMENT

For administrative purposes, information concerning confidential enforcement strategy for this Site is contained in the Enforcement (*see* Attachment #1). The total cost for this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated to be $78,090.

(Direct Cost) + (Other Indirect costs) + 52.61% (Direct + Indirect Costs) = Estimated EPA Cost

$$\$500,000 + \$7,000 + (.5261 \times \$507,000) = \$773,732.70$$

Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2002. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only, and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor the deviation of actual total costs from this estimate will affect the right of the United States to seek cost recovery.

X. RECOMMENDATION

This decision document represents the selected removal action for the Donna Reservoir Site in Donna, Hidalgo County, Texas. It was developed in accordance with CERCLA, 43 U.S.C. § 9601 et seq., and is consistent with the NCP, 40 CFR Part 300. This decision is based on the administrative record for the Site.

Conditions at the Site meet the criteria as defined by 40 CFR Section 300.415(b)(2) of the NCP for a removal, and I recommend your approval of the proposed removal action. The total project ceiling, if approved, will be $500,000.

APPROVED: Pamela Phillips, Acting DATE: 8/6/08

Attachments:

References

Reference Number	Description of the Reference
1	Texas Natural Resource Conservation Commission. *Screening Site Inspection Report: Donna reservoir and canal system Donna, Hidalgo county, Texas TX0000605363.* TNRCC. November 2001. Total pages: 52.
2	Texas Natural Resource Conservation Commission. *Polychlorinated biphenyls in Donna reservoir and contiguous waters: Results of intensive sediment, water and fish sampling and human health risk assessment.* October 1998. AS-161. Total Pages: 45.
3	Mahler, Barbara, United States Geological Survey. *Final Progress Memorandum: Investigation of PCBs on Suspended Sediment in Donna Canal, Texas.* December 14, 2000. Total Pages: 7.
4	Texas Department of State Health Services. *Characterization of potential adverse health effects associated with consuming fish from the Donna irrigation system.* August 2007. Total Pages: 28.
5	Texas Natural Resource Conservation Commission. Implementation Plan for Arroyo Colorado and Donna Reservoir and Canal Legacy Pollutant TMDLs For Segments 2202 and 2202A, September 4, 2001. Total Pages: 33.
6	U.S. Code of Federal Regulations, 21 CFR 109.30
7	Texas Department of Health, Aquatic Life Order Number 9, February 4, 1994

ATTACHMENT 1

ENFORCEMENT ATTACHMENT TO THE ACTION MEMORANDUM FOR the "Donna Reservoir and Canal System" SITE," IS ENFORCEMENT SENSITIVE

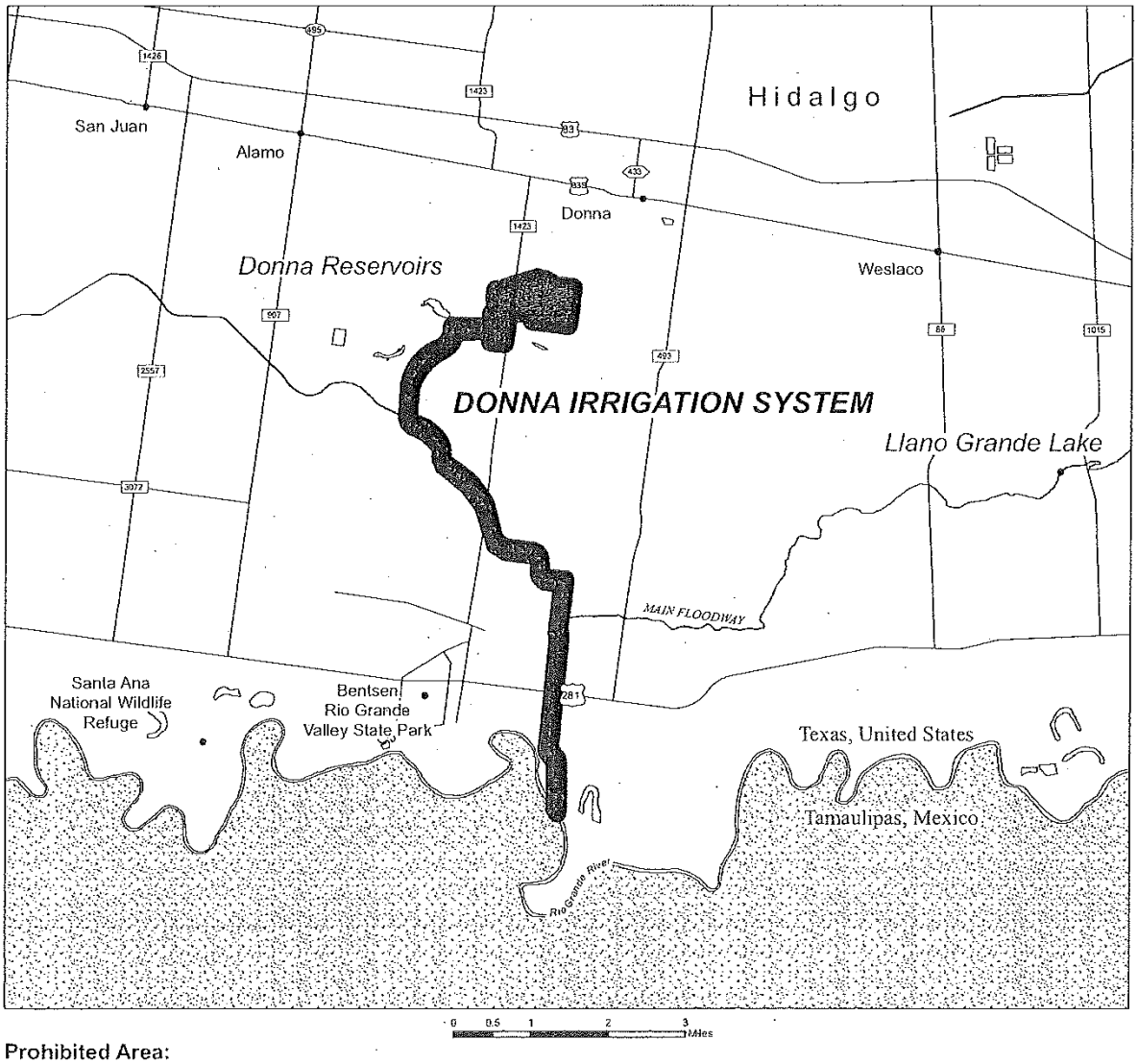
Note: **This document has been withheld as Enforcement Confidential and is located in Separate "CONFIDENTIALITY FILING" at U.S. EPA, Region 6**

ATTACHMENT 2

Site Location Map

Donna Irrigation System

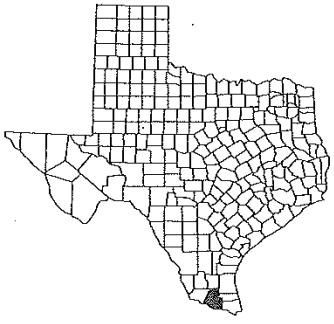
Hidalgo County
AL-9 Issued February 4, 1994



Prohibited Area:
Donna Reservoir and interconnecting canal system

Contaminants of Concern:
Polychlorinated Biphenyls (PCBs)

Restricted Species:
Persons are prohibited from possessing any species of fish from these waters.



ATTACHMENT 3

TDH Aquatic Life Order

IN THE MATTER OF CLOSURE	§	BEFORE THE TEXAS
	§	
OF AQUATIC LIFE	§	DEPT. OF HEALTH
	§	
HARVESTING AREAS	§	AUSTIN, TEXAS

AQUATIC LIFE ORDER NUMBER 9

Pursuant to the duty delegated to the Texas Department of Health to protect and promote the health of the people of this state to control all matters relating to the health of the citizens of this state and pursuant to Chapter 436 of the Texas Health and Safety Code, it is ORDERED that the Donna Irrigation System located in Hidalgo County is declared a prohibited area or the taking of all species of aquatic life. This order is effective at 12:01 a.m. February 4, 1994 and remains in full force and effect until modified or rescinded by further written order.

Issued on this 3rd day of February, 1994, in Austin, Travis County, Texas.

David R. Smith, M.D.
Commissioner of Health
Texas Department of Health

ATTACHMENT 4

TDH Health Consultation

Characterization of Potential Adverse Health Effects Associated with Consuming Fish from the

DONNA IRRIGATION SYSTEM

Hidalgo County, TX

August 2007

Department of State Health Services
Austin, Texas
Seafood and Aquatic Life Group
Policy, Standards, and Quality Assurance Unit
Division for Regulatory Services
and the
Environmental and Injury Epidemiology and Toxicology Branch

INTRODUCTION

Description of the Donna Irrigation System and History of the Extant Possession Ban

The Donna Irrigation District reservoirs are located in the Hidalgo County, one of the Texas Rio Grande Valley counties directly bordering Mexico. The Donna District Reservoirs (Donna Irrigation System (DIS) Donna Reservoirs; Donna West and a larger Donna East) lie slightly southwest of the town of Donna, TX. The main canal winds its way south between County Roads 907 and 493 traveling for a distance with the main floodway. East of Bentsen Rio Grande Valley State Park, the canal crosses U.S. Highway 281, from which point the channel runs almost due south to empty into the Rio Grande a few miles south of U.S. Highway 281.[1]

The United States Environmental Protection Agency (USEPA) first detected PCBs in fish from the Donna Canal in 1993. In an environmental study of the Lower Rio Grande Valley of Texas, the agency sampled *cooked* fish from representative households in the valley, taking blood and urine from families who participated. Laboratory analyses of fish from this study revealed high concentrations of PCBs, with one carp – reportedly from the Donna Canal – containing 399 milligrams PCBs per kilogram tissue – some 1500 times the concentration that, if consumed, was thought to pose a hazard to human health. Blood from people who ate that particular fish contained excessive concentrations of PCBs. Upon receiving this information, the Texas Commissioner of Health informed the Seafood Safety Division of the Texas Department of Health (TDH). The SSD quickly confirmed the information and sent a collection team to the Donna Reservoir to sample fish. Fish collected by the TDH at that time contained high concentrations of PCBs consistent with Aroclor® 1248, 1254, and 1260.[2],[3] On February 9, 1994, consequent to this finding, the TDH issued Aquatic Life Order #9 (AL-9). AL-9 prohibited possession of any fish species from the DIS.[4] Despite this possession ban, evidence abounds that the DIS remains a popular fishing spot for residents of Hidalgo County. For instance, in 2002, the USGS published a document with photographs of locals fishing outside the Donna Canal pump house and at the Donna Reservoir.[3] Although the source of the PCBs in the DIS remains a mystery, in that document, the USGS outlined a 600-meter reach in the northernmost 90-degree curve of the canal, suspended sediment from which has the highest PCB concentrations identified in the system. From these data, the USGS proposed that 600-meter reach as likely to contain the source of PCBs in the DIS. Fish caught from this same area have historically contained high levels of PCBs.[3]

The Seafood and Aquatic Life Group (SALG) of the Department of State Health Services (DSHS, formerly the Texas Department of Health) – with funding from the Total Maximum Daily Load (TMDL) Program of the Texas Commission on Environmental Quality (TCEQ) collected fish in 2005 and 2006 from the DIS (DIS). The analytical results from those fish form the basis for this report. The report, written some 13 years after AL-9 prohibited possession of fish from the DIS, describes results, presents conclusions from the study, addresses implications to public health from consumption of contaminated fish from the DIS, recommends public health actions, and supplies the TMDL Program with needed data. In the present study (2005-2006), DSHS again characterized PCB contamination in fish from the DIS. The 2005-2006 tissue data show that fish from the DIS continue to contain PCBs in excess of the health-related

concentrations used by the DSHS to protect public health. Interestingly, PCBs in fish collected for this report from sites in the DIS positively correlate with PCB concentrations in sediments from the same sites as measured by the USGS for PCBs.[3]

The TMDL Program at the TCEQ and the Relationship between DSHS Consumption Advisories or Possession Bans and TMDLs

The TCEQ enforces federal and state laws that promote judicious use of water bodies under state jurisdiction and protects state-controlled water bodies from pollution. Pursuant to the federal Clean Water Act, Section 303(d),[5] all states must establish a "total maximum daily load" (TMDL) for each pollutant contributing to the impairment of a water body for one or more designated uses. A "TMDL" is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources, and including a margin of safety to ensure the usability of the water body for all designated purposes, accounting for seasonal variation in water quality. States, territories, and tribes define the uses for a specific water body (e.g., drinking water, contact recreation, aquatic life support [fish consumption] along with the scientific criteria designated to support each specified use). The Clean Water Act, section 303, which promulgates rules that promote water quality, orders the states to establish TMDLs and implementation plans for impaired waters.[5] Fish consumption is a recognized use for many waters. A water body is impaired if fish from that water body contain contaminants that make those fish unfit for human consumption or if consumption of those contaminants potentially could harm human health. Although a water body and its aquatic life may spontaneously clear toxicants over time with removal of the source(s), it is often necessary to institute some type of remediation such as those devised by the TMDL Program. Thus, when the DSHS prohibits possession of environmentally contaminated fish, the TMDL Program automatically places the water body on its current draft 303(d) List.[5] TMDL staff members then prepare a TMDL for each contaminant present at concentrations that, if consumed, would be capable of negatively affecting human health. Once the TMDLs are approved, the group prepares an Implementation Plan – a "remediation" plan, if you will – for each contaminant. Upon "implementation," these plans facilitate rehabilitation of the water body. Successful remediation should result in return of the water body to conditions compatible with all stated uses, including consumption of fish from the water body. When the DSHS lifts a possession ban, people may once again keep and consume fish from the water body. If fish in a water body are contaminated, one of the several items on an Implementation Plan for a water body on a state's 303(d) list might be the periodic reassessment of contaminant levels in fish. For the DIS, the TMDL Program does specify such periodic reassessments.

Demographics of Hidalgo County and the Likelihood of Subsistence Fishing in the Area of the Donna Irrigation System

The USEPA suggests that, along with ethnic characteristics and cultural practices of an area's population, the poverty rate could contribute to any determination of the rate of subsistence fishing in an area.[6] In Hidalgo County, TX, the 2005 population was 671,967 people.[7]. Of this population, 5,099 claimed Asian heritage or ethnicity. Of the 252,000+ people in the labor force, 12.6% were unemployed. The median household income in 2005 inflation-adjusted figures was $24,501. For the year 2005, 41% of people in Hidalgo County lived in poverty. Fifty-two percent of related children less than 18 years of age lived below the poverty level, while 29% of those 65

years or older lived below the poverty level. Thirty-six percent of all families and 55% of families with a female householder (no husband present) had incomes below the poverty level. Of those people over 25 years of age, 42% had less than a 9th grade education but 58% had at least a high school diploma (or an equivalency). Fifteen percent had a bachelor's degree or higher. Of people in Hidalgo County with a mortgage, 46% pay more than 30% of their income for housing, leaving less money for other essentials such as food. Finally, about one in six individuals over five years of age claimed a disability, with the percentage increasing with increasing age.[8] Disabilities affect income. All of these demographic variables may affect the likelihood of subsistence fishing. Why is it important to know whether and how many subsistence fishers are residents of the area? The USEPA and the DSHS believe it important to consider subsistence fishing as occurring at any water body because subsistence fishers (as well as recreational anglers and certain tribal and groups of certain ethnicities) may consume more locally caught fish than the general population. As shown by the above demographics, many Hidalgo County residents have characteristics of subsistence fishers. These groups sometimes harvest fish or shellfish from the same water body over many years to supplement caloric and protein intake. Should local water bodies contain chemically contaminated fish or shellfish, people who routinely eat fish from the water body or those who eat large quantities of fish from the same waters, could increase their risk of adverse health effects. The USEPA suggests that states assume that at least 10% of *licensed* fishers in any area are subsistence fishers. The DIS is a popular fishing "hole" for residents of the area. Subsistence fishing, while not explicitly documented by the DSHS, likely occurs along the Donna System. The DSHS assumes the rate of subsistence fishing to be similar to that estimated by the USEPA.[6]

METHODS

Fish Sampling, Preparation, and Analysis

The DSHS SALG collects and analyzes edible fish from the state's public waters to evaluate potential risks to the health of people consuming contaminated fish or shellfish. Fish tissue sampling follows standard operating procedures from the DSHS *Seafood and Aquatic Life Group Survey Team Standard Operating Procedures and Quality Control/Assurance Manual.*[9] The SALG bases its sampling and analysis protocols, in part, on procedures recommended by the USEPA in that agency's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1.*[10] Advice and direction are also received from the legislatively mandated *State of Texas Toxic Substances Coordinating Committee (TSCC) Fish Sampling Advisory Subcommittee (FSAS).*[11] Samples usually represent species, trophic levels, and legal-sized specimens available for consumption from a water body. When practical, the DSHS collects samples from two or more sites within a water body to better characterize geographical distributions of contaminants.

Fish Sampling Method and Description of the Donna Irrigation System 2005-2006 Sample Set

In December 2005 and January 2006, the field collection team from SALG collected 30 fish samples from sites along the DIS. That system includes two small reservoirs and a canal from which irrigation water is drawn. The SALG selected six sample sites to provide spatial coverage of the study area (Figure 1). Sites 1, 2, and 3 were in the canal proper. Sites 4 and 5 were in the reservoirs: Site 4 in the West Reservoir and Site 5 in the East Reservoir. Table 1 also shows exact latitudes and longitudes for each site.

The collection team targeted species for collection from the DIS through fish-tissue sampling protocols developed over many years by the SALG. Species collected represent two distinct ecological groups (i.e. predators and bottom-dwellers) that have some potential to bio-accumulate chemical contaminants, have a wide geographic distribution, are of local recreational fishing value, and/or which anglers and their families commonly consume. The 30 fish collected from the DIS in December 2005 and January 2006 represented all species targeted for collection from this water body. Table 1 presents date collected, sample number, species, collection site, length and weight of each sample. The table lists the samples by site: largemouth bass (12), common carp (10), smallmouth buffalo (3), freshwater drum (3), and channel catfish (2).

During each day of sampling, staff set gill nets in late afternoon and fished those overnight, collecting samples from the nets early the following morning. Gill nets were set to maximize available cover and habitat. SALG staff stored captured fish retrieved from the nets on wet ice until processed. The staff returned to the reservoir or canal system any remaining live fish culled from the catch. Staff also properly disposed of fish found dead in the gill nets.

The SALG utilized a boat-mounted electrofisher to collect fish. SALG staff conducted electrofishing activities during daylight hours, using pulsed direct current (Smith Root 5.0 GPP electrofishing system settings: 4.0-6.0 amps, 60 pulses per second [pps], low range 360 volts, 80% duty cycle) to stun fish that crossed the electric field in the water in front of the boat. Staff used dip nets over the bow of the boat to retrieve stunned fish, netting only fish pre-selected as target samples. Staff immediately stored retrieved samples on wet ice in large coolers to ensure interim preservation of tissues.

SALG staff processed fish from the DIS at the sites from which the samples came. Staff weighed each sample to the nearest gram on an electronic scale and measured total length (tip of nose to tip of tail fin) to the nearest millimeter. After weighing and measuring a fish, staff used a cutting board covered with aluminum foil and a fillet knife to prepare two skin-off fillets from each fish. The foil was changed and the filleting knife cleaned with distilled water after each sample was processed, after which the fillet(s) was wrapped in two layers of fresh aluminum foil, placed in an unused, clean, pre-labeled plastic freezer bag, and stored on wet ice in an insulated chest until further processing. At the end of each sampling trip, SALG staff transported tissue samples on wet ice to their Austin, TX, headquarters, where the samples were stored temporarily at -5° Fahrenheit (-20° Celsius) in a locked freezer. The freezer key is accessible only to authorized SALG staff members to ensure the chain of custody remains intact while samples are in the possession of agency staff. The week following each collection trip, frozen fish tissue samples were shipped by commercial carrier (UPS next-day air) to the Geochemical and Environmental

Research Group (GERG) Laboratory, Texas A&M University, College Station, TX, for contaminant analysis.

Analytical Laboratory Information

The GERG laboratory notified the SALG when samples from the DIS arrived. Upon receipt of the samples, the laboratory recorded the DSHS sample number – assigned by the collection team – and noted the condition of each fillet.

Utilizing USEPA-sanctioned methodology, the laboratory analyzed the 30 samples for common inorganic and organic contaminants, including seven metals – cadmium (Cd), copper (Cu), lead (Pb), selenium (Se), zinc (Zn), total arsenic (As), and total mercury (Hg). The GERG laboratory analyzed each fish for total (inorganic arsenic + organic arsenic = total As) arsenic. Although the proportions of each form of arsenic may differ among species, under different water conditions, and, perhaps, with other variables, the literature suggests that well over 90% of arsenic in fish is likely organic arsenic – a form that is virtually non-toxic to humans. Taking a conservative approach, DSHS estimates that 10% of arsenic in a fish is inorganic arsenic and derives estimates of inorganic arsenic concentrations by multiplying total arsenic concentration in each fish by a factor of 0.1.[12] Virtually all mercury in upper trophic level fish three years of age or older is methylmercury.[5] Thus, total mercury concentration in a fish of legal size for possession in Texas serves well as a surrogate for methylmercury. Because methylmercury analyses are difficult to perform well and are more expensive than analysis of total mercury, the USEPA recommends that states determine total mercury concentration in a fish and that – to protect human health – states conservatively assume that all reported mercury in fish or shellfish is methylmercury. The GERG laboratory analyzed fish tissues for total mercury. In its risk characterizations, the DSHS may interchangeably utilize the terms "mercury", "methylmercury", or "organic mercury" to refer to methylmercury in fish.[13]

The laboratory analyzed tissues for several classes of pesticides such as organophosphates, organochlorines, and carbamates. The laboratory also analyzed 30 fish tissue samples for PCBs, while it analyzed five of the 30 for panels of semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs).

PCB Analyses and the Measurement of PCB Congeners instead of Aroclors

The GERG laboratory reports the presence and concentrations of 209 PCB congeners using detection limits that are, typically, around 1 µg/kg. Although only about 130 congeners existed in mixtures commonly used in the U.S. (Aroclors®), it may be useful to have measured all 209 congeners for examining the effects of "weathering" on the PCB mixture presumed originally disseminated.

Despite USEPA's suggestion that the states analyze PCB congeners rather than Aroclor or homolog analyses, the toxicity literature does not reflect this state-of-the-art laboratory science. To handle this dilemma, DSHS empirically uses recommendations from the National Oceanic and Atmospheric Administration (NOAA)[14] and from McFarland and Clarke,[15] along with the USEPA's guidance documents for assessing contaminants in fish tissues[10,16] to address the

toxicity of PCB congeners in fish tissues, summing concentrations of 43 PCB congeners to derive a "total" PCB concentration. The DSHS averages the summed congeners to derive a mean PCB concentration. The authors of the preceding references utilized congeners for their likelihood of occurrence in fish, the likelihood of significant toxicity – based on structure-activity relationships – and for the relative environmental abundance of those congeners.[14,15] Using only a few PCB congeners to determine "total PCBs" could underestimate PCB concentrations in fish tissue. Nonetheless, the above-described method complies with expert recommendations on evaluation of PCBs in fish. Therefore, SALG risk assessors compare average PCB concentrations with information in the USEPA's (Integrated Risk Information System) IRIS database.[17] IRIS currently contains systemic toxicity information for five Aroclor mixtures: Aroclor 1016, 1242, 1248, 1254, and 1260, as well as supplying one or more cancer potency factors (CPFs) – also known as slope factors (SFs) - for mixtures of PCBs, (not all information is available for all mixtures).[17] Systemic toxicity estimates in this document reflect comparisons with the Reference Dose (RfD) for Aroclor 1254 because IRIS contains an RfD for Aroclor 1254 but not for Aroclor 1260. As of yet, IRIS does not contain toxicity information on individual PCB congeners. Risk assessors may be unable to determine the originally-present Aroclor® mixture or whether the PCBs observed even originated from Aroclors® as U.S. companies used PCB mixtures imported from abroad as well as U.S.- produced PCBs. Additionally, airplanes and ships from foreign countries entered U.S. waters and may have discharged foreign-made PCB mixtures into U.S. portal waters.

Statistical Analysis

SALG risk assessors employed SPSS® statistical software, version 13.0 installed on IBM-compatible microcomputers (Dell, Inc) to generate descriptive statistics (mean, standard deviation, median, range, and minimum and maximum concentrations) on all measured compounds in each species of fish from each sample site.[18] SALG risk assessors utilized ½ the detection limit for all analytes not detected (ND) or estimated (J)[a] concentrations in computing descriptive statistics. SALG risk assessors imported previously edited Excel data files into SPSS® to generate means, standard deviations, median concentrations, and minimum and maximum concentrations of each measured analyte. SALG used the descriptive statistical results to generate the present report. SALG protocols do not require hypothesis testing. Nevertheless, when data are of sufficient quantity and quality, and, should it be necessary, the SALG utilizes SPSS® software to determine significant differences in contaminant concentrations among species and/or collection sites. The SALG risk assessors did not test hypotheses on differences among species from the DIS because all samples contained PCBs, and most were above the HAC_{nonca}. The SALG employed Microsoft Excel® spreadsheets to generate figures, to compute health-based assessment comparison values (HAC_{nonca}) for contaminants, and to calculate hazard quotients (HQ), hazard indices (HI), cancer risk probabilities, and meal consumption limits for fish from the DIS.[19] When lead data are of sufficient quality, concentration, and interest, the SALG utilizes the USEPA's Interactive Environmental Uptake Bio-Kinetic (IEUBK) model to determine whether consumption of lead-contaminated fish could cause children's blood lead (PbB) level to exceed the federally set 10 micrograms/deciliter.[20]

[a] "J-value" is standard laboratory nomenclature for analyte concentrations detected and reported, which reported concentration is an estimate, quantitation of which may be suspect and may not be reproducible. The DSHS treats J-Values as "not detected" in its statistical analyses of a sample set.

Derivation and Application of Health-Based Assessment Comparison Values (HAC_{nonca} or HAC_{ca})

The effects of exposure to any hazardous substance depend on the dose, the duration of exposure, the manner in which one is exposed, one's personal traits and habits, and whether other chemicals are present.[21] People who regularly consume contaminated fish or shellfish conceivably suffer repeated exposures to relatively low concentrations of contaminants over extended times. Such exposures are unlikely to result in acute toxicity but may increase risk of subtle, chronic, and/or delayed adverse health effects that include cancer, benign tumors, birth defects, infertility, blood disorders, brain damage, peripheral nerve damage, lung disease, and kidney disease, to name but a few.[21] Presuming people to eat a diet of diverse fish or shellfish from a water body if species variety is available, the DSHS routinely collapses data across species and sampling sites to evaluate mean contaminant concentrations of toxicants in all samples. This approach intuitively reflects consumers' likely exposure over time to contaminants in fish or shellfish from a water body, but may not reflect reality at a specific water body. The agency thus reserves the right to examine risks associated with ingestion of individual species of fish or shellfish from separate collection sites or at higher concentrations (e.g., the upper 95 percent confidence limit on the mean concentration. Confidence intervals are derived from Monte Carlo simulation techniques with software developed by Dr. Richard Beauchamp, of the DSHS).[22] The DSHS evaluates contaminants in fish by comparing the mean, and – when appropriate – the 95% upper confidence limit on the mean concentration of a contaminant to its HAC value (measured in milligrams of contaminant per kilogram of edible tissue – mg/kg) derived for non-cancer or cancer endpoints. To derive HAC values for systemic (HAC_{nonca}) effects, the department assumes a standard adult weighs 70 kilograms and that adults consume 30 grams of edible tissue per day (about one 8-ounce meal per week). The DSHS uses USEPA's oral RfDs[23] or the Agency for Toxic Substances and Disease Registry's (ATSDR) chronic oral minimal risk levels (MRLs)[24] to generate HAC values used in evaluating systemic (noncancerous) adverse health effects. The USEPA defines a contaminant's RfD as

> *An estimate of a daily oral exposure for a given duration to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime.*[25]

EPA also states that an RfD

> *… is derived from a BMDL* (benchmark dose lower confidence limit)*, a NOAEL* (no observed adverse effect level)*, a LOAEL* (lowest observed adverse effect level)*, or another suitable point of departure, with uncertainty/variability factors applied to reflect limitations of the data used. [Durations include acute, short-term, subchronic, and chronic and are defined individually in this glossary]*" and "*RfDs are generally reserved for health effects thought to have a threshold or a low dose limit for producing effects.*[25]

The ATSDR uses a similar technique to derive MRLs.[24] The DSHS compares the estimated daily dose (mg/kg/day) – derived from the mean of the measured concentrations of a

contaminant – to the contaminant's RfD or MRL, using HQ methodology as suggested by the USEPA.

A HQ, defined by the EPA, is

> *...the ratio of the estimated exposure dose of a contaminant (mg/kg/day) to the contaminant's RfD or MRL (mg/kg/day).*[26]

Note that a linear increase in the hazard quotients for a site or species usually does *not* represent a linear increase in the likelihood or severity of systemic adverse effects (i.e., a substance having an HQ of 2 is not twice as toxic as if the substance had an HQ of 1.0. Similarly, a substance with a HQ of 4 does not imply that adverse events will be four times more likely than a HQ of 1.0). As stated by the USEPA, a HQ (or an HI) of less than 1.0 "is no cause for concern, whereas an HQ (or HI) greater than 1.0 should indicate some cause for concern." Thus, risk managers at the DSHS utilize a HQ of 1.0 as a "jumping-off point," not for decisions concerning likelihood of occurrence of adverse systemic events, but as a point of departure for management decisions that assume, in a manner similar to EPA decisions, that fish or shellfish having a HQ of less than 1.0 are unlikely to be cause for concern. Since the chronic oral RfD derived by the USEPA represents chronic consumption, eating fish with a toxicant-to-RfD ratio (the HQ) of less than 1.0 is not likely to result in adverse health effects, whereas routine consumption of fish where the HQ for a specific chemical exceeds 1.0 represents a qualitatively unacceptable increase in the likelihood of systemic adverse health outcomes.

Although DSHS preferentially utilizes an RfD derived by federal scientists for each contaminant, should no RfD be available for a specific contaminant, the USEPA advises risk assessors to consider using an RfD determined for a contaminant of similar molecular structure, or mode or mechanism of action. For instance, DSHS – as specifically directed by the USEPA – uses the published reference dose for Aroclor 1254 to assess noncarcinogenic effects of Aroclor 1260, for which no reference dose is available – the USEPA has derived one other reference dose for Aroclors – that of Aroclor 1016. However, Aroclor 1016 is not as clearly like Aroclor 1260 as is Aroclor 1254. In the past, when DSHS had access only to the relatively crude measurement of Aroclors, the agency did not attempt to determine the dioxin equivalent toxicity of coplanar PCBs found in fish. The SALG recently adopted PCB congener analysis, as is suggested by the USEPA. This change in methodology allows the agency to identify coplanar or dioxin-like PCBs and to apply toxicity equivalency factors (TEFs) to PCBs in fish should SALG staff consider this a priority.

The constants (RfDs, MRLs) the DSHS employs to calculate HAC_{nonca} values are derived by federal agencies from the peer-reviewed literature (which the federal agencies routinely re-examine). These values incorporate built-in margins of safety called "uncertainty factors" or "safety factors" as mentioned in EPA reference materials.[25] In developing an oral RfD or MRL, federal scientists review the extant literature on the toxicant to determine an experimentally-derived NOAEL, a LOAEL, or, in some cases, a benchmark dose (BMD). Once the NOAEL, LOAEL, or BMD is determined, the scientist then utilizes uncertainty factors to minimize potential systemic adverse health effects in people exposed through consumption of contaminated materials. The uncertainty factors account for certain conditions that are

undetermined by the experimental data. The classic four uncertainty factors are (1) extrapolation from animals to humans (interspecies variability), (2) intra-human variability, (3) using a subchronic study rather than a chronic study to determine the NOAEL, LOAEL, or BMD, (4) using a LOAEL instead of a NOAEL to determine the RfD. Recently, a fifth uncertainty factor, (5) database insufficiencies for the toxicant, was added.[23] Vulnerable groups – women who are pregnant or lactating, women who may become pregnant, the elderly, infants, children, people with chronic illnesses, those with compromised immune systems, or those who consume exceptionally large servings, collectively called "sensitivities" by the EPA, also receive special consideration in calculations of the RfD.[25, 27]

The SALG calculates cancer-risk comparison values (HAC_{ca}) from the EPA's CPFs – also known as SFs – derived through mathematical modeling of carcinogenicity studies. For carcinogenic outcomes, the DSHS calculates a theoretical lifetime excess risk of cancer for specific exposure scenarios for carcinogens, using a standard 70-kg body weight and assuming an adult consumes 30 grams of edible tissue per day. The SALG risk assessors incorporate two additional factors into determinations of theoretical lifetime excess cancer risk: (1) an acceptable lifetime risk level (ARL) [25] of one excess cancer case in 10,000 persons whose average daily exposure is equal and (2) daily exposure for 30 years. Comparison values used to assess the probability of cancer, thus, do not contain "uncertainty" factors as such. However, conclusions drawn from those probability determinations infer substantial safety margins for all people by virtue of the models utilized to derive the slope factors (cancer potency factors). For instance, the USEPA suggests the use of a tiered approach to determine the potency of PCB mixtures to cause cancer in exposed individuals. This approach depends on information available from the IRIS database.[17] Three tiers of carcinogen slope factors (SFs) used to assess the impact of environmental PCBs exist. The first tier, with an upper bound slope factor of 2.0 and a central tendency slope factor of 1.0, is used for PCBs with "high risk and persistence." Criteria for using this most restrictive slope factor include (1) exposure via food, (2) ingestion of sediment or soil, (3) inhalation of dust or aerosols (4) dermal exposure – if an absorption factor was applied – (5) the presence of dioxin-like, tumor-promoting, or persistent PCB congeners, and, perhaps most importantly, (6) the possibility of early-life exposure. Because the potential implications of early-life exposures include factors such as possibly greater perinatal sensitivity, or the likelihood of interactions between PCBs and normal functions (such as PCB-mediated depletion of thyroid hormones, an effect that can result in irreparable damage to the developing brain) of development, the USEPA concludes that early-life exposures may be associated with increased risks.[17] The DSHS, in agreement with the federal agency, utilizes the upper bound slope factor of the "high risk" tier for all exposures to PCBs in fish.

The calculated comparison values (HAC_{nonca} and HAC_{ca}) are quite conservative, so adverse systemic or carcinogenic health effects are unlikely to occur, even if exposures are consistently greater or last longer than those used to calculate comparison values. Moreover, comparison values for adverse health effects (systemic or carcinogenic) do not represent sharp dividing lines (bright-line divisions) between safe and unsafe exposures. The *perceived* strict demarcation between acceptable and unacceptable exposures or risks is primarily a tool to assist risk managers to make decisions that ensure protection of the public's health. For instance, the DSHS considers it unacceptable when consumption of four or fewer meals per month of contaminated fish or shellfish would result in exposure to contaminant(s) in excess of a HAC value or other

measure of risk even though most such exposures are unlikely to result in adverse health effects. The department further advises people who wish to minimize exposure to contaminants in fish or shellfish to eat a variety of fish and/or shellfish and to limit consumption of those species most likely to contain toxic contaminants. DSHS aims to protect vulnerable subpopulations with its consumption advice. The DSHS assumes that advice protective of vulnerable subgroups will also minimize the impact to the general population of consuming contaminated fish or shellfish.

Children's Health Considerations

The DSHS recognizes that fetuses, infants, and children may be uniquely susceptible to the effects of toxic chemicals and suggests that exceptional susceptibilities demand special attention.[28,29] Windows of special vulnerability; known as "critical developmental periods," exist during development. Critical periods occur particularly during early gestation (weeks 0 through 8), but can occur at any time during pregnancy, infancy, childhood, or adolescence – indeed, at any time during development – times when toxicants can impair or alter the structure or function of susceptible systems.[30] Unique early sensitivities may exist because organs and body systems are structurally or functionally immature – even at birth – continuing to develop throughout infancy, childhood, and adolescence. Developmental variables may influence the mechanisms or rates of absorption, metabolism, storage, or excretion of toxicants, any of which factors could alter the concentration of biologically effective toxicant at the target organ(s) or that could modulate target organ response to the toxicant. Children's exposures to toxicants may be more extensive than adults' exposures because, in proportion to their body weights, children consume more food and liquids than adults do, another factor that might alter the concentration of toxicant at the target. Infants can ingest toxicants through breast milk – an exposure pathway that often goes unrecognized (nonetheless, the advantages of breastfeeding outweigh the probability of significant exposure to infants through breast milk. Women are encouraged to continue breastfeeding and to limit exposure of their infants by limiting intake of the contaminated foodstuff). Children's behaviors (i.e., hand to mouth behaviors) might expose them to more toxicants or higher concentrations of a toxicant than adults.[31] Children may experience effects at a lower exposure dose than might adults because children's organs may be more sensitive to the effects of toxicants. Stated differently, children's systems could respond more extensively or with greater severity to a given dose than would an adult organ exposed to an equivalent dose of a toxicant. Children could be more prone to developing certain cancers from chemical exposures than are adults.[32] In any case, if a chemical – or a class of chemicals – is observed to be – or is thought to be – more toxic to the fetus, infants, or children than to adults, the constants (e.g., RfD, MRL, or CPF) are usually further modified to assure protection of the immature system's potentially greater susceptibility.[23] Additionally, in accordance with the ATSDR's *Child Health Initiative*[33] and the USEPA's *National Agenda to Protect Children's Health from Environmental Threats,*[34] (In recognition of the possibly greater vulnerability of children to harmful substances, USEPA has established the Office of Children's Health Protection (OCHP). The OCHP ensures that all standards set by USEPA will protect children from any heightened risks and that newly developed policies address children's health concerns)[35] the DSHS further seeks to protect children from the possible negative effects of toxicants in fish by suggesting that this potentially sensitive subgroup consume smaller quantities of contaminated fish or shellfish than adults consume. Thus, DSHS recommends that children weighing 35 kg or less and/or who are 11 years of age or younger limit exposure to contaminants in fish or shellfish by eating no more than four

ounces per meal of the contaminated species. The DSHS also recommends that consumers spread these meals over time. For instance, if the DSHS issues consumption advice that suggests consumption of no more than two meals per month of a contaminated species, those children should eat no more than 24 meals of the contaminated fish or shellfish per year and, ideally, should not eat such fish or shellfish more than twice per month.

RESULTS

Laboratory Analytical Results

The GERG laboratory submitted electronic copies of the analytical results on fish from the DIS (Donna Canal and Donna Reservoir) to the SALG between December 2005 and February 2006. As SALG requested, the laboratory analyzed 30 fish for pesticides, metal-like constituents and for PCBs. The laboratory reported data for VOCs and SVOCs measured in five samples. Information about the samples is presented in Table 1.

Inorganic Contaminants

Arsenic, Cadmium, Copper, Mercury, Lead, Selenium, Zinc

Samples from the DIS contained no detectable arsenic or cadmium (data not shown). Inorganic contaminants present at measurable levels in one or more fish from the DIS included copper, mercury, lead, selenium, and zinc (Table 2). Six of 30 fish contained some level of lead. Four fish contained measurable quantities of lead; two contained estimated concentrations. The remaining 24 fish were reported only as "less than the reporting limit" for the sample.

The laboratory reported mercury in 30 fish tissues (Table 2). The average mercury concentration in all fish combined was 0.229±0.112 mg/kg. The highest mercury value in the sample data set was 0.467 mg/kg (Table 2). One sample contained an estimated concentration of mercury (a J-value).

Copper, selenium, and zinc are all essential nutrients. Thirty of 30 samples contained copper. The mean copper concentration for all fish was 0.271±0.258 mg/kg. The minimum concentration of copper (reported below the detection limit as a J-value) was 0.041 mg/kg and the maximum concentration was 0.916 mg/kg. Selenium and zinc were present in all fish, as is often observed (Table 2). Average selenium concentration across all fish was 0.547±0.135 mg/kg, ranging from 0.268-0.931mg/kg (Table 2). The mean zinc concentration was 5.766±2.601 mg/kg with a spread of 2.364 to 13.261 mg/kg (Table 2).

Organic Contaminants

The GERG laboratory analyzed 30 fish tissue samples from the DIS for commonplace and/or legacy pesticides and PCBs. The laboratory also analyzed five of the samples for SVOCs and VOCs.

Pesticides

The laboratory analyzed fish tissue from the DIS for 34 pesticides representing legacy and/or major pesticide groups such as organochlorines, organophosphates, and carbamates. The following pesticides were observed at some levels in one or more fish.

Organophosphates were reported present in fish from the DIS. All but one sample from the 2005-2006 DIS dataset contained trace quantities of 4,4'-DDD; 22 samples had estimated concentrations (J-values) below the laboratory's reporting limit. Seven fish had measurable concentrations of 4,4'-DDD. One sample contained no detectable 4,4'-DDD. All samples contained 4,4'-DDE (minimum value to maximum value = 0.005 mg/kg-1.432 mg/kg). Four samples contained 4,4'-DDT, two at estimated (J-value) concentrations and two as measured concentrations. Other samples (26 fish) did not contain detectable 4,4'-DDT, according to the laboratory report. 2,4'-DDD, DDE, and DDT were present in a number of samples but are not addressed in this report because EPA has not established RfDs or cancer slope factors for these isomers of DDT, it's metabolites, or breakdown products. The procedural blanks revealed no 4,4'-DDT, 4,4'-DDE, or 4,4'-DDT.

Measurable concentrations of chlordane were reported present in seven samples (0.014 mg/kg± 0.021 mg/kg). Fourteen samples contained chlordane at detectable concentrations below the analytical method detection limit (MDL). Nine samples had detectable, but not quantifiable chlordane (reported only as < the MDL). The laboratory does not utilize chlordane in its quality control (QC) procedure.

Three fish tissues contained estimated concentrations of the organochlorine pesticide chlorpyrifos. One sample had a measurable 0.0146 mg/kg chlorpyrifos. Twenty-six samples contained chlorpyrifos at some concentration below the laboratory MDL.

Another organochlorine, dacthal, was also present in fish from the DIS. All 30 samples contained some level of dacthal. Twenty samples contained estimated (J-values) of dacthal, while ten samples contained measurable concentrations of Dacthal (0.015±0.024 mg/kg, ranging from 0.0012 to 0.062 mg/kg). Twenty samples contained Dacthal at levels below the laboratory's reporting limit.

One sample (DIC15, a common carp) contained traces of 1,2,3,4-tetrachlorobenzene and 1,2,3,5-tetrahlorobenzene. The laboratory reported no other pesticides in any sample from the DIS.

Volatile Organic Compounds (VOCs)

Four of five fish tested for VOCs contained acetone at levels below the laboratory's MDL; one fish, a common carp contained a quantifiable level of acetone (5.22 mg/kg; MDL = 0.200 mg/kg). Four of five samples contained quantifiable methylene chloride. Although the reporting limit for methylene chloride is 0.050 mg/kg, these levels were around 0.032 mg/kg – below the MDL. One fish contained an estimated concentration of a magnitude similar to those reported as firm measurements. A single fish contained a trace of benzene (0.001 mg/kg, MDL=0.020 mg/kg). Toluene was present at estimated levels (below the MDL) in four fish. All five fish contained naphthalene, three at levels above the MDL (0.020 mg/kg).The average concentration of naphthalene in the five fish was 0.031 mg/kg However, acetone, methylene chloride, and naphthalene were also identified in the procedural blanks, an indication, perhaps, of handling or laboratory contamination. When these contaminants were identified in the samples, they were usually equal to, or higher than those of the procedural blank were. It is possible these contaminants could have been byproducts of sample necrosis (data not presented).

Semi-volatile Organic Compounds (SVOCs)

No SVOCs were present in any fish at levels above the laboratory's MDL, although some SVOCs occurred sporadically at levels below the MDLs. All five fish contained one or more phthalate esters: diethylphthalate, di-n-butyl phthalate, and/or di-(2-ethylhexyl) phthalate, albeit at low levels. The procedural blank contained all three phthalates at levels similar to or higher than the samples. Three fish contained traces of dibenz(a,h)anthracene. The procedural blank contained this substance at a level higher than the sample concentrations. One fish also contained a trace of 3-methylcholanthrene, as did the procedural blank. Both compounds are polycyclic aromatic hydrocarbons (PAHs), common sources of which include asphalt sealers, shampoos, medications, roofing materials, and other tar-like materials. Finally, four fish contained marginal levels of phenol (estimated concentrations below the MDL for phenol). The laboratory reported no phenol in the procedural blank. The authors did not present data for these sporadic and low SVOCs.

Polychlorinated Biphenyls (PCBs)

For the DIS, the present study marks the first analysis of PCB congeners instead of analysis of samples for Aroclors®. Thus, the reader should not compare PCB levels among this and previous risk characterizations for the DIS. As described in the methods section, the survey team collected fish for PCBs from five sites within the DIS: Three sites were within the canal system and two were within Donna Reservoirs, one in the West Reservoir and one in the East Reservoir.

Representatives of five fish species were collected from five sites within the DIS. Survey staff did not collect all species from each site. Table 3 presents PCB concentration in each species at each site. Table 3 also gives the average concentration of PCBs at each site. SALG staff noted that the highest PCB concentrations tended to cluster about Canal Site 2. Canal Sites 1 and 3, Reservoir West Site 4, and Reservoir East Site 5 had much lower concentrations of PCBs than did Canal Site 2.

The PCB data from this site could be further partitioned to illustrate species at each site contained the highest PCB concentrations. Risk assessors cannot know a person is fishing sites or how many different species a fisher might collect from each site. However, most species at each site contained some level of PCBs. Therefore, any fisher could choose to eat any number of species from any site recently sampled. Nonetheless, visual inspection of the data suggested that PCBs were at their highest concentrations in fish collected near Canal Site 2, with a gradient in both directions from this site. Canal Site 1, closest to the Rio Grande, has the lowest average concentration of PCBs. The gradient is as follows- from highest PCB concentrations to lowest: Canal Site 2 > Canal Site 3 > Reservoir Site 4 >Reservoir Site 5> Canal Site 1.

Assuming fish containing the highest concentrations of PCB to have accumulated those PCBs from areas having the highest PCB concentrations in dissolved solids, [3] the partitioned data could assist the USGS [3] and other agencies to definitively locate the elusive source of PCBs in the DIS.

DISCUSSION

Risk Characterization

The actual risk of adverse health outcomes from exposure to toxicants based on experimental or epidemiological data is subject to the known variability of individual and population responses. Thus, calculated risks can be orders of magnitude above or below the actual risks of systemic or local effects of toxicants. The variability depends upon many factors: the target organ; the species of animal used in the study; different exposure periods; different doses; or other variations in conditions.[23] Nevertheless, the DSHS calculated a number of risk parameters for potential toxicity to humans who consume contaminated fish from the DIS. Conclusions and recommendations predicated upon the stated goal of the DSHS to protect human health follow this discussion of findings.

Characterization of Possible Systemic (Noncancerous) Health Effects Related to Consumption of Fish from the Donna Irrigation System

The RfD for PCBs – the primary contaminant of concern in the DIS – comes from the findings of ocular exudates, inflamed and prominent Meibomian glands, distorted growth of finger and toenails, decreased antibody (IgG and IgM) response to sheep erythrocytes in clinical and immunologic studies conducted in monkeys.[36] The LOAEL was 0.005 mg/kg-day. Researchers applied several uncertainty factors: a full factor of 10 for intra-human variability (sensitive subgroups), a factor of three to account for extrapolation to humans from monkeys. To account for use of a subchronic study (approximately 25% of the animal's life); an uncertainty factor (UF) of three was used. Risk assessors at the federal level used a minimal LOAEL to determine the RfD, using a partial uncertainty factor of approximately 3.3. The composite uncertainty factor was 300. The modifying factor was 1.0. To calculate the RfD for Aroclor 1254, use the following:

$$RfD = LOAEL \div UFs * MF$$

Therefore, the RfD for Aroclor 1254 is

$$0.005 \div 300 * 1.0 = 0.00002 \text{ mg/kg-day (2E-05 mg/kg-day).}$$

Using the SALG's assumptions, the HAC_{nonca} for systemic effects for Aroclor 1254 is 0.047 mg/kg (mg Aroclor per kg of edible tissue). Risk assessors derive hazard quotients from the toxic substance's RfD or MRL and that substance's measured concentration in tissue, as described earlier. Table 4 contains hazard quotients for each species of fish examined at the DIS. Since PCBs were the only contaminants of concern in fish collected in 2005 from the DIS to exceed a HAC value, the HQs in Table 4 refer only to PCBs. Even though one cannot assume a linear relationship for HQs, one observes from this table that HQs are greater than 1.0 by a large margin for some fish (smallmouth buffalo, channel catfish, and common carp), while for others (largemouth bass, freshwater drum) the margin is not so different from 1.0. Nonetheless, all HQs are greater than 1.0, suggesting that all species from this reservoir have some potential to harm those who regularly consume fish from the DIS. The DSHS interprets this table as evidence of a continuing danger to those who regularly eat fish from the DIS and for continuing the possession ban in force for this water body.

Characterization of Excess Lifetime Cancer Risk from Consumption of Fish from the Donna Irrigation System

Table 5 outlines the probability of cancer from regular, long-term, or, perhaps, repeatedly large meals of one or more fish species collected from the DIS, containing the calculated probability of one excess cancer in X number of people exposed to PCBs in different species of fish from the DIS. The probability that DSHS utilizes to make risk management decisions about fish or shellfish contaminated with chemicals that have carcinogenic potential is 1 excess cancer in 10,000 equally exposed people. Only largemouth bass and freshwater drum do not exceed a 1 in 10,000 calculated theoretical lifetime risk of cancer (Table 5). This finding indicates that three fish species from the DIS contain PCBs at concentrations that may be capable of causing or contributing to cancer in people who regularly consume these fish. Although two species that do not exceed the cancer risk level used by the DSHS to ensure protection of public health (largemouth bass and freshwater drum), these species may already pose a hazard to health from the noncarcinogenic or systemic effects of long-term, low-level consumption of PCBs present in these fish.

Characterization of Cumulative Systemic Health Effects and Cumulative Excess Lifetime Cancer Risk from Consumption of Fish from the Donna Irrigation System

Because only one contaminant (PCBs) occurred in fish from the DIS at concentrations approaching or exceeding DSHS' health-based guidelines for protection of human health, the SALG determined it neither necessary nor possible to accurately predict or determine cumulative effects from consuming multiple chemicals in one or more species of fish from the DIS. If more than one contaminant of concern acting on the same target organ, by the same mode or mechanism of action, or that caused cancer had reached biological or toxicological significance, SALG risk assessors would have discussed those cumulative effects in this document.

CONCLUSIONS

SALG risk assessors prepare risk characterizations to determine public health hazards from consumption of fish and shellfish harvested from Texas water bodies by recreational or subsistence fishers, and – if indicated – may suggest strategies for reducing risk to the health of those who eat contaminated fish or seafood to risk managers at DSHS, including the Texas Commissioner of Health.

The primary reason for conducting this study was to re-assess the potential risks to public health from consuming fish from the DIS, a body of water that has a long history of PCB contamination, only one example of which is PCB-contaminated fish. Risk assessors from the SALG and the Environmental and Injury Epidemiology and Toxicology Branch (EIETB) confirmed that PCBs in several species from the DIS exceed the HAC_{nonca} or the HAC_{ca} for PCBs. All samples contained some PCBs. Fish from the DIS contained no other contaminants at concentrations that would be expected to be of importance to human health if consumed over the long term or in large quantities. Thus, risk assessors from the SALG and the EIETB conclude from this characterization of risks possibly associated with consuming fish from the DIS

1. That all fish sampled species from the DIS contain PCBs at levels exceeding those concentrations used by the DSHS to ensure protection of public health from adverse systemic health effects of these contaminants. Although some species from some sites appear not to contain high concentrations of PCBs, this finding is not consistent, meaning the fish could previously been in waters the sediment of which were heavily contaminated with PCBs, having lately traveled to the collection site. Therefore, consumption of any of the sampled fish species and, presumably all fish species from the DIS continues to **pose an apparent hazard to human health**, systemic adverse health effects being the more sensitive endpoint in the SALG calculations of the likelihood of adverse health outcomes from consuming contaminated fish or shellfish. Additionally, consumption of channel catfish, common carp, and smallmouth buffalo from the DIS, heavily contaminated with PCBs, markedly increases the calculated lifetime excess risk of cancer in people eating these fish.

2. That cumulative adverse health effects from consuming fish from the DIS are not likely. Fish from the DIS do not contain concentrations of metal-like contaminants, VOCs, or SVOCs at concentrations in excess of DSHS guidelines for protection of human health. In fact, with the exception of metallic contaminants – which frequently were present in low, presumably nontoxic concentrations – contaminants of other chemical classes were present only sporadically and in low concentrations. Therefore, consumption of fish containing these compounds in addition to PCBs should not increase the risk to human health already posed by the PCBs. To reiterate: metalloid contaminants, VOCs and SVOCs observed in fish from the DIS are not likely to **pose no apparent human health hazard**, even when consumed along with PCBs in fish from the DIS.

3. That fish from the DIS do not appear to contain organochlorine pesticides at concentrations of significance to human health. Therefore, consumption of fish

containing only these pesticides at levels observed in sample tissues – were that possible – would **pose no apparent human health hazard.**

RECOMMENDATIONS

Risk managers at the DSHS have established criteria for issuing fish consumption advisories based on approaches suggested by the USEPA.[10,16] If a risk characterization confirms that people can eat four, or fewer than four, meals per month (adults: eight ounces per meal; children: four ounces per meal) of fish or shellfish from the water body under investigation could lead risk managers at DSHS to recommend consumption advice for fish or shellfish from that water body. Alternatively, the department may ban possession of fish from the affected water body. Fish or shellfish possession bans are enforceable under subchapter D of the Texas Health and Safety Code, part 436.061(a).[37]. Declarations of prohibited harvesting areas are enforceable under the Texas Health and Safety Code, Subchapter D, parts 436.091 and 436.101.[37] DSHS consumption advice carries no penalty for noncompliance. Consumption advisories, instead, inform the public of potential health hazards from consuming contaminated fish or shellfish from Texas waters. With this information, members of the public can make informed decisions about whether – and how much – contaminated fish or shellfish they wish to consume. Risk assessors from the SALG and the EIETB conclude from this risk characterization that consuming fish from the DIS apparently **poses a continuing public health hazard**. Based on these observations, the SALG and the EIETB recommend

1. That the DSHS continues to enforce AL-9 – which bans possession of fish from the DIS and that is currently in force for this water body because every sampled fish species contained PCBs in concentrations that could increase the likelihood of experiencing adverse systemic health outcomes. Additionally, several sampled species contained PCBs at concentrations high enough to increase the theoretical lifetime excess risk of cancer if eaten regularly or in bulk.

2. That the DSHS continues to monitor fish from the DIS for PCBs until these contaminants decrease to a level, consumption of which would likely not interfere with the health of those consuming such fish.

3. That the DSHS analyze fish from the DIS for dioxins and furans.

PUBLIC HEALTH ACTION PLAN

Communication to the public of new and continuing possession bans or consumption advisories – or the removal of either – are essential to effective management of risk from consuming contaminated fish. In fulfillment of the responsibility for communication, the Texas Department of State Health Services (DSHS) takes several steps. The agency irregularly publishes fish consumption advisories and bans in a booklet available to the public through the Seafood and Aquatic Life Group (SALG). To receive the booklet and/or the data, please contact the SALG at 1-512-834-6757.[38] The SALG also posts the most current information about advisories, bans, and the repeal of such on the Internet at http://www.dshs.state.tx.us/seafood. The SALG regularly

updates this web site. The Texas Department of State Health Services also provides the U.S. Environmental Protection Agency (http://epa.gov/waterscience/fish/advisories/), the Texas Commission on Environmental Quality (TCEQ; http://www.tceq.state.tx.us), and the Texas Parks and Wildlife Department (TPWD; http://www.tpwd.state.tx.us) with information on all consumption advisories and possession bans. Each year, the TPWD informs the fishing and hunting public of consumption advisories and fishing bans on it's Web site and in an official hunting and fishing regulations booklet available at many state parks and at all establishments selling Texas fishing licenses.[39] Readers may direct questions about the scientific information or recommendations in this risk characterization to risk managers at the (SALG) at 512-834-6757 or may find the information at the SALG's website (http://www.dshs.state.tx.us/). Secondarily, one may address inquiries to the Environmental and Injury Epidemiology and Toxicology Branch of the Department of State Health Services (512-458-7269). The EPA's IRIS Web site (http://www.epa.gov/iris/) contains much information on environmental contaminants found in food and environmental media. The Agency for Toxic Substances and Disease Registry (ATSDR), Division of Toxicology (888-42-ATSDR or 888-422-8737 or the ATSDR's Web site (http://www.atsdr.cdc.gov) supplies brief information via ToxFAQs.® ToxFAQs are available on the ATSDR website in either English http://www.atsdr.cdc.gov/toxfaq.html) or Spanish (http://www.atsdr.cdc.gov/es/toxfaqs/es_toxfaqs.html). The ATSDR also publishes more in-depth reviews of many toxic substances in its *Toxicological Profiles.* To request a copy of available *Toxicological Profiles*, readers may telephone the ATSDR at 1-404-498-0261 or email requests to atsdric@cdc.gov. Many *Toxicological Profiles* are also available for downloading at ATSDR's website.

TABLES

Table 1. Fish samples collected from five sites within the Donna Irrigation System in December 2005 and January 2006.

Sample Number	Species	Length (mm)	Weight (g)
Site 1 Donna Irrigation Canal			
DIC40	Common Carp	647	3501
DIC41	Common Carp	520	2283
DIC42	Largemouth Bass	358	737
DIC43	Largemouth Bass	362	723
DIC44	Smallmouth Buffalo	673	5244
Site 2 Donna Irrigation Canal			
DIC24	Largemouth Bass	406	1163
DIC25	Common Carp	553	2294
DIC26	Largemouth Bass	382	858
DIC27	Largemouth Bass	364	717
DIC12	Largemouth Bass	445	1127
DIC15	Common Carp	535	1919
DIC28	Channel Catfish	399	684
DIC29	Smallmouth Buffalo	735	6612
DIC30	Common Carp	647	3640
DIC31	Smallmouth Buffalo	655	4902
Site 3 Donna Irrigation Canal			
DIC18	Freshwater Drum	450	1133
DIC20	Largemouth Bass	371	698
DIC21	Common Carp	582	2905
DIC22	Common Carp	550	2237
DIC23	Largemouth Bass	368	882
Site 4 Donna Irrigation Canal			
DIC1	Channel Catfish	357	405
DIC2	Largemouth Bass	434	1479
DIC3	Largemouth Bass	415	1498
DIC4	Largemouth Bass	397	1278
DIC5	Common Carp	660	4082
Site 5 Donna Irrigation Canal			
DIC6	Largemouth Bass	438	1445
DIC7	Freshwater Drum	487	1783
DIC8	Freshwater Drum	455	1268
DIC9	Common Carp	595	2179
DIC10	Common Carp	622	3410

Table 2. Inorganic Contaminants (mg/kg) in Fish Collected in December 2005 and January 2006 from the Donna Irrigation System

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
Copper				
Channel catfish	2/2	0.202±0.073 (0.150, 0.253)	333	National Academy of Science Upper Limit: 0.143 mg/kg–day
Common carp	10/10	0.479±0.232 (0.157-0.811)		
Freshwater drum	3/3	0.061±0.026 (BDL[c]-0.091)		
Largemouth bass	12/12	0.149±0.246 (BDL-0.916)		
Smallmouth buffalo	3/3	0.317±0.091 (0.231-0.413)		
All Fish Combined	30/30	0.271±0.258 (BDL-0.916)		
Lead				
Channel catfish	1/2	0.076±0.047 (ND[d]-0.109)	0.6	USEPA IEUBKwin
Common carp	2/10	0.070±0.076 (ND-0.285)		
Freshwater Drum	0/3	ND		
Largemouth bass	1/12	0.045±0.003 (ND-BDL)		
Smallmouth buffalo	2/3	0.324±0.327 (ND-0.692)		
All fish combined	6/30	0.083±0.127 (ND-0.692)		
Mercury				
Channel catfish	2/2	0.126±0.126 (0.108,0.143)	0.7	ATSDR chronic oral MRL: 0.0003 mg/kg- day
Common carp	10/10	0.212±0.137 (BDL-0.467)		
Freshwater drum	3/3	0.158±0.053 (0.098-0.194		
Largemouth bass	12/12	0.246±0.084 (0.165-0.453)		
Smallmouth buffalo	3/3	0.358±0.093 (0.252-0.427)		
All Fish Combined	30/30	0.229±0.112 (BDL-0.467)		
Selenium				
Channel catfish	2/2	0.315±0.066 (0.268,0.361)	6	EPA chronic oral RfD: 0.005 mg/kg-day
Common carp	10/10	0.666±0.113 (0.496-0.931)		

[b] *Derived from the MRL or RfD for noncarcinogens or the USEPA slope factor for carcinogens; assumes a body weight of 70 kg, and a consumption rate of 30 grams per day, and assumes a 30-year exposure period for carcinogens and an excess lifetime cancer risk of $1x10^{-4}$.*
[c] *BDL: Below Detection Limit — Estimated concentrations reported were less than the laboratory's method detection limit (J-values).*
[d] *ND: Not Detected above the method detection limit or reporting limit (method specific).*

Table 2. Inorganic Contaminants (mg/kg) in Fish Collected in December 2005 and January 2006 from the Donna Irrigation System

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
Selenium, continued				
Freshwater drum	3/3	0.504±0.042 (0.457-0.538)		ATSDR chronic oral MRL: 0.005 mg/kg-day NAS UL: 0.400 mg/day (0.005 mg/kg-day) RfD or MRL/2: (0.005 mg/kg-day/2= 0.0025 mg/kg-day) to account for other sources of selenium in the diet
Largemouth bass	12/12	0.476±0.074 (0.379-0.640)		
Smallmouth buffalo	3/3	0.632±0.064 (0.573-0.700)		
All Fish Combined	30/30	0.547±0.135 (0.268-0.931)		
Zinc				
Channel catfish	2/2	5.312±0.599 (4.888,5.735)	700	EPA chronic oral RfD: 0.3 mg/kg-day
Common carp	10/10	8.391±2.845 (5.140-13.261)		
Freshwater drum	3/3	3.193±0.742 (2.364-3.797)		
Largemouth bass	12/12	4.516±0.9269 (3.220-6.138)		
Smallmouth buffalo	3/3	4.894±1.053 (3.838-5.943)		
All Fish Combined	30/30	5.766±2.601 (2.364-13.261)		

Table 3. Polychlorinated Biphenyls (PCBs) (mg/kg) in Fish by Species and Site from Donna Irrigation System, 2005-2006.

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
Site 1 (Donna Canal SH 281)				
Common carp	2/2	0.012 ± 0.003 (0.010-0.014)	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg-day EPA slope factor: 2.0 per mg/kg-day
Largemouth bass	2/2	BDL[c]		
Smallmouth buffalo	1/1	**0.049**		
All Sampled Fish, Site 1	5/5	0.018 ± 0.018 (BDL-0.049)		
Site 2 (Donna Canal Siphon Outlet)				
Channel catfish	1/1	**2.509**	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg-day EPA slope factor: 2.0 per mg/kg-day
Common carp	3/3	3.777 ± 5.202 (0.129-9.733)		
Largemouth bass	4/4	0.195 ± 0.159 (BDL-0.401)		
Smallmouth buffalo	2/2	13.782 ± 9.002 (7.417-20.148)		
All Sampled Fish, Site 2	10/10	4.219± 6.553 (BDL-20.148)		
Site 3 (Donna Canal FM 1423)				
Common carp	2/2	1.276 ± 1.063 (0.524-2.027)	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg-day EPA slope factor: 2.0 per mg/kg-day
Freshwater drum	1/1	**0.175**		
Largemouth bass	2/2	**0.056** ± 0.035 (0.032-0.081)		
All Sampled Fish, Site 3	5/5	**0.568** ±0.838 (0.032-2.027)		
Site 4 (Donna Reservoir West)				
Channel catfish	1/1	**0.057**	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg-day EPA slope factor: 2.0 per mg/kg-day
Common carp	1/1	0.043		
Largemouth bass	3/3	**0.052** ± 0.012 (0.039-0.063)		
All Sampled Fish, Site 4	5/5	**0.051** ± 0.010 (0.039-0.063)		
Site 5 (Donna Reservoir East)				
Common carp	2/2	0.031 ± 0.010 (0.024-0.038)	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg-day EPA slope factor: 2.0 per mg/kg-day
Freshwater drum	2/2	BDL		
Largemouth bass	1/1	0.023		
All Sampled Fish, Site 5	5/5	0.025 ± 0.007 (BDL-0.038)		

Table 3 continued. Polychlorinated Biphenyls (PCBs) (mg/kg) in Fish by Species from Donna Irrigation System, 2005-2006.

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
All Sites (Sample Sites Combined)				
Channel catfish	2/2	1.283 ± 1.734 (0.057-2.509)		
Common carp	10/10	1.401 ± 3.012 (0.010-9.733)		
Freshwater drum	3/3	0.072 ± 0.089 (BDL– 0.175)	0.047	EPA chronic oral RfD: 0.00002 mg/kg-day
Largemouth bass	12/12	0.090 ± 0.115 (BDL-0.401)	0.272	EPA slope factor: 2.0 per mg/kg–day
Smallmouth buffalo	3/3	9.205 ± 10.168 (0.049-20.148)		
All Sampled Fish, All Sites	30/30	1.516 ± 4.152 (BDL-20.148)		

Table 4. Hazard quotients (HQ) for PCBs in fish Collected from Lake The Donna Irrigation System in 2005-2006 along with suggested consumption rates for adults eating fish (8-oz per meal) containing PCBs at concentrations near those found in these samples.[c]

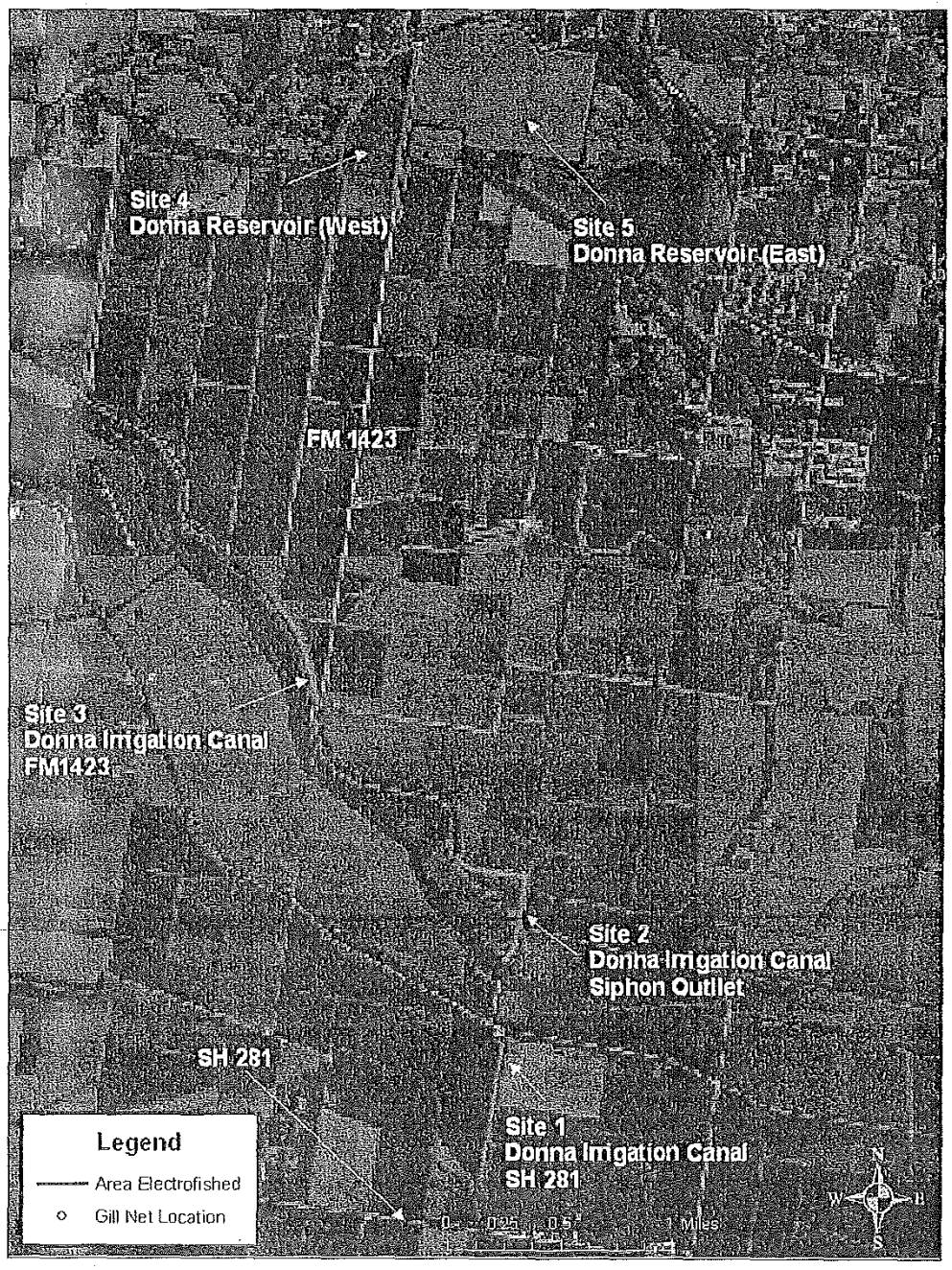
Species	Hazard Quotient	Meals per Week
Channel catfish	27.5	0.0
Common carp	30.0	0.0
Freshwater drum	1.5	0.6
Largemouth bass	1.9	0.5
Smallmouth buffalo	197.2	0.0
All Fish Combined	32.5	0.0

[c] *DSHS assumes that children under the age of 12 years and/or those who weigh less than 35 kg eat 4-ounce meals.*

Table 5. Theoretical lifetime excess cancer risk for each PCB-contaminated species collected in 2005 from the Donna Irrigation System along with suggested weekly (8 oz per meal) consumption rates for 70-kg adults who eat each species of fish.[e]

Species/Contaminant	Theoretical Lifetime Excess Cancer Risk		Meals per Week
	Risk	1 excess cancer per number of people exposed	
Channel catfish	**4.7E-04**	**2122**	**0.2**
Common carp	**5.1E-04**	**1943**	**0.2**
Freshwater drum	2.6E-05	37809	3.5
Largemouth bass	3.3E-05	30047	2.8
Smallmouth buffalo	**3.4E-03**	**296**	**0.0**
All Fish Combined	**4.4E-03**	**226**	**0.2**

Figure 1. Donna Irrigation System Sample Site Map



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ATTACHMENT 5

USGS Fact Sheet 016-02
(April 2002)

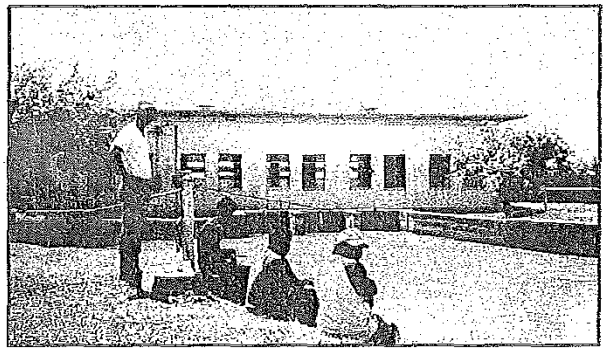
USGS
science for a changing world

In cooperation with the Texas Natural Resource Conservation Commission

Occurrence of Polychlorinated Biphenyls (PCBs) on Suspended Sediment in the Donna Canal, Hidalgo County, Texas, 1999–2001

Some fish in the Donna Canal contain PCBs at levels that might pose a risk to human health if the fish are eaten. Early attempts to locate the source of PCBs in the canal were unsuccessful. An innovative method of sampling and analyzing suspended sediment helped scientists detect PCBs in suspended sediment and narrowed the probable PCB source area(s) from the entire 11-kilometer canal to a 600-meter reach.

The Donna Canal is a popular fishing spot for residents of Hidalgo County. The 11.3-kilometer-long irrigation canal and water-supply system is home to some of the best bass and catfish angling in the Rio Grande Valley of South Texas, and fish from the Donna Canal often end up on dinner tables. The fish, however, might be contaminated with PCBs, a group of toxic and carcinogenic (cancer-causing) compounds. PCBs are hydrophobic (meaning "water fearing"). These kinds of chemicals do not dissolve in water but instead adsorb to sediment and become incorporated into animal tissue. Small animals living in or around sediment contaminated with PCBs accumulate these toxic chemicals in their bodies. These creatures are eaten by other animals, which concentrate the PCBs in their tissue, and in this way, PCBs work their way up the food chain. Often the final consumers and concentrators of PCBs are humans.



Local fishermen at the Donna Canal pumphouse.

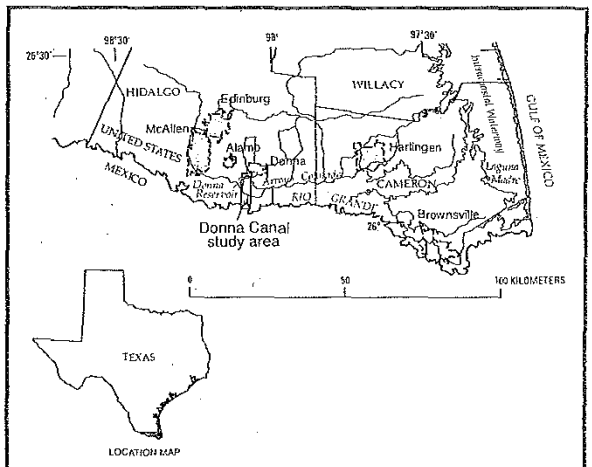


Figure 1. Location of the Donna Canal study area.

Water is pumped from the Rio Grande into the Donna Canal at an average rate of about 3.4 cubic meters per second. The Donna Canal carries the water north by simple gravity flow. The water from the canal is used for irrigation of nearby farmland. On its way north, the canal carries the water underneath a perennial stream, the Arroyo Colorado, by way of an underground siphon. The Donna Canal ultimately flows into Donna Reservoir, which supplies drinking water to the nearby municipalities of Donna and Alamo.

PCBs in the Donna Canal were first detected in 1993 by the U.S. Environmental Protection Agency (USEPA) during an environmental study of the Lower Rio Grande Valley. As part of the study, the USEPA tested samples of cooked fish from nine representative households, as well as samples of blood and urine from the individuals who consumed the fish. One carp fillet from a fish reportedly caught in the Donna Canal had a PCB concentration of 399 milligrams per kilogram, more than 1,500 times higher than the concentration thought to pose a health risk to an adult (U.S. Environmental Protection Agency, 1994). The individuals who consumed the fish had elevated levels of PCBs in their blood.

During 1994–2000, the Texas Department of Health (TDH) and the Texas Natural Resource Conservation Commission (TNRCC) sampled more fish and found many with elevated concentrations of PCBs, although none were as high as those in

the first fish analyzed in 1993 by the USEPA. The risk of cancer was calculated to be 1 in 174 for adults consuming two 8-ounce meals per week of fish caught from the Donna Canal (Buchanan, 1997). Possession of fish from the Donna Canal was banned while the TDH and the TNRCC tried to find the source of the PCBs.

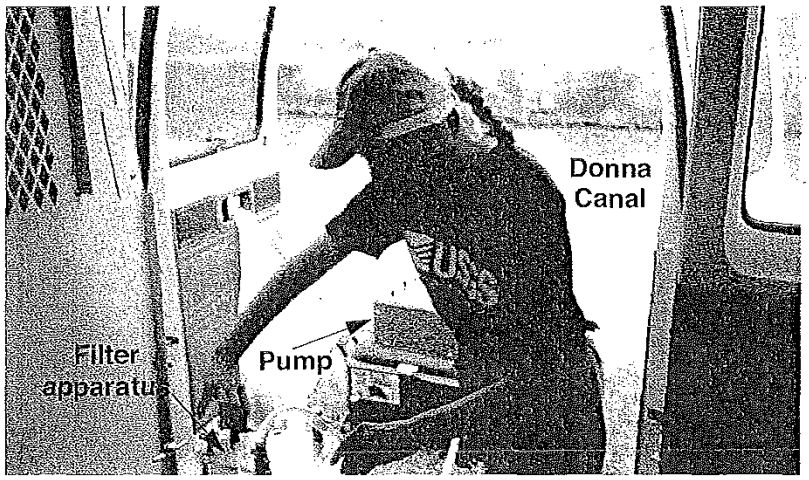
During 1994–97, more than 75 samples of water and bed sediment from the canal, the reservoir, surrounding reservoirs, the Rio Grande, public water supplies, and a ground-water monitoring well were analyzed. The only PCB detection was in a sample from a drainage ditch 0.3 kilometer from the canal (Webster and others, 1998).

In 1997, the TNRCC asked the U.S. Geological Survey (USGS) for assistance in detecting the source of the PCBs. This report summarizes the results of the USGS investigation.

Sampling of Suspended Sediment

Water in the Donna Canal is pumped directly from the Rio Grande and flows north about 11 kilometers to Donna Reservoir. The pumping rate is set at the beginning of each day. On the days samples were collected, the pumping rate ranged from 1,420 to 4,530 liters per second, and the flow rate ranged from about 0.07 to 0.14 meter per second. The water in the canal looks cloudy or murky because the constant flow of water keeps sediment in suspension in the water. Some of the suspended sediment is pumped into the canal from the Rio Grande, and some of the sediment comes from erosion of the sides of the canal.

To try to find the source of the PCBs, the USGS used a different type of sampling approach—collection and analysis of the suspended sediment. Because PCBs do not dissolve readily in water but instead stick to sediment, they usually are not detected in water samples, even in contaminated environments. By removing the suspended sediment from the water and analyzing it directly, the PCBs are more likely to be detected. In other words, the USGS approach was to look for the PCBs where they were expected to be.



Collecting a suspended sediment sample from the Donna Canal.

Suspended sediment was collected for analysis by filtering. At each sampling site, tubing was suspended in the canal about 2.5 meters from the bank at a depth of about 1 meter, and water was pumped from the canal with a peristaltic pump; at bridges and at the mouth of a siphon in the canal, the tubing was suspended in the center of the canal. For all but the final round


Suspended sediment from Donna Canal collected on a filter.

• What are PCBs?

PCBs are synthetic compounds that were used in the United States in the 1950s to 1970s for many industrial purposes. They were used mostly as coolants and lubricants in transformers, capacitors, and other electrical equipment. PCBs also were used as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and in many other products (U.S. Environmental Protection Agency, 2001). Because of the threat they pose to human health, the U.S. Government banned PCB production and use in 1976. PCBs break down to other, less-harmful compounds extremely slowly, and PCBs that were released to the environment decades ago are still a threat to human health today. The fate of many PCBs used before the ban is largely unknown. PCBs have been found in a variety of residential and industrial locations and dumpsites throughout the United States and Canada. Some PCBs were illegally dumped or buried after their use was banned. The exact location of the PCB source contaminating the Donna Canal is unknown, but the effect of these chemicals on the local environment is seen in contaminated fish in the Donna Canal.

• How does eating PCB-contaminated fish affect humans?

PCBs concentrate in the skin and fatty tissue of human consumers and most animals and can affect the skin, liver, stomach, and thyroid gland. It also can affect the nervous system causing severe degenerative conditions. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects. Rats that ate food containing high levels of PCBs for 2 years developed liver cancer. The EPA and the International Agency for Research on Cancer have determined that PCBs are probably carcinogenic to humans. Studies have shown that babies born to women who ate PCB-contaminated fish have shown abnormal responses in tests of infant behavior (Agency for Toxic Substances and Disease Registry, 2001).

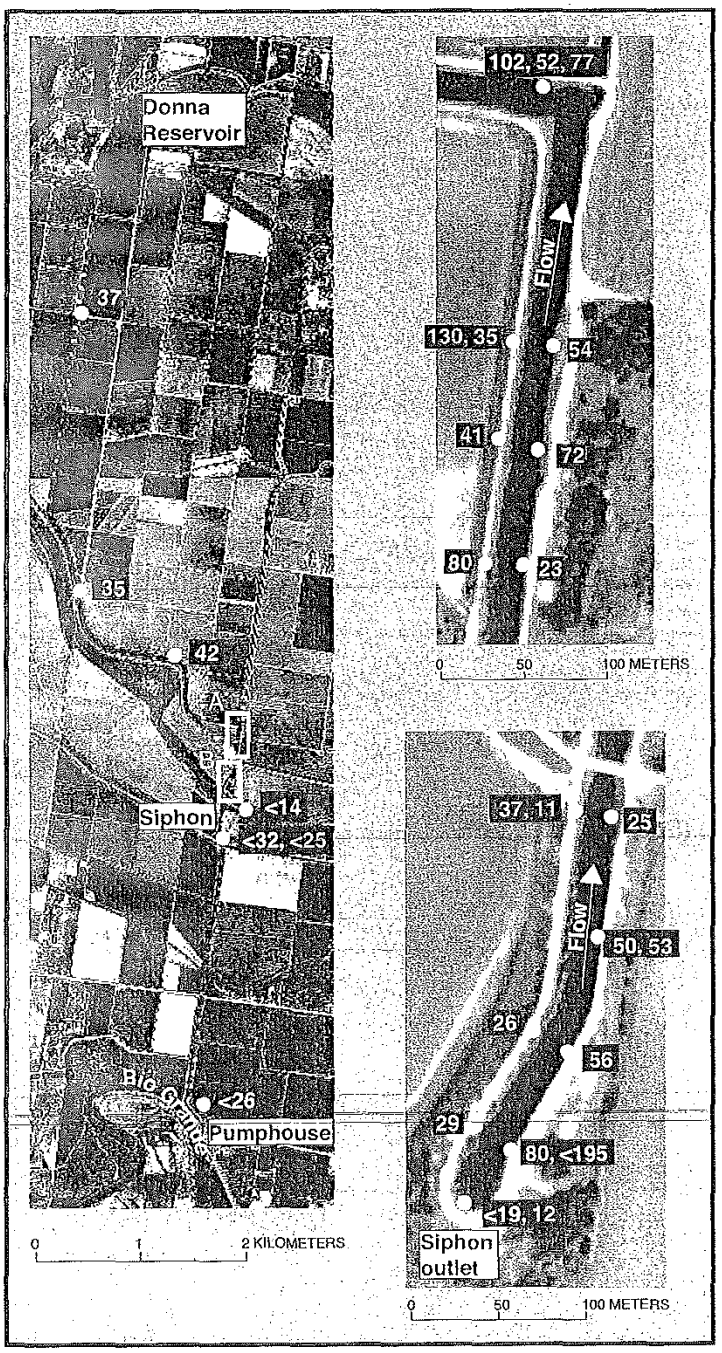


Figure 2. Aerial photographs of the Donna Canal (indicated by the dashed blue line), sampling sites, and concentrations detected. Flow is to the north from the pumphouse toward the reservoir. To the right are enlarged images of two areas of the canal chosen for more closely spaced sampling. Sampling sites are indicated with yellow dots, and results of samples collected during the same sampling trip are shown in the same color: white (February 1999), yellow (July 1999), pink (January 2000), blue (July 2000), and green (April 2001). All concentrations are in micrograms per kilogram of sediment collected.

of sampling, water was pumped through a 298-millimeter-diameter glass fiber filter with a nominal pore size of 0.5 micrometer. For the final round of sampling, water was pumped through similarly sized PTFE (Teflon) filters. Water was pumped through the filter until the filter clogged; three filters were used at each site, and a total of 25 to 140 liters of water was filtered. The filters were put inside a baked glass jar and chilled until sent to the laboratory for analysis. Unfiltered water samples also were submitted for analysis of total suspended sediment concentration. PCBs were analyzed by gas chromatography/mass spectrometry (GC/MS) following the method of Foreman and others (1995).

Sampling Results and Conclusion

Five separate sampling trips to the Donna Canal were made to collect suspended sediment. The overall strategy was to narrow the search for the PCB source area(s) from the entire 11-kilometer length to a much shorter distance by collecting samples at more closely spaced intervals. The sampling sites and spacing were chosen on the basis of the results from the previous event (fig. 2).

Round 1: February 1999

No PCBs were detected during the first round of sampling when samples were collected from sites near the pumphouse, at the siphon inlet, at the siphon outlet, and in the Arroyo Colorado (results shown in white, fig. 2). These results suggested that the source of the PCBs must be downstream (north) of the siphon outlet.

Round 2: July 1999

The results of the second sampling round (shown in yellow, fig. 2) confirmed that the source was in or downstream of the siphon outlet, and that it was probably upstream (south) of the 90-degree bend. On the basis of these detections, samples were collected at more closely spaced intervals in the reach downstream of the siphon to try to pinpoint the PCB source.

Round 3: January 2000

The results of the third sampling round (shown in pink, fig. 2) indicated a possible PCB source in the 200-meter reach downstream of the siphon outlet and a possible second source at least 150 meters upstream of the 90-degree bend.

Round 4: July 2000

On the basis of previous results, the fourth sampling round samples were collected at about 50-meter intervals on both banks of the canal downstream of the siphon outlet. The results (shown in blue, fig. 2) indicated a potential PCB source on the right bank of the canal, just downstream of the siphon outlet.

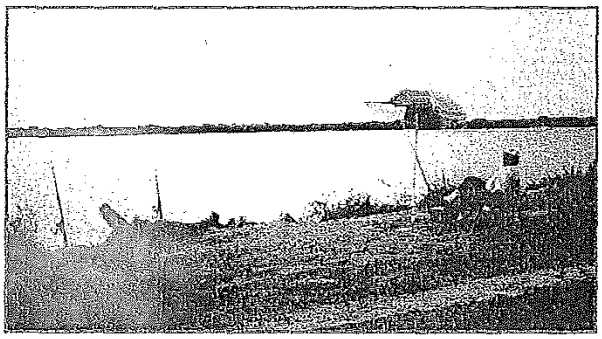
Round 5: April 2001

In an attempt to pinpoint the location of an additional source or sources upstream of the 90-degree bend, the fifth sampling-round samples were collected

at about 50-meter intervals in the reach upstream of the 90-degree bend. The results (shown in green, fig. 2) confirmed the presence of PCBs in suspended sediment along this section of the canal but do not identify any one location as a probable PCB source. One or several sources of PCBs might be present along this stretch of the canal.

The TNRCC also participated in the fifth and final sampling round, collecting whole water and bed sediment at selected locations in the canal and extracting two soil borings from the area of the canal just downstream of the siphon outlet. However, no PCBs were detected in the TNRCC water or sediment samples, and this additional sampling was unsuccessful in further pinpointing the location of the PCB source(s).

In conclusion, the source or sources of the PCBs must be located between the siphon outlet and the 90-degree bend in the Donna Canal.



Fisherman at Donna Reservoir, Hidalgo County.

What is the future of the Donna Canal?

Using the information gathered from the suspended sediment sampling during 1999–2001, the TNRCC has begun a multiphase project to investigate and remediate all sources of PCBs in the Donna Canal. Efforts will be concentrated in the 600-meter reach identified by the USGS as the most likely reach of the canal to contain the source(s) of the PCB contamination. The first phase of the TNRCC project began in August 2001 and involves additional assessment and delineation of the PCB source. Subsequent phases of the project will involve the development of a remediation plan and implementation of remedial actions in the canal.

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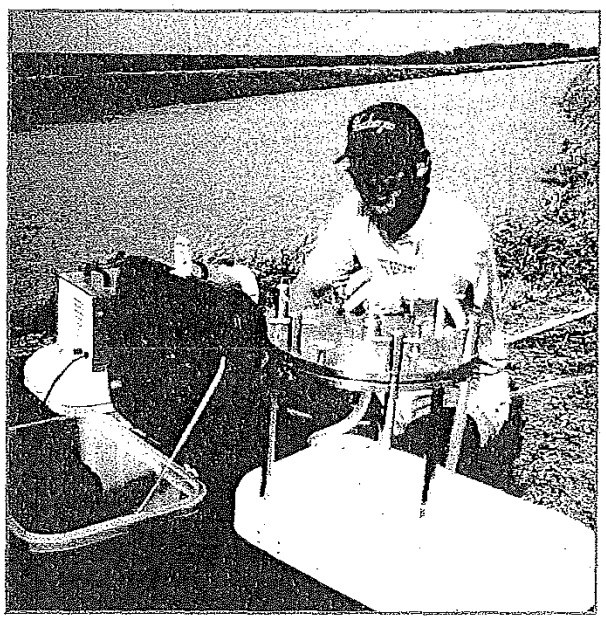


Sampling suspended sediment at Donna Canal.

— B.J. Mahler, P.C. Van Metre, and R.M. Miranda

Photographs by B.J. Mahler and M.P. Cordell

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Information on technical reports and hydrologic data related to this study can be obtained from:

District Chief
U.S. Geological Survey
8027 Exchange Dr.
Austin, TX 78754–4733
E-mail: dc_tx@usgs.gov

Phone: (512) 927–3500
FAX: (512) 927–3590
World Wide Web:
http://tx.usgs.gov/

ATTACHMENT 6

ATSDR Public Health Statement For PCBs

PUBLIC HEALTH STATEMENT
POLYCHLORINATED BIPHENYLS (PCBS)

Division of Toxicology **November 2000**

This Public Health Statement is the summary chapter from the Toxicological Profile for Polychlorinated Biphenyls (PCBs). It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about polychlorinated biphenyls (PCBs) and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. PCBs have been found in at least 500 of the 1,598 current or former NPL sites. However, the total number of NPL sites evaluated for PCBs is not known. As more sites are evaluated, the sites at which PCBs are found may increase. This information is important because exposure to PCBs may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact. If you are exposed to PCBs, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with them. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT ARE POLYCHLORINATED BIPHENYLS (PCBs)?

PCBs are a group of synthetic organic chemicals that can cause a number of different harmful effects. There are no known natural sources of PCBs in the environment. PCBs are either oily liquids or solids and are colorless to light yellow. Some PCBs are volatile and may exist as a vapor in air. They have no known smell or taste. PCBs enter the environment as mixtures containing a variety of individual chlorinated biphenyl components, known as congeners, as well as impurities. Because the health effects of environmental mixtures of PCBs are difficult to evaluate, most of the information in this toxicological profile is about seven types of PCB mixtures that were commercially produced. These seven kinds of PCB mixtures include 35% of all the PCBs commercially produced and 98% of PCBs sold in the United States since 1970. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor. For example, the name Aroclor 1254 means that the mixture contains approximately 54% chlorine by weight, as indicated by the second two digits in the name. Because they don't burn easily and are good insulating materials, PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of

PCBs stopped in the United States in August 1977 because there was evidence that PCBs build up in the environment and may cause harmful effects. Consumer products that may contain PCBs include old fluorescent lighting fixtures, electrical devices or appliances containing PCB capacitors made before PCB use was stopped, old microscope oil, and old hydraulic oil.

1.2 WHAT HAPPENS TO POLYCHLORINATED BIPHENYLS (PCBs) WHEN THEY ENTER THE ENVIRONMENT?

Before 1977, PCBs entered the air, water, and soil during their manufacture and use in the United States. Wastes that contained PCBs were generated at that time, and these wastes were often placed in landfills. PCBs also entered the environment from accidental spills and leaks during the transport of the chemicals, or from leaks or fires in transformers, capacitors, or other products containing PCBs. Today, PCBs can still be released into the environment from poorly maintained hazardous waste sites that contain PCBs; illegal or improper dumping of PCB wastes, such as old transformer fluids; leaks or releases from electrical transformers containing PCBs; and disposal of PCB-containing consumer products into municipal or other landfills not designed to handle hazardous waste. PCBs may be released into the environment by the burning of some wastes in municipal and industrial incinerators.

Once in the environment, PCBs do not readily break down and therefore may remain for very long periods of time. They can easily cycle between air, water, and soil. For example, PCBs can enter the air by evaporation from both soil and water. In air, PCBs can be carried long distances and have been found in snow and sea water in areas far away from where they were released into the environment, such as in the arctic. As a consequence, PCBs are found all over the world. In general, the lighter the type of PCBs, the further they may be transported from the source of contamination. PCBs are present as solid particles or as a vapor in the atmosphere. They will eventually return to land and water by settling as dust or in rain and snow. In water, PCBs may be transported by currents, attach to bottom sediment or particles in the water, and evaporate into air. Heavy kinds of PCBs are more likely to settle into sediments while lighter PCBs are more likely to evaporate to air. Sediments that contain PCBs can also release the PCBs into the surrounding water. PCBs stick strongly to soil and will not usually be carried deep into the soil with rainwater. They do not readily break down in soil and may stay in the soil for months or years; generally, the more chlorine atoms that the PCBs contain, the more slowly they break down. Evaporation appears to be an important way by which the lighter PCBs leave soil. As a gas, PCBs can accumulate in the leaves and above-ground parts of plants and food crops.

PCBs are taken up into the bodies of small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs especially accumulate in fish and marine mammals (such as seals and whales) reaching levels that may be many thousands of times higher than in water. PCB levels are highest in animals high up in the food chain.

1.3 HOW MIGHT I BE EXPOSED TO POLYCHLORINATED BIPHENYLS (PCBs)?

Although PCBs are no longer made in the United States, people can still be exposed to them. Many older transformers and capacitors may still contain PCBs, and this equipment can be used for 30 years or more. Old fluorescent lighting fixtures and old electrical devices and appliances, such as television sets and refrigerators, therefore may contain PCBs if they were made before PCB use was stopped. When these electric devices get hot during operation, small amounts of PCBs may get into the air and raise the level of PCBs in indoor air. Because devices that contain PCBs can leak with age, they could also be a source of skin exposure to PCBs.

Small amounts of PCBs can be found in almost all outdoor and indoor air, soil, sediments, surface water, and animals. However, PCB levels have generally decreased since PCB production stopped in 1977. People are exposed to PCBs primarily from contaminated food and breathing contaminated air. The major dietary sources of PCBs are fish (especially sportfish that were caught in contaminated lakes or rivers), meat, and dairy products. Between 1978 and 1991, the estimated daily intake of PCBs in adults from dietary sources declined from about 1.9 nanograms (a nanogram is a billionth part of a gram) to less than 0.7 nanograms. PCB levels in sportfish are still high enough so that eating PCB-contaminated fish may be an important source of exposure for some people. Recent studies on fish indicate maximum concentrations of PCBs are a few parts of PCBs in a million parts (ppm) of fish, with higher levels found in bottom-feeders such as carp. Meat and dairy products are other important sources of PCBs in food, with PCB levels in meat and dairy products usually ranging from less than 1 part in a billion parts (ppb) of food to a few ppb. Concentrations of PCBs in subsurface soil at a Superfund site have been as high as 750 ppm. People who live near hazardous waste sites may be exposed to PCBs by consuming PCB-contaminated sportfish and game animals, by breathing PCBs in air, or by drinking PCB-contaminated well water. Adults and children may come into contact with PCBs when swimming in contaminated water and by accidentally swallowing water during swimming. However, both of these exposures are far less serious than exposures from ingesting PCB-contaminated food (particularly sportfish and wildlife) or from breathing PCB-contaminated air.

Workplace exposure to PCBs can occur during repair and maintenance of PCB transformers; accidents, fires, or spills involving PCB transformers and older computers and instruments; and disposal of PCB materials. In addition to older electrical instruments and fluorescent lights that contain PCB-filled capacitors, caulking materials, elastic sealants, and heat insulation have also been known to contain PCBs. Contact with PCBs at hazardous waste sites can happen when workers breathe air and touch soil containing PCBs. Exposure in the contaminated workplace occurs mostly by breathing air containing PCBs and by touching substances that contain PCBs.

1.4 HOW CAN POLYCHLORINATED BIPHENYLS (PCBs) ENTER AND LEAVE MY BODY?

If you breathe air that contains PCBs, they can enter your body through your lungs and pass into the bloodstream. We do not know how fast or how much of the PCBs that are breathed will pass into the blood. A common way for PCBs to enter your body is by eating meat or fish products or other foods that contain PCBs. Exposure from drinking water is less than from food. It is also possible that PCBs can enter your body by breathing indoor air or by skin contact in buildings that have the kinds of old electrical devices that contain and can leak PCBs. For people living near waste sites or processing or storage facilities, and for people who work with or around PCBs, the most likely ways that PCBs will enter their bodies are from skin contact with contaminated soil and from breathing PCB vapors. Once PCBs are in your body, some may be changed by your body into other related chemicals called metabolites. Some metabolites of PCBs may have the potential to be as harmful as some unchanged PCBs. Some of the metabolites may leave your body in the feces in a few days, but others may remain in your body fat for months. Unchanged PCBs may also remain in your body and be stored for years mainly in the fat and liver, but smaller amounts can be found in other organs as well. PCBs collect in milk fat and can enter the bodies of infants through breast-feeding.

1.5 HOW CAN POLYCHLORINATED BIPHENYLS (PCBs) AFFECT MY HEALTH?

Many studies have looked at how PCBs can affect human health. Some of these studies investigated people exposed in the workplace, and others have examined members of the general population. Skin conditions, such as acne and rashes, may occur in people exposed to high levels of PCBs. These effects on the skin are well documented, but are not likely to result from exposures in the general population. Most of the human studies have many shortcomings, which make it difficult for scientists to establish a clear association between PCB exposure levels and health effects. Some studies in workers suggest that exposure to PCBs may also cause irritation of the nose and lungs, gastrointestinal discomfort, changes in the blood and liver, and depression and fatigue. Workplace concentrations of PCBs, such as those in areas where PCB transformers are repaired and maintained, are higher than levels in other places, such as air in buildings that have electrical devices containing PCBs or in outdoor air, including air at hazardous waste sites. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs. The possible health effects of PCBs in children are discussed in Section 1.6.

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat

research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Rats that ate food containing large amounts of PCBs for short periods of time had mild liver damage, and some died. Rats, mice, or monkeys that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia, acne-like skin conditions, and liver, stomach, and thyroid gland injuries. Other effects caused by PCBs in animals include reductions in the immune system function, behavioral alterations, and impaired reproduction. Some PCBs can mimic or block the action of hormones from the thyroid and other endocrine glands. Because hormones influence the normal functioning of many organs, some of the effects of PCBs may result from endocrine changes. PCBs are not known to cause birth defects. Only a small amount of information exists on health effects in animals exposed to PCBs by skin contact or breathing. This information indicates that liver, kidney, and skin damage occurred in rabbits following repeated skin exposures, and that a single exposure to a large amount of PCBs on the skin caused death in rabbits and mice. Breathing PCBs over several months also caused liver and kidney damage in rats and other animals, but the levels necessary to produce these effects were very high.

Studies of workers provide evidence that PCBs were associated with certain types of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate commercial PCB mixtures throughout their lives developed liver cancer. Based on the evidence for cancer in animals, the Department of Health and Human Services (DHHS) has stated that PCBs may reasonably be anticipated to be carcinogens. Both EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

1.6 HOW CAN POLYCHLORINATED BIPHENYLS (PCBs) AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans.

Children are exposed to PCBs in the same way as are adults: by eating contaminated food, breathing indoor air in buildings that have electrical devices containing PCBs, and drinking contaminated water. Because of their smaller weight, children's intake of PCBs per kilogram of body weight may be greater than that of adults. In addition, a child's diet often differs from that of adults. A Food and Drug Administration (FDA) study in 1991 estimated dietary intakes of PCBs for infants (6 months) and toddlers (2 years) of less than 0.001 and 0.002 µg/kg/day. Children who live near hazardous waste sites may accidentally eat some PCBs through hand-to-mouth behavior, such as by putting dirty hands or other soil/dirt covered objects in their mouths, or eating without washing their hands. Some children also eat dirt on purpose; this behavior is called pica. Children could also be exposed by playing with old appliances or electrical devices that contain PCBs.

It is possible that children could be exposed to PCBs following transport of the chemical on clothing from the parent's workplace to the home.

PUBLIC HEALTH STATEMENT
POLYCHLORINATED BIPHENYLS (PCBS)

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Division of Toxicology **November 2000**

House dust in homes of workers exposed to PCBs contained higher than average levels of PCBs. PCBs have also been found on the clothing of firefighters following transformer fires. The most likely way infants will be exposed is from breast milk that contains PCBs. Fetuses in the womb are also exposed from the exposed mother.

In one study of women exposed to relatively high concentrations of PCBs in the workplace during pregnancy, their babies weighed slightly less at birth than babies born to women exposed to lower concentrations of PCBs. Studies of women who consumed high amounts of fish contaminated with PCBs and other chemicals also had babies that weighed less than babies from women who did not eat fish. Similar observations have been made in some studies of women with no known high exposure to PCBs, but not all studies have confirmed these findings. Babies born to women who ate fish contaminated with PCBs before and during pregnancy showed abnormal responses to tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, persisted for several years. However, in these studies, the women may have been exposed to other chemicals. Other studies suggest that the immune system may be affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects in humans caused by exposure to PCBs or of health effects of PCBs in older children. It is not known whether PCB exposure can cause in skin acne and rashes in children as occurs in some adults, although it is likely that the same effects would occur at very high PCB exposure levels.

Animal studies have shown harmful effects in the behavior of very young animals when their mothers were exposed to PCBs and they were exposed in the womb or by nursing. In addition, some animal studies suggest that exposure to PCBs causes an increased incidence of prenatal death and changes in the immune system, thyroid, and reproductive organs. Studies in monkeys showed that young animals developed skin effects from nursing after their mothers were exposed to PCBs. Some studies indicate that very high doses of PCBs may cause structural birth defects in animals.

Children can be exposed to PCBs both prenatally and from breast milk. PCBs are stored in the mother's body and can be released during pregnancy, cross the placenta, and enter fetal tissues. Because PCBs dissolve readily in fat, they can accumulate in breast milk fat and be transferred to babies and young children. PCBs have been measured in umbilical cord blood and in breast milk. Some studies have estimated that an infant who is breast fed for 6 months may accumulate in this period 6–12% of the total PCBs that will accumulate during its lifetime. However, in most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk. You should consult your health care provider if you have any concerns about PCBs and breast feeding. Because the brain, nervous system, immune system, thyroid, and reproductive organs are still developing in the fetus and child, the effects of PCBs on these target systems may be more profound after exposure during the prenatal and neonatal periods, making fetuses and children more susceptible to PCBs than adults.

DEPARTMENT of HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

www.atsdr.cdc.gov/ Telephone: 1-888-422-8737 Fax: 770-488-4178 E-Mail: atsdric@cdc.gov

1.7 HOW CAN FAMILIES REDUCE THEIR RISK OF EXPSOURE TO POLYCHLORINATED BIPHENYLS (PCBs)?

If your doctor finds that you have been exposed to significant amounts of polychlorinated biphenyls, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued fish and wildlife advisories to warn people about PCB-contaminated fish and fish-eating wildlife. These advisories will tell you what types and sizes of fish and game animals are of concern. An advisory may completely ban eating fish or game or tell you to limit your meals of a certain fish or game type. For example, an advisory may tell you not to eat a certain type of fish or game more than once a month. The advisory may tell you only to eat certain parts of the fish or game and how to prepare or cook the fish or game to decrease your exposure to PCBs. The fish or wildlife advisory may have special restrictions to protect pregnant women, nursing mothers, and young children. To reduce your children's exposure to PCBs, obey these advisories. Additional information on fish and wildlife advisories for PCBs, including states that have advisories, is provided in Chapter 6 (Section 6.7) and Chapter 8 of the toxicological profile. You can consult your local and state health departments or state natural resources department on how to obtain PCB advisories, as well as other important information, such as types of fish and wildlife and the locations that the advisories apply to.

Children should be told that they should not play with old appliances, electrical equipment, or transformers, since they may contain PCBs. Children who live near hazardous waste sites should be discouraged from playing in the dirt near these sites and should not play in areas where there was a transformer fire. In addition, children should be discouraged from eating dirt, and careful handwashing practices should be followed.

As mentioned in Section 1.3 of the profile, workplace exposure to PCBs can still occur during repair and maintenance of old PCB transformers; accidents, fires, or spills involving these transformers or other PCB-containing items; and disposal of PCB materials. If you are exposed to PCBs in the workplace, it may be possible to carry them home from work. Your occupational health and safety officer at work can tell you whether the chemicals you work with may contain PCBs and are likely to be carried home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO POLYCHLORINATED BIPHENYLS (PCBs)?

Levels of PCBs in the environment were zero before PCBs were manufactured. Now, all people in industrial countries have some PCBs in their bodies. There are tests to determine whether PCBs are in the blood, body fat, and breast milk. These are not regular or routine clinical tests, such as the one for

cholesterol, but could be ordered by a doctor to detect PCBs in people exposed to them in the environment and at work. If your PCB levels are higher than the background levels, this will show that you have been exposed to high levels of PCBs. However, these measurements cannot determine the exact amount or type of PCBs that you have been exposed to, or how long you have been exposed. Although these tests can indicate whether you have been exposed to PCBs to a greater extent than the general population, they do not predict whether you will develop harmful health effects. Blood tests are the easiest, safest, and probably the best method for detecting recent exposures to large amounts of PCBs. Results of such tests should be reviewed and carefully interpreted by physicians with a background in environmental and occupational medicine. Nearly everyone has been exposed to PCBs because they are found throughout the environment, and people are likely to have detectable amounts of PCBs in their blood, fat, and breast milk. Recent studies have shown that PCB levels in tissues from United States population are now declining.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health . Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals; then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors. Recommendations and regulations are periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for PCBs include the following:
The EPA standard for PCBs in drinking water is 0.5 parts of PCBs per billion parts (ppb) of water. For the protection of human health from the possible effects of drinking the water or eating the fish or shellfish from lakes and streams that are contaminated with PCBs, the EPA regulates that the level of PCBs in these waters be no greater than 0.17 parts of PCBs per trillion parts (ppt) of water. States with fish and wildlife consumption advisories for PCBs are identified in Chapter 6 (Section 6.7) and Chapter 8 of the toxicological profile.

The FDA has set residue limits for PCBs in various foods to protect from harmful health effects. FDA required limits include 0.2 parts of PCBs per million parts (ppm) in infant and junior foods, 0.3 ppm in eggs, 1.5 ppm in milk and other dairy

products (fat basis), 2 ppm in fish and shellfish (edible portions), and 3 ppm in poultry and red meat (fat basis).

OSHA regulates that workers not be exposed by inhalation over a period of 8 hours for 5 days per week to more than 1 milligram per cubic meter of air (mg/m^3) for 42% chlorine PCBs, or to 0.5 mg/m^3 for 54% chlorine PCBs.

NIOSH recommends that workers not breathe air containing 42 or 54% chlorine PCB levels higher than 1 microgram per cubic meter of air (µg/m^3) for a 10-hour workday, 40-hour workweek.

EPA requires that companies that transport, store, or dispose of PCBs follow the rules and regulations of the federal hazardous waste management program. EPA also limits the amount of PCBs put into publicly owned waste water treatment plants. To minimize exposure of people to PCBs, EPA requires that industry tell the National Response Center each time 1 pound or more of PCBs have been released to the environment.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333

Information line and technical assistance:
Phone: 888-422-8737
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ATTACHMENT 7

CDC International Chemical Safety Cards for PCBs

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

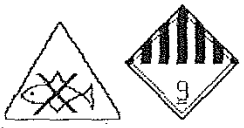
ICSC: 0939

UNEP

National Institute for Occupational Safety and Health NIOSH

Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

ICSC # 0939
CAS # 11097-69-1
RTECS # TQ1360000
UN # 2315
EC # 602-039-00-4
October 20, 1999 Peer reviewed



TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
•INHALATION		Ventilation.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Headache. Numbness.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do	Separated from food and feedstuffs Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.

NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.		Severe marine pollutant. Note: C Xn symbol N symbol R: 33-50/53 S: 2-35-60-61 UN Hazard Class: 9 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT

PHYSICAL STATE; APPEARANCE:
LIGHT YELLOW VISCOUS LIQUID.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes in a fire producing irritating and toxic gases

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.5 mg/m³ as TWA (skin) A3 (ACGIH 2004).
MAK: 0.05 ppm 0.70 mg/m³ H
Peak limitation category: II(8) Carcinogen category: 3B Pregnancy risk group: B (DFG 2004).
OSHA PEL: TWA 0.5 mg/m^3 skin
NIOSH REL*: Ca TWA 0.001 mg/m^3 See Appendix A *Note: The REL also applies to other PCBs.
NIOSH IDLH: Ca 5 mg/m^3 See: IDLH INDEX

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES	Relative density (water = 1): 1.5 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.01 Octanol/water partition coefficient as log Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment. 	

N O T E S

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C.

Transport Emergency Card: TEC (R)-90GM2-II-L

ADDITIONAL INFORMATION

ICSC: 0939 **POLYCHLORINATED BIPHENYL (AROCLOR 1254)**

Attachment 3

Request for Removal Action at the Donna Reservoir and Canal System Superfund Site. Action Memorandum of July 7, 2009

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

JUL 07 2009

MEMORANDUM

SUBJECT: Request for Removal Action at the Donna Reservoir Site Donna, Hidalgo County, Texas

FROM: Valmichael Leos, Remedial Project Manager
Remedial Branch (6SF-RL)

TO: Samuel Coleman, P.E., Director
Superfund Division (6SF)

THRU: for Ragan Broyles, Associate Director
Prevention and Response Branch (6SF-P)

I. PURPOSE

This memorandum requests approval for a removal action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. § 9601 et seq. at the Donna Reservoir Site (hereinafter referred as the "Site") located in Donna, Hidalgo County, Texas. The proposed action involves the removal and offsite disposal of fish contaminated with polychlorinated biphenyls (PCBs) above the U.S. Food and Drug Administration (FDA) allowable levels that are actively being caught and consumed by local residents. This action meets the criteria for initiating a removal action under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR § 300.415, and is expected to require less than twelve months and $350,000 to complete.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS #	TX0000605363
Category of removal:	Time Critical
Site ID #	A6P3
Latitude:	26.096547 N
Longitude:	98.072556 W

A. Site Description

The Donna Reservoir Site includes the 400-acre reservoir, from the Donna Main Canal. The reservoir has an average depth of five feet and storage of 1,200 acre-feet, sustained by pumping from the Donna Main Canal. Water from the canal system is used for drinking water and crop irrigation in the city of Donna.

1. Removal Site Evaluation

Since the Site was identified in 1993, the Texas Department of State Health Services (TDSHS and predecessor TDH) have conducted numerous environmental fish and sediment sampling, water assessments, and searches for responsible parties. To date, neither the contamination source nor responsible parties have been identified. However, environmental data since 1993 up to the most recent data collected in 2009 show both the spread and increase in contamination throughout the local fish population at the Site. During a two-year (1993-1994) joint investigation by the TSDHS and the Texas Commission on Environmental Quality (TECQ and predecessor TNRCC), PCB (primarily Aroclor-1254) concentrations ranging from 0.55 parts per million (ppm) to 24.0 ppm were detected in fillets from twelve out of twenty-three fish collected in the Donna Main Canal, three out of sixteen fish taken from Donna Reservoir, and eight out of eleven fish from the adjacent reach of the Arroyo Colorado River.[2] Additional fish fillet samples taken in 1997 confirmed the continued presence of PCBs in aquatic life with concentrations as high as 20.0 ppm within the area of concern (TNRCC Sept. 2001, 27).[5] Current fish sampling data collected by TDSHS in 2005 have confirmed concentrations as high as 13.8 ppm of PCBs within the canal and according to the report "all fish species from the Donna Irrigation System (DIS) continues to pose an apparent hazard to human health".[4] Moreover, the report concludes that based on current site data, the TDSHS will continue to enforce a fish possession ban and collect future monitoring data until a decrease level of threat is documented. With PCB concentrations well above the FDA limit of 2.0 ppm for fish tissue, the TSDHS issued an aquatic life closure for the reservoir and contiguous waters effective June 24, 1993.[6] The closure prohibits the taking of all species of aquatic life.[7]

In 1997, the TCEQ asked the U.S. Geological Survey (USGS) for assistance in detecting the source of the PCBs. Starting February 1999 through April 2001 the USGS conducted a series of sediment sampling at various locations at the Site. According to the USGS, the source of contamination in the sediment is suspected to be located between the siphon outlet and the 90-degree bend in the Donna canal.[3]

A 2001 Screening Site Inspection (SSI) report prepared by TCEQ for the Environmental Protection Agency (EPA) noted that, "The Donna Reservoir and Canal System is a fishery with documented human food chain consumption that is subject to actual contamination".[1] Although the TSDHS has repeatedly posted warning signs informing the public about the hazards of eating fish from the reservoir and contiguous waters, these signs quickly disappear, and fishing continues unabated.

In 2008, a removal action was conducted in the Donna Main Canal to mitigate exposure to those consuming fish from the Canal.

2. Physical Location

The site is a 400-acre impoundment located southwest of the city of Donna in southeast Hidalgo County. The site is located at 26.096547 degrees north latitude and 98.072556 degrees west longitude (see Attachment 1), and is referenced on the U.S. Geological Survey (USGS) 7.5-minute San Juan SE and Donna Quadrangles.

3. Site Characteristics

The Donna Reservoir is a 400-acre impoundment located southwest of the city of Donna in southeast Hidalgo County, within the Arroyo Colorado watershed. Water for the Donna Reservoir is pumped from the Rio Grande, through a seven mile elevated earthen Main Canal, to the reservoir, which is used for water supply and irrigation storage by the city of Donna and surrounding areas. The area around the reservoir and canal is primarily irrigated crops and pastureland, with scattered residences.

4. NPL Status

This Site was listed on the National Priorities List (NPL) in March 2008. EPA Region 6 is currently planning to begin a remedial investigation before January 2010.

5. Maps, Photographs and Other Graphic Representations

Attachment 1	Enforcement Addendum (Enforcement Confidential/FOIA Exempt)
Attachment 2	Site Location Map
Attachment 3	TDH Aquatic Life Order
Attachment 4	TDH Health Report
Attachment 5	USGS Fact Sheet 016-02 (April 2002)
Attachment 6	ATSDR Public Health Statement for PCBs
Attachment 7	CDC International Chemical Safety Cards for PCBs

B. Other Actions to Date

1. Previous Actions

On August 6, 2008, EPA Region 6 approved an action memorandum for the removal of contaminated fish in the main Donna Canal. Contaminated fish at the site have been identified to have concentrations of polychlorinated biphenyls (PCBs) above the 2.0 parts per million (ppm) safe consumption level established by the FDA. The removal action involved the depopulation of edible size fish contaminated with PCBs from the canal area of the site. The 2008 removal was conducted in two separate phases. The first phase, which began on August 23, 2008, successfully removed approximately 7,800 fish from the canal. On February 16, 2009, EPA re-mobilized to the site and conducted phase two of the fish removal. Phase two work mirrored phase one and was conducted to remove any remaining fish. All fish collected were sent for

immediate offsite transportation and disposal at an EPA approved hazardous waste landfill.

In November of 2001, the TNRCC in coordination with EPA Region 6 initiated a hazardous assessment of the Site.[1] The investigation contained sampling data, historical site data, and observations of hazardous materials releases.

2. Current Actions

Sampling data and analysis reports are being finalized from 2008 removal work conducted in the canal. In addition, EPA enforcement staff continues to research potential responsible party liability and viability issues.

C. State and Local Authorities/ Roles

1. State and Local Actions to Date

As part of a multi-agency (i.e. including EPA) regional study in 1993, multi-media sampling was conducted in the homes of nine families in the Lower Rio Grande Valley. Of specific relevance to the current PCB issue, these samples included food and blood. Two persons in a single household were found to have elevated blood-PCB (TNRCC Oct. 1998, 1).[2] The source was identified as a carp, taken from the freezer of the home, which yielded a "dramatic" PCB concentration. Residents reported to have caught the carp from the Donna canal, where at least one of them routinely fished. Sampling in the Donna Reservoir confirmed PCB fish contamination. The TDSHS health consultation determined that there was no safe consumption level of these fish, and promptly issued a possession ban in an attempt to prevent the taking of any fish from the area. This is well beyond the traditional "advisory" against eating certain fish over certain amounts. It is a possession ban. Subsequent fish studies conducted by TDSHS in 2005, document an increase in both concentration and percentage of sampled fish contaminated now approaching 100%.[4]

The source of the PCB contamination is still unknown and now fish further downstream in the Donna east reservoir have been impacted. The results from a 2005 fish tissue collection by TDSHS shows PCBs in most of the 30 fish collected in the main canal and reservoir at concentrations ranging from below detection limits (<.005 ug/kg) to 2,706.26 ug/kg (2.7 ppm). Fish and suspended sediments have already been impacted, and residents continue to consume fish regardless of the ban. TDSHS concludes in their 2005 report by stating that the "consumption of any of the...fish species from the DIS [Donna Irrigation System]...continues to pose an apparent hazard to human health."[4] The city of Donna drinking water supply lies within the contaminated sediment plume and without remediation, the contamination will spread, potentially contaminating more fish and the city's drinking water supply.

This site constitutes an imminent and substantial endangerment to human health. TCEQ has referred the site to Region 6 EPA.

2. Potential for Continued State/Local Response

Neither the state of Texas nor local governments have the resources to deal with this site.

The Donna Irrigation District (DID) may only be able to contribute a limited amount of in-kind services, such as utilities and site security, to support the project.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

Conditions at the site meet the following criteria, indicating that the Site is a threat to the public health, welfare and the environment, and that a removal action is appropriate under § 300.415(b)(2) of the NCP. Any or all of these factors may be present at a site, and any one of these factors may determine the appropriateness of a removal action.

1. Actual or Potential Exposure to Nearby Human Populations, Animals or the Food Chain; NCP Section 300.415(b)(2)(i)

On a recent site visit conducted by EPA staff on July 10, 2007, with representatives from the TCEQ and the DID, local residents were observed actively fishing in the Donna Reservoir and Canal system. A family of four, with two young children below the age of 10, were observed fishing off the banks of the Reservoir. The local fisherman with his children had caught two fish at the time of the observation and reported frequently eating fish from the reservoir despite warning signs posted nearby. When asked as to why the locals continue to eat fish despite federal and state concerns about contamination in the fish, the Irrigation District representative responded that locals consider the danger similar to a bacteria or germ and that if "the fish are cooked the right way, it will not hurt them." PCBs are unlike a bacteria or germ which can be eliminated with heat and sterilization with soap and water. The chemical nature of PCBs allows it to have a natural resistance to heat. The chemical compounds in PCBs store in the fat tissue of fish and pose a threat to humans if consumed.

Humans and animals may potentially be exposed by direct contact with hazardous substances, pollutants or contaminants at or from the site. PCB-contaminated fish from this unsecured Site are routinely caught and consumed by humans and wildlife. PCBs are a hazardous substance as defined at Section 101(14) of CERCLA, 42 U.S.C. § 9601(14) and further defined at 40 CFR § 302.4. Sediment or storm water at or discharging from the Site could contain PCBs. The lack of physical security and evidence of ongoing consumption only increases concerns that persons, particularly children, known to consume the fish could be exposed. PCBs have a low solubility in water. Due to PCBs low solubility, historical surface water sampling has not found PCBs at drinking water intakes. The primary risk to human health from the PCBs is from suspended sediment in the water and the consumption of contaminated fish.

The major hazards from exposure to PCBs relate to their toxicological properties. As a group they are generally thought to be carcinogenic by ingestion, and readily accumulated in the body. There is evidence to suggest that PCBs also may cause reproductive disorders and behavioral defects in newborns and infants. The primary target organ is the liver. Effects of overexposure may include skin acne and cancer (*see* Attachments 6 and 7). Effects on animals

and marine life are thought to be similar, and food and other aquatic organism bioaccumulate PCBs and pass them up to consumers, including larger predators and humans.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances, pollutants or contaminants from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

This proposed removal action involves the depopulation of edible size PCB-contaminated fish from the reservoir area in a two-phase event if needed. The first fish removal event will begin immediately upon the signing of this action memo with a second follow up removal event as needed within six (6) months to ensure that response action goals have been met. The collected fish will be sampled as needed for hazardous waste categorization. This proposed action is being coordinated with USFW, ATSDR, TDSHS, TCEQ, TPW and DID. This action will not prevent long-term recontamination of the remaining fish as they grow in size, but it will assist in removing the immediate health threat to the public and allow EPA along with other state and local authorities the opportunity to continue work on a long term management and removal of the contamination source. All collected fish will be properly disposed of at an appropriate permitted facility.

2. Contribution to Remedial Performance

The proposed actions will be consistent with any conceivable remedial responses at this Site. Eliminating potential sources of exposure (fish) will temporarily mitigate imminent threats to health, welfare or the environment.

3. Description of Alternative Technologies

EPA will evaluate the use of various methods of collecting and removing contaminated fish at the Site.

4. Applicable or Relevant and Appropriate Requirements

This removal action will be conducted to eliminate the actual or potential release of a hazardous substance, pollutant, or contaminant to the environment, pursuant to CERCLA, 42 U.S.C. § 9601 et seq., and in a manner consistent with the National Contingency Plan, 40 CFR Part 300, as required at 33 U.S.C. § 1321(c)(2) and 42 U.S.C. § 9605. Pursuant to 40 CFR Part

300.415(j), fund-financed removal actions under CERCLA § 104 and removal actions pursuant to CERCLA § 106 shall, to the extent practicable considering the exigencies of the situation, attain the applicable or relevant and appropriate requirements under Federal environmental law.

5. Project Schedule

The duration of activities is expected to be one to two months. The removal of edible size contaminated fish will be evaluated within 6 months from completion of the action. The schedule for the depopulation event will be contingent upon weather conditions, personnel scheduling, availability of disposal options, and contractor support.

B. Estimated Costs

Extramural Costs	
USFW	$150,000
ERRS	$100,000
START	$75,000
Extramural Costs Contingency	$25,000
TOTAL, Extramural Costs	$350,000
TOTAL PROJECT CEILING	**$350,000**

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Should this action not be taken at the Site, the potential for human exposure to contaminants will remain unabated. Consumption of these contaminated fish is a documented and continuing source of exposure, particularly to children. This threat will only increase over time due to bioaccumulation of PCBs in the fish population.

VII. OUTSTANDING POLICY ISSUES

There are no known outstanding policy issues associated with this site.

VIII. ENFORCEMENT

For administrative purposes, information concerning confidential enforcement strategy for this Site is contained in the Enforcement Attachment (*see* Attachment #1). The total cost for

this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated to be $509,190.

(Direct Cost) + (Other Indirect costs) + 42.63% (Direct + Indirect Costs) = Estimated EPA Cost

$350,000 + $7,000 + (.4263 x $357,000) = $509,190

Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2002. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only, and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor the deviation of actual total costs from this estimate will affect the right of the United States to seek cost recovery.

X. RECOMMENDATION

This decision document represents the selected removal action for the Donna Reservoir Site in Donna, Hidalgo County, Texas. It was developed in accordance with CERCLA, 43 U.S.C. § 9601 et seq., and is consistent with the NCP, 40 CFR Part 300. This decision is based on the administrative record for the Site.

Conditions at the Site meet the criteria as defined by 40 CFR Section 300.415(b)(2) of the NCP for a removal, and I recommend your approval of the proposed removal action. The total project ceiling, if approved, will be $350,000.

APPROVED: Pam Phillips Acting DATE: 7/7/09

Samuel Coleman, P.E., Director
Superfund Division

Attachments:

Endnotes

Endnotes

1 Texas Natural Resource Conservation Commission. *Screening Site Inspection Report: Donna reservoir and canal system Donna, Hidalgo county, Texas TX0000605363.* TNRCC. November 2001. Total pages: 52.

2 Texas Natural Resource Conservation Commission. *Polychlorinated biphenyls in Donna reservoir and contiguous waters: Results of intensive sediment, water and fish sampling and human health risk assessment.* October 1998. AS-161. Total Pages: 45.

3 Mahler, Barbara, United States Geological Survey. *Final Progress Memorandum: Investigation of PCBs on Suspended Sediment in Donna Canal, Texas.* December 14, 2000. Total Pages: 7.

4 Texas Department of State Health Services. *Characterization of potential adverse health effects associated with consuming fish from the Donna irrigation system.* August 2007. Total Pages: 28.

5 Texas Natural Resource Conservation Commission. Implementation Plan for Arroyo Colorado and Donna Reservoir and Canal Legacy Pollutant TMDLs For Segments 2202 and 2202A, September 4, 2001. Total Pages: 33.

6 U.S. Code of Federal Regulations, 21 CFR 109.30

7 Texas Department of Health, Aquatic Life Order Number 9, February 4, 1994

ATTACHMENT 1

ENFORCEMENT ATTACHMENT TO THE ACTION MEMORANDUM FOR the "Ranger Abandoned Chemical Site" IS ENFORCEMENT SENSITIVE

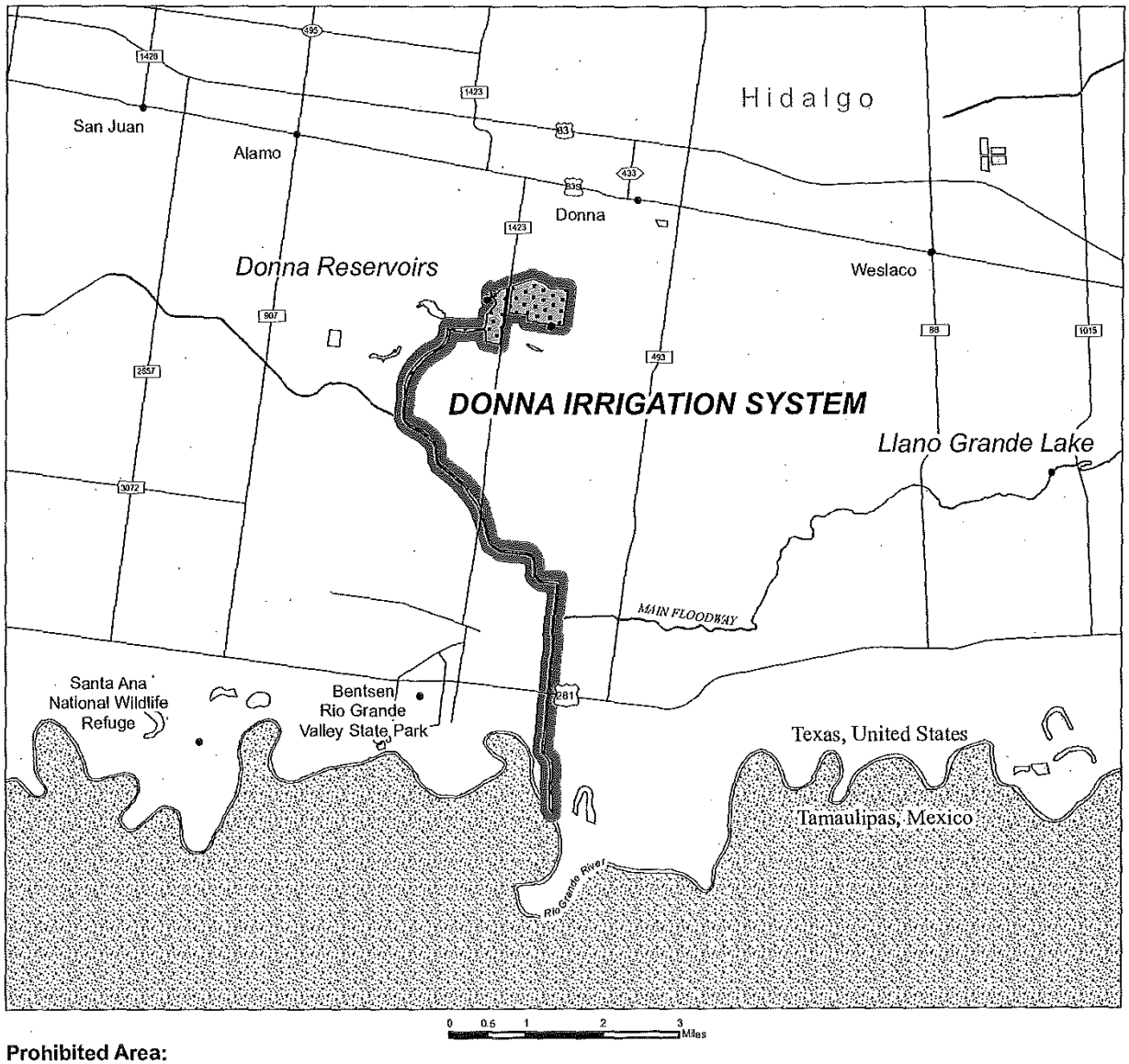
Note: **This document has been withheld as Enforcement Confidential and is located in Separate "CONFIDENTIALITY FILING" at U.S. EPA, Region 6**

ATTACHMENT 2

Site Location Map

Donna Irrigation System

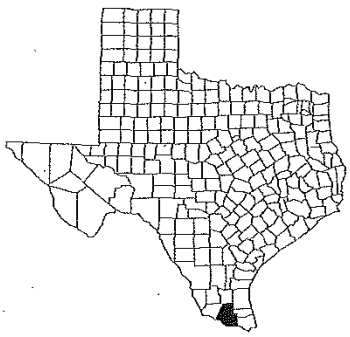
Hidalgo County
AL-9 Issued February 4, 1994



Prohibited Area:
Donna Reservoir and interconnecting canal system

Contaminants of Concern:
Polychlorinated Biphenyls (PCBs)

Restricted Species:
Persons are prohibited from possessing any species of fish from these waters.



ATTACHMENT 3

TDH Aquatic Life Order

IN THE MATTER OF CLOSURE	§	BEFORE THE TEXAS
	§	
OF AQUATIC LIFE	§	DEPT. OF HEALTH
	§	
HARVESTING AREAS	§	AUSTIN, TEXAS

AQUATIC LIFE ORDER NUMBER 9

Pursuant to the duty delegated to the Texas Department of Health to protect and promote the health of the people of this state to control all matters relating to the health of the citizens of this state and pursuant to Chapter 436 of the Texas Health and Safety Code, it is ORDERED that the Donna Irrigation System located in Hidalgo County is declared a prohibited area or the taking of all species of aquatic life. This order is effective at 12:01 a.m. February 4, 1994 and remains in full force and effect until modified or rescinded by further written order.

Issued on this 3rd day of February, 1994, in Austin, Travis County, Texas.

David R. Smith, M.D.
Commissioner of Health
Texas Department of Health

ATTACHMENT 4

TDH Health Report

Characterization of Potential Adverse Health Effects Associated with Consuming Fish from the

DONNA IRRIGATION SYSTEM

Hidalgo County, TX

August 2007

Department of State Health Services
Austin, Texas
Seafood and Aquatic Life Group
Policy, Standards, and Quality Assurance Unit
Division for Regulatory Services
and the
Environmental and Injury Epidemiology and Toxicology Branch

INTRODUCTION

Description of the Donna Irrigation System and History of the Extant Possession Ban

The Donna Irrigation District reservoirs are located in the Hidalgo County, one of the Texas Rio Grande Valley counties directly bordering Mexico. The Donna District Reservoirs (Donna Irrigation System (DIS) Donna Reservoirs; Donna West and a larger Donna East) lie slightly southwest of the town of Donna, TX. The main canal winds its way south between County Roads 907 and 493 traveling for a distance with the main floodway. East of Bentsen Rio Grande Valley State Park, the canal crosses U.S. Highway 281, from which point the channel runs almost due south to empty into the Rio Grande a few miles south of U.S. Highway 281.[1]

The United States Environmental Protection Agency (USEPA) first detected PCBs in fish from the Donna Canal in 1993. In an environmental study of the Lower Rio Grande Valley of Texas, the agency sampled *cooked* fish from representative households in the valley, taking blood and urine from families who participated. Laboratory analyses of fish from this study revealed high concentrations of PCBs, with one carp – reportedly from the Donna Canal – containing 399 milligrams PCBs per kilogram tissue – some 1500 times the concentration that, if consumed, was thought to pose a hazard to human health. Blood from people who ate that particular fish contained excessive concentrations of PCBs. Upon receiving this information, the Texas Commissioner of Health informed the Seafood Safety Division of the Texas Department of Health (TDH). The SSD quickly confirmed the information and sent a collection team to the Donna Reservoir to sample fish. Fish collected by the TDH at that time contained high concentrations of PCBs consistent with Aroclor® 1248, 1254, and 1260.[2],[3] On February 9, 1994, consequent to this finding, the TDH issued Aquatic Life Order #9 (AL-9). AL-9 prohibited possession of any fish species from the DIS.[4] Despite this possession ban, evidence abounds that the DIS remains a popular fishing spot for residents of Hidalgo County. For instance, in 2002, the USGS published a document with photographs of locals fishing outside the Donna Canal pump house and at the Donna Reservoir.[3] Although the source of the PCBs in the DIS remains a mystery, in that document, the USGS outlined a 600-meter reach in the northernmost 90-degree curve of the canal, suspended sediment from which has the highest PCB concentrations identified in the system. From these data, the USGS proposed that 600-meter reach as likely to contain the source of PCBs in the DIS. Fish caught from this same area have historically contained high levels of PCBs.[3]

The Seafood and Aquatic Life Group (SALG) of the Department of State Health Services (DSHS, formerly the Texas Department of Health) – with funding from the Total Maximum Daily Load (TMDL) Program of the Texas Commission on Environmental Quality (TCEQ) collected fish in 2005 and 2006 from the DIS (DIS). The analytical results from those fish form the basis for this report. The report, written some 13 years after AL-9 prohibited possession of fish from the DIS, describes results, presents conclusions from the study, addresses implications to public health from consumption of contaminated fish from the DIS, recommends public health actions, and supplies the TMDL Program with needed data. In the present study (2005-2006), DSHS again characterized PCB contamination in fish from the DIS. The 2005-2006 tissue data show that fish from the DIS continue to contain PCBs in excess of the health-related

concentrations used by the DSHS to protect public health. Interestingly, PCBs in fish collected for this report from sites in the DIS positively correlate with PCB concentrations in sediments from the same sites as measured by the USGS for PCBs.[3]

The TMDL Program at the TCEQ and the Relationship between DSHS Consumption Advisories or Possession Bans and TMDLs

The TCEQ enforces federal and state laws that promote judicious use of water bodies under state jurisdiction and protects state-controlled water bodies from pollution. Pursuant to the federal Clean Water Act, Section 303(d),[5] all states must establish a "total maximum daily load" (TMDL) for each pollutant contributing to the impairment of a water body for one or more designated uses. A "TMDL" is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources, and including a margin of safety to ensure the usability of the water body for all designated purposes, accounting for seasonal variation in water quality. States, territories, and tribes define the uses for a specific water body (e.g., drinking water, contact recreation, aquatic life support [fish consumption] along with the scientific criteria designated to support each specified use). The Clean Water Act, section 303, which promulgates rules that promote water quality, orders the states to establish TMDLs and implementation plans for impaired waters.[5] Fish consumption is a recognized use for many waters. A water body is impaired if fish from that water body contain contaminants that make those fish unfit for human consumption or if consumption of those contaminants potentially could harm human health. Although a water body and its aquatic life may spontaneously clear toxicants over time with removal of the source(s), it is often necessary to institute some type of remediation such as those devised by the TMDL Program. Thus, when the DSHS prohibits possession of environmentally contaminated fish, the TMDL Program automatically places the water body on its current draft 303(d) List.[5] TMDL staff members then prepare a TMDL for each contaminant present at concentrations that, if consumed, would be capable of negatively affecting human health. Once the TMDLs are approved, the group prepares an Implementation Plan – a "remediation" plan, if you will – for each contaminant. Upon "implementation," these plans facilitate rehabilitation of the water body. Successful remediation should result in return of the water body to conditions compatible with all stated uses, including consumption of fish from the water body. When the DSHS lifts a possession ban, people may once again keep and consume fish from the water body. If fish in a water body are contaminated, one of the several items on an Implementation Plan for a water body on a state's 303(d) list might be the periodic reassessment of contaminant levels in fish. For the DIS, the TMDL Program does specify such periodic reassessments.

Demographics of Hidalgo County and the Likelihood of Subsistence Fishing in the Area of the Donna Irrigation System

The USEPA suggests that, along with ethnic characteristics and cultural practices of an area's population, the poverty rate could contribute to any determination of the rate of subsistence fishing in an area.[6] In Hidalgo County, TX, the 2005 population was 671,967 people.[7]. Of this population, 5,099 claimed Asian heritage or ethnicity. Of the 252,000+ people in the labor force, 12.6% were unemployed. The median household income in 2005 inflation-adjusted figures was $24,501. For the year 2005, 41% of people in Hidalgo County lived in poverty. Fifty-two percent of related children less than 18 years of age lived below the poverty level, while 29% of those 65

years or older lived below the poverty level. Thirty-six percent of all families and 55% of families with a female householder (no husband present) had incomes below the poverty level. Of those people over 25 years of age, 42% had less than a 9th grade education but 58% had at least a high school diploma (or an equivalency). Fifteen percent had a bachelor's degree or higher. Of people in Hidalgo County with a mortgage, 46% pay more than 30% of their income for housing, leaving less money for other essentials such as food. Finally, about one in six individuals over five years of age claimed a disability, with the percentage increasing with increasing age.[8] Disabilities affect income. All of these demographic variables may affect the likelihood of subsistence fishing. Why is it important to know whether and how many subsistence fishers are residents of the area? The USEPA and the DSHS believe it important to consider subsistence fishing as occurring at any water body because subsistence fishers (as well as recreational anglers and certain tribal and groups of certain ethnicities) may consume more locally caught fish than the general population. As shown by the above demographics, many Hidalgo County residents have characteristics of subsistence fishers. These groups sometimes harvest fish or shellfish from the same water body over many years to supplement caloric and protein intake. Should local water bodies contain chemically contaminated fish or shellfish, people who routinely eat fish from the water body or those who eat large quantities of fish from the same waters, could increase their risk of adverse health effects. The USEPA suggests that states assume that at least 10% of *licensed* fishers in any area are subsistence fishers. The DIS is a popular fishing "hole" for residents of the area. Subsistence fishing, while not explicitly documented by the DSHS, likely occurs along the Donna System. The DSHS assumes the rate of subsistence fishing to be similar to that estimated by the USEPA.[6]

METHODS

Fish Sampling, Preparation, and Analysis

The DSHS SALG collects and analyzes edible fish from the state's public waters to evaluate potential risks to the health of people consuming contaminated fish or shellfish. Fish tissue sampling follows standard operating procedures from the DSHS *Seafood and Aquatic Life Group Survey Team Standard Operating Procedures and Quality Control/Assurance Manual.*[9] The SALG bases its sampling and analysis protocols, in part, on procedures recommended by the USEPA in that agency's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1.*[10] Advice and direction are also received from the legislatively mandated *State of Texas Toxic Substances Coordinating Committee (TSCC) Fish Sampling Advisory Subcommittee (FSAS).*[11] Samples usually represent species, trophic levels, and legal-sized specimens available for consumption from a water body. When practical, the DSHS collects samples from two or more sites within a water body to better characterize geographical distributions of contaminants.

Fish Sampling Method and Description of the Donna Irrigation System 2005-2006 Sample Set

In December 2005 and January 2006, the field collection team from SALG collected 30 fish samples from sites along the DIS. That system includes two small reservoirs and a canal from which irrigation water is drawn. The SALG selected six sample sites to provide spatial coverage of the study area (Figure 1). Sites 1, 2, and 3 were in the canal proper. Sites 4 and 5 were in the reservoirs: Site 4 in the West Reservoir and Site 5 in the East Reservoir. Table 1 also shows exact latitudes and longitudes for each site.

The collection team targeted species for collection from the DIS through fish-tissue sampling protocols developed over many years by the SALG. Species collected represent two distinct ecological groups (i.e. predators and bottom-dwellers) that have some potential to bio-accumulate chemical contaminants, have a wide geographic distribution, are of local recreational fishing value, and/or which anglers and their families commonly consume. The 30 fish collected from the DIS in December 2005 and January 2006 represented all species targeted for collection from this water body. Table 1 presents date collected, sample number, species, collection site, length and weight of each sample. The table lists the samples by site: largemouth bass (12), common carp (10), smallmouth buffalo (3), freshwater drum (3), and channel catfish (2).

During each day of sampling, staff set gill nets in late afternoon and fished those overnight, collecting samples from the nets early the following morning. Gill nets were set to maximize available cover and habitat. SALG staff stored captured fish retrieved from the nets on wet ice until processed. The staff returned to the reservoir or canal system any remaining live fish culled from the catch. Staff also properly disposed of fish found dead in the gill nets.

The SALG utilized a boat-mounted electrofisher to collect fish. SALG staff conducted electrofishing activities during daylight hours, using pulsed direct current (Smith Root 5.0 GPP electrofishing system settings: 4.0-6.0 amps, 60 pulses per second [pps], low range 360 volts, 80% duty cycle) to stun fish that crossed the electric field in the water in front of the boat. Staff used dip nets over the bow of the boat to retrieve stunned fish, netting only fish pre-selected as target samples. Staff immediately stored retrieved samples on wet ice in large coolers to ensure interim preservation of tissues.

SALG staff processed fish from the DIS at the sites from which the samples came. Staff weighed each sample to the nearest gram on an electronic scale and measured total length (tip of nose to tip of tail fin) to the nearest millimeter. After weighing and measuring a fish, staff used a cutting board covered with aluminum foil and a fillet knife to prepare two skin-off fillets from each fish. The foil was changed and the filleting knife cleaned with distilled water after each sample was processed, after which the fillet(s) was wrapped in two layers of fresh aluminum foil, placed in an unused, clean, pre-labeled plastic freezer bag, and stored on wet ice in an insulated chest until further processing. At the end of each sampling trip, SALG staff transported tissue samples on wet ice to their Austin, TX, headquarters, where the samples were stored temporarily at -5° Fahrenheit (-20° Celsius) in a locked freezer. The freezer key is accessible only to authorized SALG staff members to ensure the chain of custody remains intact while samples are in the possession of agency staff. The week following each collection trip, frozen fish tissue samples were shipped by commercial carrier (UPS next-day air) to the Geochemical and Environmental

Research Group (GERG) Laboratory, Texas A&M University, College Station, TX, for contaminant analysis.

Analytical Laboratory Information

The GERG laboratory notified the SALG when samples from the DIS arrived. Upon receipt of the samples, the laboratory recorded the DSHS sample number – assigned by the collection team – and noted the condition of each fillet.

Utilizing USEPA-sanctioned methodology, the laboratory analyzed the 30 samples for common inorganic and organic contaminants, including seven metals – cadmium (Cd), copper (Cu), lead (Pb), selenium (Se), zinc (Zn), total arsenic (As), and total mercury (Hg). The GERG laboratory analyzed each fish for total (inorganic arsenic + organic arsenic = total As) arsenic. Although the proportions of each form of arsenic may differ among species, under different water conditions, and, perhaps, with other variables, the literature suggests that well over 90% of arsenic in fish is likely organic arsenic – a form that is virtually non-toxic to humans. Taking a conservative approach, DSHS estimates that 10% of arsenic in a fish is inorganic arsenic and derives estimates of inorganic arsenic concentrations by multiplying total arsenic concentration in each fish by a factor of 0.1.[12] Virtually all mercury in upper trophic level fish three years of age or older is methylmercury.[5] Thus, total mercury concentration in a fish of legal size for possession in Texas serves well as a surrogate for methylmercury. Because methylmercury analyses are difficult to perform well and are more expensive than analysis of total mercury, the USEPA recommends that states determine total mercury concentration in a fish and that – to protect human health – states conservatively assume that all reported mercury in fish or shellfish is methylmercury. The GERG laboratory analyzed fish tissues for total mercury. In its risk characterizations, the DSHS may interchangeably utilize the terms "mercury", "methylmercury", or "organic mercury" to refer to methylmercury in fish.[13]

The laboratory analyzed tissues for several classes of pesticides such as organophosphates, organochlorines, and carbamates. The laboratory also analyzed 30 fish tissue samples for PCBs, while it analyzed five of the 30 for panels of semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs).

PCB Analyses and the Measurement of PCB Congeners instead of Aroclors

The GERG laboratory reports the presence and concentrations of 209 PCB congeners using detection limits that are, typically, around 1 µg/kg. Although only about 130 congeners existed in mixtures commonly used in the U.S. (Aroclors®), it may be useful to have measured all 209 congeners for examining the effects of "weathering" on the PCB mixture presumed originally disseminated.

Despite USEPA's suggestion that the states analyze PCB congeners rather than Aroclor or homolog analyses, the toxicity literature does not reflect this state-of-the-art laboratory science. To handle this dilemma, DSHS empirically uses recommendations from the National Oceanic and Atmospheric Administration (NOAA)[14] and from McFarland and Clarke,[15] along with the USEPA's guidance documents for assessing contaminants in fish tissues[10,16] to address the

toxicity of PCB congeners in fish tissues, summing concentrations of 43 PCB congeners to derive a "total" PCB concentration. The DSHS averages the summed congeners to derive a mean PCB concentration. The authors of the preceding references utilized congeners for their likelihood of occurrence in fish, the likelihood of significant toxicity – based on structure-activity relationships – and for the relative environmental abundance of those congeners.[14,15] Using only a few PCB congeners to determine "total PCBs" could underestimate PCB concentrations in fish tissue. Nonetheless, the above-described method complies with expert recommendations on evaluation of PCBs in fish. Therefore, SALG risk assessors compare average PCB concentrations with information in the USEPA's (Integrated Risk Information System) IRIS database.[17] IRIS currently contains systemic toxicity information for five Aroclor mixtures: Aroclor 1016, 1242, 1248, 1254, and 1260, as well as supplying one or more cancer potency factors (CPFs) – also known as slope factors (SFs) - for mixtures of PCBs, (not all information is available for all mixtures).[17] Systemic toxicity estimates in this document reflect comparisons with the Reference Dose (RfD) for Aroclor 1254 because IRIS contains an RfD for Aroclor 1254 but not for Aroclor 1260. As of yet, IRIS does not contain toxicity information on individual PCB congeners. Risk assessors may be unable to determine the originally-present Aroclor® mixture or whether the PCBs observed even originated from Aroclors® as U.S. companies used PCB mixtures imported from abroad as well as U.S.- produced PCBs. Additionally, airplanes and ships from foreign countries entered U.S. waters and may have discharged foreign-made PCB mixtures into U.S. portal waters.

Statistical Analysis

SALG risk assessors employed SPSS® statistical software, version 13.0 installed on IBM-compatible microcomputers (Dell, Inc) to generate descriptive statistics (mean, standard deviation, median, range, and minimum and maximum concentrations) on all measured compounds in each species of fish from each sample site.[18] SALG risk assessors utilized ½ the detection limit for all analytes not detected (ND) or estimated (J)[a] concentrations in computing descriptive statistics. SALG risk assessors imported previously edited Excel data files into SPSS® to generate means, standard deviations, median concentrations, and minimum and maximum concentrations of each measured analyte. SALG used the descriptive statistical results to generate the present report. SALG protocols do not require hypothesis testing. Nevertheless, when data are of sufficient quantity and quality, and, should it be necessary, the SALG utilizes SPSS® software to determine significant differences in contaminant concentrations among species and/or collection sites. The SALG risk assessors did not test hypotheses on differences among species from the DIS because all samples contained PCBs, and most were above the HAC_{nonca}. The SALG employed Microsoft Excel® spreadsheets to generate figures, to compute health-based assessment comparison values (HAC_{nonca}) for contaminants, and to calculate hazard quotients (HQ), hazard indices (HI), cancer risk probabilities, and meal consumption limits for fish from the DIS.[19] When lead data are of sufficient quality, concentration, and interest, the SALG utilizes the USEPA's Interactive Environmental Uptake Bio-Kinetic (IEUBK) model to determine whether consumption of lead-contaminated fish could cause children's blood lead (PbB) level to exceed the federally set 10 micrograms/deciliter.[20]

[a] "J-value" is standard laboratory nomenclature for analyte concentrations detected and reported, which reported concentration is an estimate, quantitation of which may be suspect and may not be reproducible. The DSHS treats J-Values as "not detected" in its statistical analyses of a sample set.

Derivation and Application of Health-Based Assessment Comparison Values (HAC_{nonca} or HAC_{ca})

The effects of exposure to any hazardous substance depend on the dose, the duration of exposure, the manner in which one is exposed, one's personal traits and habits, and whether other chemicals are present.[21] People who regularly consume contaminated fish or shellfish conceivably suffer repeated exposures to relatively low concentrations of contaminants over extended times. Such exposures are unlikely to result in acute toxicity but may increase risk of subtle, chronic, and/or delayed adverse health effects that include cancer, benign tumors, birth defects, infertility, blood disorders, brain damage, peripheral nerve damage, lung disease, and kidney disease, to name but a few.[21] Presuming people to eat a diet of diverse fish or shellfish from a water body if species variety is available, the DSHS routinely collapses data across species and sampling sites to evaluate mean contaminant concentrations of toxicants in all samples. This approach intuitively reflects consumers' likely exposure over time to contaminants in fish or shellfish from a water body, but may not reflect reality at a specific water body. The agency thus reserves the right to examine risks associated with ingestion of individual species of fish or shellfish from separate collection sites or at higher concentrations (e.g., the upper 95 percent confidence limit on the mean concentration. Confidence intervals are derived from Monte Carlo simulation techniques with software developed by Dr. Richard Beauchamp, of the DSHS).[22] The DSHS evaluates contaminants in fish by comparing the mean, and – when appropriate – the 95% upper confidence limit on the mean concentration of a contaminant to its HAC value (measured in milligrams of contaminant per kilogram of edible tissue – mg/kg) derived for non-cancer or cancer endpoints. To derive HAC values for systemic (HAC_{nonca}) effects, the department assumes a standard adult weighs 70 kilograms and that adults consume 30 grams of edible tissue per day (about one 8-ounce meal per week). The DSHS uses USEPA's oral RfDs[23] or the Agency for Toxic Substances and Disease Registry's (ATSDR) chronic oral minimal risk levels (MRLs)[24] to generate HAC values used in evaluating systemic (noncancerous) adverse health effects. The USEPA defines a contaminant's RfD as

> *An estimate of a daily oral exposure for a given duration to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime.*[25]

EPA also states that an RfD

> *… is derived from a BMDL* (benchmark dose lower confidence limit)*, a NOAEL* (no observed adverse effect level)*, a LOAEL* (lowest observed adverse effect level)*, or another suitable point of departure, with uncertainty/variability factors applied to reflect limitations of the data used. [Durations include acute, short-term, subchronic, and chronic and are defined individually in this glossary]"* and *"RfDs are generally reserved for health effects thought to have a threshold or a low dose limit for producing effects.*[25]

The ATSDR uses a similar technique to derive MRLs.[24] The DSHS compares the estimated daily dose (mg/kg/day) - derived from the mean of the measured concentrations of a

contaminant – to the contaminant's RfD or MRL, using HQ methodology as suggested by the USEPA.

A HQ, defined by the EPA, is

> *...the ratio of the estimated exposure dose of a contaminant (mg/kg/day) to the contaminant's RfD or MRL (mg/kg/day).*[26]

Note that a linear increase in the hazard quotients for a site or species usually does *not* represent a linear increase in the likelihood or severity of systemic adverse effects (i.e., a substance having an HQ of 2 is not twice as toxic as if the substance had an HQ of 1.0. Similarly, a substance with a HQ of 4 does not imply that adverse events will be four times more likely than a HQ of 1.0). As stated by the USEPA, a HQ (or an HI) of less than 1.0 "is no cause for concern, whereas an HQ (or HI) greater than 1.0 should indicate some cause for concern." Thus, risk managers at the DSHS utilize a HQ of 1.0 as a "jumping-off point," not for decisions concerning likelihood of occurrence of adverse systemic events, but as a point of departure for management decisions that assume, in a manner similar to EPA decisions, that fish or shellfish having a HQ of less than 1.0 are unlikely to be cause for concern. Since the chronic oral RfD derived by the USEPA represents chronic consumption, eating fish with a toxicant-to-RfD ratio (the HQ) of less than 1.0 is not likely to result in adverse health effects, whereas routine consumption of fish where the HQ for a specific chemical exceeds 1.0 represents a qualitatively unacceptable increase in the likelihood of systemic adverse health outcomes.

Although DSHS preferentially utilizes an RfD derived by federal scientists for each contaminant, should no RfD be available for a specific contaminant, the USEPA advises risk assessors to consider using an RfD determined for a contaminant of similar molecular structure, or mode or mechanism of action. For instance, DSHS – as specifically directed by the USEPA – uses the published reference dose for Aroclor 1254 to assess noncarcinogenic effects of Aroclor 1260, for which no reference dose is available – the USEPA has derived one other reference dose for Aroclors – that of Aroclor 1016. However, Aroclor 1016 is not as clearly like Aroclor 1260 as is Aroclor 1254. In the past, when DSHS had access only to the relatively crude measurement of Aroclors, the agency did not attempt to determine the dioxin equivalent toxicity of coplanar PCBs found in fish. The SALG recently adopted PCB congener analysis, as is suggested by the USEPA. This change in methodology allows the agency to identify coplanar or dioxin-like PCBs and to apply toxicity equivalency factors (TEFs) to PCBs in fish should SALG staff consider this a priority.

The constants (RfDs, MRLs) the DSHS employs to calculate HAC_{nonca} values are derived by federal agencies from the peer-reviewed literature (which the federal agencies routinely re-examine). These values incorporate built-in margins of safety called "uncertainty factors" or "safety factors" as mentioned in EPA reference materials.[25] In developing an oral RfD or MRL, federal scientists review the extant literature on the toxicant to determine an experimentally-derived NOAEL, a LOAEL, or, in some cases, a benchmark dose (BMD). Once the NOAEL, LOAEL, or BMD is determined, the scientist then utilizes uncertainty factors to minimize potential systemic adverse health effects in people exposed through consumption of contaminated materials. The uncertainty factors account for certain conditions that are

undetermined by the experimental data. The classic four uncertainty factors are (1) extrapolation from animals to humans (interspecies variability), (2) intra-human variability, (3) using a subchronic study rather than a chronic study to determine the NOAEL, LOAEL, or BMD, (4) using a LOAEL instead of a NOAEL to determine the RfD. Recently, a fifth uncertainty factor, (5) database insufficiencies for the toxicant, was added.[23] Vulnerable groups – women who are pregnant or lactating, women who may become pregnant, the elderly, infants, children, people with chronic illnesses, those with compromised immune systems, or those who consume exceptionally large servings, collectively called "sensitivities" by the EPA, also receive special consideration in calculations of the RfD.[25,27]

The SALG calculates cancer-risk comparison values (HAC_{ca}) from the EPA's CPFs – also known as SFs – derived through mathematical modeling of carcinogenicity studies. For carcinogenic outcomes, the DSHS calculates a theoretical lifetime excess risk of cancer for specific exposure scenarios for carcinogens, using a standard 70-kg body weight and assuming an adult consumes 30 grams of edible tissue per day. The SALG risk assessors incorporate two additional factors into determinations of theoretical lifetime excess cancer risk: (1) an acceptable lifetime risk level (ARL) [25] of one excess cancer case in 10,000 persons whose average daily exposure is equal and (2) daily exposure for 30 years. Comparison values used to assess the probability of cancer, thus, do not contain "uncertainty" factors as such. However, conclusions drawn from those probability determinations infer substantial safety margins for all people by virtue of the models utilized to derive the slope factors (cancer potency factors). For instance, the USEPA suggests the use of a tiered approach to determine the potency of PCB mixtures to cause cancer in exposed individuals. This approach depends on information available from the IRIS database.[17] Three tiers of carcinogen slope factors (SFs) used to assess the impact of environmental PCBs exist. The first tier, with an upper bound slope factor of 2.0 and a central tendency slope factor of 1.0, is used for PCBs with "high risk and persistence." Criteria for using this most restrictive slope factor include (1) exposure via food, (2) ingestion of sediment or soil, (3) inhalation of dust or aerosols (4) dermal exposure – if an absorption factor was applied – (5) the presence of dioxin-like, tumor-promoting, or persistent PCB congeners, and, perhaps most importantly, (6) the possibility of early-life exposure. Because the potential implications of early-life exposures include factors such as possibly greater perinatal sensitivity, or the likelihood of interactions between PCBs and normal functions (such as PCB-mediated depletion of thyroid hormones, an effect that can result in irreparable damage to the developing brain) of development, the USEPA concludes that early-life exposures may be associated with increased risks.[17] The DSHS, in agreement with the federal agency, utilizes the upper bound slope factor of the "high risk" tier for all exposures to PCBs in fish.

The calculated comparison values (HAC_{nonca} and HAC_{ca}) are quite conservative, so adverse systemic or carcinogenic health effects are unlikely to occur, even if exposures are consistently greater or last longer than those used to calculate comparison values. Moreover, comparison values for adverse health effects (systemic or carcinogenic) do not represent sharp dividing lines (bright-line divisions) between safe and unsafe exposures. The *perceived* strict demarcation between acceptable and unacceptable exposures or risks is primarily a tool to assist risk managers to make decisions that ensure protection of the public's health. For instance, the DSHS considers it unacceptable when consumption of four or fewer meals per month of contaminated fish or shellfish would result in exposure to contaminant(s) in excess of a HAC value or other

measure of risk even though most such exposures are unlikely to result in adverse health effects. The department further advises people who wish to minimize exposure to contaminants in fish or shellfish to eat a variety of fish and/or shellfish and to limit consumption of those species most likely to contain toxic contaminants. DSHS aims to protect vulnerable subpopulations with its consumption advice. The DSHS assumes that advice protective of vulnerable subgroups will also minimize the impact to the general population of consuming contaminated fish or shellfish.

Children's Health Considerations

The DSHS recognizes that fetuses, infants, and children may be uniquely susceptible to the effects of toxic chemicals and suggests that exceptional susceptibilities demand special attention.[28,29] Windows of special vulnerability; known as "critical developmental periods," exist during development. Critical periods occur particularly during early gestation (weeks 0 through 8), but can occur at any time during pregnancy, infancy, childhood, or adolescence – indeed, at any time during development – times when toxicants can impair or alter the structure or function of susceptible systems.[30] Unique early sensitivities may exist because organs and body systems are structurally or functionally immature – even at birth – continuing to develop throughout infancy, childhood, and adolescence. Developmental variables may influence the mechanisms or rates of absorption, metabolism, storage, or excretion of toxicants, any of which factors could alter the concentration of biologically effective toxicant at the target organ(s) or that could modulate target organ response to the toxicant. Children's exposures to toxicants may be more extensive than adults' exposures because, in proportion to their body weights, children consume more food and liquids than adults do, another factor that might alter the concentration of toxicant at the target. Infants can ingest toxicants through breast milk – an exposure pathway that often goes unrecognized (nonetheless, the advantages of breastfeeding outweigh the probability of significant exposure to infants through breast milk. Women are encouraged to continue breastfeeding and to limit exposure of their infants by limiting intake of the contaminated foodstuff). Children's behaviors (i.e., hand to mouth behaviors) might expose them to more toxicants or higher concentrations of a toxicant than adults.[31] Children may experience effects at a lower exposure dose than might adults because children's organs may be more sensitive to the effects of toxicants. Stated differently, children's systems could respond more extensively or with greater severity to a given dose than would an adult organ exposed to an equivalent dose of a toxicant. Children could be more prone to developing certain cancers from chemical exposures than are adults.[32] In any case, if a chemical – or a class of chemicals – is observed to be – or is thought to be – more toxic to the fetus, infants, or children than to adults, the constants (e.g., RfD, MRL, or CPF) are usually further modified to assure protection of the immature system's potentially greater susceptibility.[23] Additionally, in accordance with the ATSDR's *Child Health Initiative*[33] and the USEPA's *National Agenda to Protect Children's Health from Environmental Threats,*[34] (In recognition of the possibly greater vulnerability of children to harmful substances, USEPA has established the Office of Children's Health Protection (OCHP). The OCHP ensures that all standards set by USEPA will protect children from any heightened risks and that newly developed policies address children's health concerns)[35] the DSHS further seeks to protect children from the possible negative effects of toxicants in fish by suggesting that this potentially sensitive subgroup consume smaller quantities of contaminated fish or shellfish than adults consume. Thus, DSHS recommends that children weighing 35 kg or less and/or who are 11 years of age or younger limit exposure to contaminants in fish or shellfish by eating no more than four

ounces per meal of the contaminated species. The DSHS also recommends that consumers spread these meals over time. For instance, if the DSHS issues consumption advice that suggests consumption of no more than two meals per month of a contaminated species, those children should eat no more than 24 meals of the contaminated fish or shellfish per year and, ideally, should not eat such fish or shellfish more than twice per month.

RESULTS

Laboratory Analytical Results

The GERG laboratory submitted electronic copies of the analytical results on fish from the DIS (Donna Canal and Donna Reservoir) to the SALG between December 2005 and February 2006. As SALG requested, the laboratory analyzed 30 fish for pesticides, metal-like constituents and for PCBs. The laboratory reported data for VOCs and SVOCs measured in five samples. Information about the samples is presented in Table 1.

Inorganic Contaminants

Arsenic, Cadmium, Copper, Mercury, Lead, Selenium, Zinc

Samples from the DIS contained no detectable arsenic or cadmium (data not shown). Inorganic contaminants present at measurable levels in one or more fish from the DIS included copper, mercury, lead, selenium, and zinc (Table 2). Six of 30 fish contained some level of lead. Four fish contained measurable quantities of lead; two contained estimated concentrations. The remaining 24 fish were reported only as "less than the reporting limit" for the sample.

The laboratory reported mercury in 30 fish tissues (Table 2). The average mercury concentration in all fish combined was 0.229±0.112 mg/kg. The highest mercury value in the sample data set was 0.467 mg/kg (Table 2). One sample contained an estimated concentration of mercury (a J-value).

Copper, selenium, and zinc are all essential nutrients. Thirty of 30 samples contained copper. The mean copper concentration for all fish was 0.271±0.258 mg/kg. The minimum concentration of copper (reported below the detection limit as a J-value) was 0.041 mg/kg and the maximum concentration was.0.916 mg/kg. Selenium and zinc were present in all fish, as is often observed (Table 2). Average selenium concentration across all fish was 0.547±0.135 mg/kg, ranging from 0.268-0.931mg/kg (Table 2). The mean zinc concentration was 5.766±2.601 mg/kg with a spread of2.364 to 13.261 mg/kg (Table 2).

Organic Contaminants

The GERG laboratory analyzed 30 fish tissue samples from the DIS for commonplace and/or legacy pesticides and PCBs. The laboratory also analyzed five of the samples for SVOCs and VOCs.

Pesticides

The laboratory analyzed fish tissue from the DIS for 34 pesticides representing legacy and/or major pesticide groups such as organochlorines, organophosphates, and carbamates. The following pesticides were observed at some levels in one or more fish.

Organophosphates were reported present in fish from the DIS. All but one sample from the 2005-2006 DIS dataset contained trace quantities of 4,4'-DDD; 22 samples had estimated concentrations (J-values) below the laboratory's reporting limit. Seven fish had measurable concentrations of 4,4'-DDD. One sample contained no detectable 4,4'-DDD. All samples contained 4,4'-DDE (minimum value to maximum value = 0.005 mg/kg-1.432 mg/kg). Four samples contained 4,4'-DDT, two at estimated (J-value) concentrations and two as measured concentrations. Other samples (26 fish) did not contain detectable 4,4'-DDT, according to the laboratory report. 2,4'-DDD, DDE, and DDT were present in a number of samples but are not addressed in this report because EPA has not established RfDs or cancer slope factors for these isomers of DDT, it's metabolites, or breakdown products. The procedural blanks revealed no 4,4'-DDT, 4,4'-DDE, or 4,4'-DDT.

Measurable concentrations of chlordane were reported present in seven samples (0.014 mg/kg± 0.021 mg/kg). Fourteen samples contained chlordane at detectable concentrations below the analytical method detection limit (MDL). Nine samples had detectable, but not quantifiable chlordane (reported only as < the MDL). The laboratory does not utilize chlordane in its quality control (QC) procedure.

Three fish tissues contained estimated concentrations of the organochlorine pesticide chlorpyrifos. One sample had a measurable 0.0146 mg/kg chlorpyrifos. Twenty-six samples contained chlorpyrifos at some concentration below the laboratory MDL.

Another organochlorine, dacthal, was also present in fish from the DIS. All 30 samples contained some level of dacthal. Twenty samples contained estimated (J-values) of dacthal, while ten samples contained measurable concentrations of Dacthal (0.015±0.024 mg/kg, ranging from 0.0012 to 0.062 mg/kg). Twenty samples contained Dacthal at levels below the laboratory's reporting limit.

One sample (DIC15, a common carp) contained traces of 1,2,3,4-tetrachlorobenzene and 1,2,3,5-tetrahlorobenzene. The laboratory reported no other pesticides in any sample from the DIS.

Volatile Organic Compounds (VOCs)

Four of five fish tested for VOCs contained acetone at levels below the laboratory's MDL; one fish, a common carp contained a quantifiable level of acetone (5.22 mg/kg; MDL = 0.200 mg/kg). Four of five samples contained quantifiable methylene chloride. Although the reporting limit for methylene chloride is 0.050 mg/kg, these levels were around 0.032 mg/kg – below the MDL. One fish contained an estimated concentration of a magnitude similar to those reported as firm measurements. A single fish contained a trace of benzene (0.001 mg/kg, MDL=0.020 mg/kg). Toluene was present at estimated levels (below the MDL) in four fish. All five fish contained naphthalene, three at levels above the MDL (0.020 mg/kg).The average concentration of naphthalene in the five fish was 0.031 mg/kg However, acetone, methylene chloride, and naphthalene were also identified in the procedural blanks, an indication, perhaps, of handling or laboratory contamination. When these contaminants were identified in the samples, they were usually equal to, or higher than those of the procedural blank were. It is possible these contaminants could have been byproducts of sample necrosis (data not presented).

Semi-volatile Organic Compounds (SVOCs)

No SVOCs were present in any fish at levels above the laboratory's MDL, although some SVOCs occurred sporadically at levels below the MDLs. All five fish contained one or more phthalate esters: diethylphthalate, di-n-butyl phthalate, and/or di-(2-ethylhexyl) phthalate, albeit at low levels. The procedural blank contained all three phthalates at levels similar to or higher than the samples. Three fish contained traces of dibenz(a,h)anthracene. The procedural blank contained this substance at a level higher than the sample concentrations. One fish also contained a trace of 3-methylcholanthrene, as did the procedural blank. Both compounds are polycyclic aromatic hydrocarbons (PAHs), common sources of which include asphalt sealers, shampoos, medications, roofing materials, and other tar-like materials. Finally, four fish contained marginal levels of phenol (estimated concentrations below the MDL for phenol). The laboratory reported no phenol in the procedural blank. The authors did not present data for these sporadic and low SVOCs.

Polychlorinated Biphenyls (PCBs)

For the DIS, the present study marks the first analysis of PCB congeners instead of analysis of samples for Aroclors®. Thus, the reader should not compare PCB levels among this and previous risk characterizations for the DIS. As described in the methods section, the survey team collected fish for PCBs from five sites within the DIS: Three sites were within the canal system and two were within Donna Reservoirs, one in the West Reservoir and one in the East Reservoir.

Representatives of five fish species were collected from five sites within the DIS. Survey staff did not collect all species from each site. Table 3 presents PCB concentration in each species at each site. Table 3 also gives the average concentration of PCBs at each site. SALG staff noted that the highest PCB concentrations tended to cluster about Canal Site 2. Canal Sites 1 and 3, Reservoir West Site 4, and Reservoir East Site 5 had much lower concentrations of PCBs than did Canal Site 2.

The PCB data from this site could be further partitioned to illustrate species at each site contained the highest PCB concentrations. Risk assessors cannot know a person is fishing sites or how many different species a fisher might collect from each site. However, most species at each site contained some level of PCBs. Therefore, any fisher could choose to eat any number of species from any site recently sampled. Nonetheless, visual inspection of the data suggested that PCBs were at their highest concentrations in fish collected near Canal Site 2, with a gradient in both directions from this site. Canal Site 1, closest to the Rio Grande, has the lowest average concentration of PCBs. The gradient is as follows- from highest PCB concentrations to lowest: Canal Site 2 > Canal Site 3 > Reservoir Site 4 >Reservoir Site 5> Canal Site 1.

Assuming fish containing the highest concentrations of PCB to have accumulated those PCBs from areas having the highest PCB concentrations in dissolved solids, [3] the partitioned data could assist the USGS [3] and other agencies to definitively locate the elusive source of PCBs in the DIS.

DISCUSSION

Risk Characterization

The actual risk of adverse health outcomes from exposure to toxicants based on experimental or epidemiological data is subject to the known variability of individual and population responses. Thus, calculated risks can be orders of magnitude above or below the actual risks of systemic or local effects of toxicants. The variability depends upon many factors: the target organ; the species of animal used in the study; different exposure periods; different doses; or other variations in conditions.[23] Nevertheless, the DSHS calculated a number of risk parameters for potential toxicity to humans who consume contaminated fish from the DIS. Conclusions and recommendations predicated upon the stated goal of the DSHS to protect human health follow this discussion of findings.

Characterization of Possible Systemic (Noncancerous) Health Effects Related to Consumption of Fish from the Donna Irrigation System

The RfD for PCBs – the primary contaminant of concern in the DIS – comes from the findings of ocular exudates, inflamed and prominent Meibomian glands, distorted growth of finger and toenails, decreased antibody (IgG and IgM) response to sheep erythrocytes in clinical and immunologic studies conducted in monkeys.[36] The LOAEL was 0.005 mg/kg-day. Researchers applied several uncertainty factors: a full factor of 10 for intra-human variability (sensitive subgroups), a factor of three to account for extrapolation to humans from monkeys. To account for use of a subchronic study (approximately 25% of the animal's life); an uncertainty factor (UF) of three was used. Risk assessors at the federal level used a minimal LOAEL to determine the RfD, using a partial uncertainty factor of approximately 3.3. The composite uncertainty factor was 300. The modifying factor was 1.0. To calculate the RfD for Aroclor 1254, use the following:

$$RfD = LOAEL \div UFs * MF$$

Therefore, the RfD for Aroclor 1254 is

$$0.005 \div 300 * 1.0 = 0.00002 \text{ mg/kg-day (2E-05 mg/kg-day).}$$

Using the SALG's assumptions, the HAC_{nonca} for systemic effects for Aroclor 1254 is 0.047 mg/kg (mg Aroclor per kg of edible tissue). Risk assessors derive hazard quotients from the toxic substance's RfD or MRL and that substance's measured concentration in tissue, as described earlier. Table 4 contains hazard quotients for each species of fish examined at the DIS. Since PCBs were the only contaminants of concern in fish collected in 2005 from the DIS to exceed a HAC value, the HQs in Table 4 refer only to PCBs. Even though one cannot assume a linear relationship for HQs, one observes from this table that HQs are greater than 1.0 by a large margin for some fish (smallmouth buffalo, channel catfish, and common carp), while for others (largemouth bass, freshwater drum) the margin is not so different from 1.0. Nonetheless, all HQs are greater than 1.0, suggesting that all species from this reservoir have some potential to harm those who regularly consume fish from the DIS. The DSHS interprets this table as evidence of a continuing danger to those who regularly eat fish from the DIS and for continuing the possession ban in force for this water body.

Characterization of Excess Lifetime Cancer Risk from Consumption of Fish from the Donna Irrigation System

Table 5 outlines the probability of cancer from regular, long-term, or, perhaps, repeatedly large meals of one or more fish species collected from the DIS, containing the calculated probability of one excess cancer in X number of people exposed to PCBs in different species of fish from the DIS. The probability that DSHS utilizes to make risk management decisions about fish or shellfish contaminated with chemicals that have carcinogenic potential is 1 excess cancer in 10,000 equally exposed people. Only largemouth bass and freshwater drum do not exceed a 1 in 10,000 calculated theoretical lifetime risk of cancer (Table 5). This finding indicates that three fish species from the DIS contain PCBs at concentrations that may be capable of causing or contributing to cancer in people who regularly consume these fish. Although two species that do not exceed the cancer risk level used by the DSHS to ensure protection of public health (largemouth bass and freshwater drum), these species may already pose a hazard to health from the noncarcinogenic or systemic effects of long-term, low-level consumption of PCBs present in these fish.

Characterization of Cumulative Systemic Health Effects and Cumulative Excess Lifetime Cancer Risk from Consumption of Fish from the Donna Irrigation System

Because only one contaminant (PCBs) occurred in fish from the DIS at concentrations approaching or exceeding DSHS' health-based guidelines for protection of human health, the SALG determined it neither necessary nor possible to accurately predict or determine cumulative effects from consuming multiple chemicals in one or more species of fish from the DIS. If more than one contaminant of concern acting on the same target organ, by the same mode or mechanism of action, or that caused cancer had reached biological or toxicological significance, SALG risk assessors would have discussed those cumulative effects in this document.

CONCLUSIONS

SALG risk assessors prepare risk characterizations to determine public health hazards from consumption of fish and shellfish harvested from Texas water bodies by recreational or subsistence fishers, and – if indicated – may suggest strategies for reducing risk to the health of those who eat contaminated fish or seafood to risk managers at DSHS, including the Texas Commissioner of Health.

The primary reason for conducting this study was to re-assess the potential risks to public health from consuming fish from the DIS, a body of water that has a long history of PCB contamination, only one example of which is PCB-contaminated fish. Risk assessors from the SALG and the Environmental and Injury Epidemiology and Toxicology Branch (EIETB) confirmed that PCBs in several species from the DIS exceed the HAC_{nonca} or the HAC_{ca} for PCBs. All samples contained some PCBs. Fish from the DIS contained no other contaminants at concentrations that would be expected to be of importance to human health if consumed over the long term or in large quantities. Thus, risk assessors from the SALG and the EIETB conclude from this characterization of risks possibly associated with consuming fish from the DIS

1. That all fish sampled species from the DIS contain PCBs at levels exceeding those concentrations used by the DSHS to ensure protection of public health from adverse systemic health effects of these contaminants. Although some species from some sites appear not to contain high concentrations of PCBs, this finding is not consistent, meaning the fish could previously been in waters the sediment of which were heavily contaminated with PCBs, having lately traveled to the collection site. Therefore, consumption of any of the sampled fish species and, presumably all fish species from the DIS continues to **pose an apparent hazard to human health**, systemic adverse health effects being the more sensitive endpoint in the SALG calculations of the likelihood of adverse health outcomes from consuming contaminated fish or shellfish. Additionally, consumption of channel catfish, common carp, and smallmouth buffalo from the DIS, heavily contaminated with PCBs, markedly increases the calculated lifetime excess risk of cancer in people eating these fish.

2. That cumulative adverse health effects from consuming fish from the DIS are not likely. Fish from the DIS do not contain concentrations of metal-like contaminants, VOCs, or SVOCs at concentrations in excess of DSHS guidelines for protection of human health. In fact, with the exception of metallic contaminants – which frequently were present in low, presumably nontoxic concentrations – contaminants of other chemical classes were present only sporadically and in low concentrations. Therefore, consumption of fish containing these compounds in addition to PCBs should not increase the risk to human health already posed by the PCBs. To reiterate: metalloid contaminants, VOCs and SVOCs observed in fish from the DIS are not likely to **pose no apparent human health hazard**, even when consumed along with PCBs in fish from the DIS.

3. That fish from the DIS do not appear to contain organochlorine pesticides at concentrations of significance to human health. Therefore, consumption of fish

containing only these pesticides at levels observed in sample tissues – were that possible – would **pose no apparent human health hazard.**

RECOMMENDATIONS

Risk managers at the DSHS have established criteria for issuing fish consumption advisories based on approaches suggested by the USEPA.[10, 16] If a risk characterization confirms that people can eat four, or fewer than four, meals per month (adults: eight ounces per meal; children: four ounces per meal) of fish or shellfish from the water body under investigation could lead risk managers at DSHS to recommend consumption advice for fish or shellfish from that water body. Alternatively, the department may ban possession of fish from the affected water body. Fish or shellfish possession bans are enforceable under subchapter D of the Texas Health and Safety Code, part 436.061(a).[37]. Declarations of prohibited harvesting areas are enforceable under the Texas Health and Safety Code, Subchapter D, parts 436.091 and 436.101.[37] DSHS consumption advice carries no penalty for noncompliance. Consumption advisories, instead, inform the public of potential health hazards from consuming contaminated fish or shellfish from Texas waters. With this information, members of the public can make informed decisions about whether – and how much – contaminated fish or shellfish they wish to consume. Risk assessors from the SALG and the EIETB conclude from this risk characterization that consuming fish from the DIS apparently **poses a continuing public health hazard**. Based on these observations, the SALG and the EIETB recommend

1. That the DSHS continues to enforce AL-9 – which bans possession of fish from the DIS and that is currently in force for this water body because every sampled fish species contained PCBs in concentrations that could increase the likelihood of experiencing adverse systemic health outcomes. Additionally, several sampled species contained PCBs at concentrations high enough to increase the theoretical lifetime excess risk of cancer if eaten regularly or in bulk.

2. That the DSHS continues to monitor fish from the DIS for PCBs until these contaminants decrease to a level, consumption of which would likely not interfere with the health of those consuming such fish.

3. That the DSHS analyze fish from the DIS for dioxins and furans.

PUBLIC HEALTH ACTION PLAN

Communication to the public of new and continuing possession bans or consumption advisories – or the removal of either – are essential to effective management of risk from consuming contaminated fish. In fulfillment of the responsibility for communication, the Texas Department of State Health Services (DSHS) takes several steps. The agency irregularly publishes fish consumption advisories and bans in a booklet available to the public through the Seafood and Aquatic Life Group (SALG). To receive the booklet and/or the data, please contact the SALG at 1-512-834-6757.[38] The SALG also posts the most current information about advisories, bans, and the repeal of such on the Internet at http://www.dshs.state.tx.us/seafood. The SALG regularly

updates this web site. The Texas Department of State Health Services also provides the U.S. Environmental Protection Agency (http://epa.gov/waterscience/fish/advisories/), the Texas Commission on Environmental Quality (TCEQ; http://www.tceq.state.tx.us), and the Texas Parks and Wildlife Department (TPWD; http://www.tpwd.state.tx.us) with information on all consumption advisories and possession bans. Each year, the TPWD informs the fishing and hunting public of consumption advisories and fishing bans on it's Web site and in an official hunting and fishing regulations booklet available at many state parks and at all establishments selling Texas fishing licenses.[39] Readers may direct questions about the scientific information or recommendations in this risk characterization to risk managers at the (SALG) at 512-834-6757 or may find the information at the SALG's website (http://www.dshs.state.tx.us/). Secondarily, one may address inquiries to the Environmental and Injury Epidemiology and Toxicology Branch of the Department of State Health Services (512-458-7269). The EPA's IRIS Web site (http://www.epa.gov/iris/) contains much information on environmental contaminants found in food and environmental media. The Agency for Toxic Substances and Disease Registry (ATSDR), Division of Toxicology (888-42-ATSDR or 888-422-8737 or the ATSDR's Web site (http://www.atsdr.cde.gov) supplies brief information via ToxFAQs.® ToxFAQs are available on the ATSDR website in either English http://www.atsdr.cdc.gov/toxfaq.html) or Spanish (http://www.atsdr.cdc.gov/es/toxfaqs/es_toxfaqs.html). The ATSDR also publishes more in-depth reviews of many toxic substances in its *Toxicological Profiles.* To request a copy of available *Toxicological Profiles*, readers may telephone the ATSDR at 1-404-498-0261 or email requests to atsdric@cdc.gov. Many *Toxicological Profiles* are also available for downloading at ATSDR's website.

TABLES

Table 1. Fish samples collected from five sites within the Donna Irrigation System in December 2005 and January 2006.

Sample Number	Species	Length (mm)	Weight (g)
Site 1 Donna Irrigation Canal			
DIC40	Common Carp	647	3501
DIC41	Common Carp	520	2283
DIC42	Largemouth Bass	358	737
DIC43	Largemouth Bass	362	723
DIC44	Smallmouth Buffalo	673	5244
Site 2 Donna Irrigation Canal			
DIC24	Largemouth Bass	406	1163
DIC25	Common Carp	553	2294
DIC26	Largemouth Bass	382	858
DIC27	Largemouth Bass	364	717
DIC12	Largemouth Bass	445	1127
DIC15	Common Carp	535	1919
DIC28	Channel Catfish	399	684
DIC29	Smallmouth Buffalo	735	6612
DIC30	Common Carp	647	3640
DIC31	Smallmouth Buffalo	655	4902
Site 3 Donna Irrigation Canal			
DIC18	Freshwater Drum	450	1133
DIC20	Largemouth Bass	371	698
DIC21	Common Carp	582	2905
DIC22	Common Carp	550	2237
DIC23	Largemouth Bass	368	882
Site 4 Donna Irrigation Canal			
DIC1	Channel Catfish	357	405
DIC2	Largemouth Bass	434	1479
DIC3	Largemouth Bass	415	1498
DIC4	Largemouth Bass	397	1278
DIC5	Common Carp	660	4082
Site 5 Donna Irrigation Canal			
DIC6	Largemouth Bass	438	1445
DIC7	Freshwater Drum	487	1783
DIC8	Freshwater Drum	455	1268
DIC9	Common Carp	595	2179
DIC10	Common Carp	622	3410

Table 2. Inorganic Contaminants (mg/kg) in Fish Collected in December 2005 and January 2006 from the Donna Irrigation System.

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
Copper				
Channel catfish	2/2	0.202±0.073 (0.150, 0.253)	333	National Academy of Science Upper Limit: 0.143 mg/kg-day
Common carp	10/10	0.479±0.232 (0.157-0.811)		
Freshwater drum	3/3	0.061±0.026 (BDL[c]-0.091)		
Largemouth bass	12/12	0.149±0.246 (BDL-0.916)		
Smallmouth buffalo	3/3	0.317±0.091 (0.231-0.413)		
All Fish Combined	30/30	0.271±0.258 (BDL-0.916)		
Lead				
Channel catfish	1/2	0.076±0.047 (ND[d]-0.109)	0.6	USEPA IEUBKwin
Common carp	2/10	0.070±0.076 (ND-0.285)		
Freshwater Drum	0/3	ND		
Largemouth bass	1/12	0.045±0.003 (ND-BDL)		
Smallmouth buffalo	2/3	0.324±0.327 (ND-0.692)		
All fish combined	6/30	0.083±0.127 (ND-0.692)		
Mercury				
Channel catfish	2/2	0.126±0.126 (0.108,0.143)	0.7	ATSDR chronic oral MRL: 0.0003 mg/kg-day
Common carp	10/10	0.212±0.137 (BDL-0.467)		
Freshwater drum,	3/3	0.158±0.053 (0.098-0.194		
Largemouth bass	12/12	0.246±0.084 (0.165-0.453)		
Smallmouth buffalo	3/3	0.358±0.093 (0.252-0.427)		
All Fish Combined	30/30	0.229±0.112 (BDL-0.467)		
Selenium				
Channel catfish	2/2	0.315±0.066 (0.268,0.361)	6	EPA chronic oral RfD: 0 .005 mg/kg day
Common carp	10/10	0.666±0.113 (0.496-0.931)		

[b] *Derived from the MRL or RfD for noncarcinogens or the USEPA slope factor for carcinogens; assumes a body weight of 70 kg, and a consumption rate of 30 grams per day, and assumes a 30-year exposure period for carcinogens and an excess lifetime cancer risk of $1x10^{-4}$.*
[c] *BDL: Below Detection Limit— Estimated concentrations reported were less than the laboratory's method detection limit (J-values).*
[d] *ND: Not Detected above the method detection limit or reporting limit (method specific).*

Table 2. Inorganic Contaminants (mg/kg) in Fish Collected in December 2005 and January 2006 from the Donna Irrigation System.

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
Selenium, continued				
Freshwater drum	3/3	0.504±0.042 (0.457-0.538)		ATSDR chronic oral MRL: 0.005 mg/kg–day NAS UL: 0.400 mg/day (0.005 mg/kg–day) RfD or MRL/2: (0.005 mg/kg–day/2= 0.0025 mg/kg–day) to account for other sources of selenium in the diet
Largemouth bass	12/12	0.476±0.074 (0.379-0.640)		
Smallmouth buffalo	3/3	0.632±0.064 (0.573-0.700)		
All Fish Combined	30/30	0.547±0.135 (0.268-0.931)		
Zinc				
Channel catfish	2/2	5.312±0.599 (4.888,5.735)	700	EPA chronic oral RfD: 0.3 mg/kg–day
Common carp	10/10	8.391±2.845 (5.140-13.261)		
Freshwater drum	3/3	3.193±0.742 (2.364-3.797)		
Largemouth bass	12/12	4.516±0.9269 (3.220-6.138)		
Smallmouth buffalo	3/3	4.894±1.053 (3.838-5.943)		
All Fish Combined	30/30	5.766±2.601 (2.364-13.261)		

Table 3. Polychlorinated Biphenyls (PCBs) (mg/kg) in Fish by Species and Site from Donna Irrigation System, 2005-2006.

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
Site 1 (Donna Canal SH 281)				
Common carp	2/2	0.012 ± 0.003 (0.010-0.014)	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg–day EPA slope factor: 2.0 per mg/kg–day
Largemouth bass	2/2	BDL[c]		
Smallmouth buffalo	1/1	**0.049**		
All Sampled Fish, Site 1	5/5	0.018 ± 0.018 (BDL-0.049)		
Site 2 (Donna Canal Siphon Outlet)				
Channel catfish	1/1	**2.509**	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg–day EPA slope factor: 2.0 per mg/kg–day
Common carp	3/3	**3.777** ± 5.202 (0.129-9.733)		
Largemouth bass	4/4	**0.195** ± 0.159 (BDL-0.401)		
Smallmouth buffalo	2/2	**13.782** ± 9.002 (7.417-20.148)		
All Sampled Fish, Site 2	10/10	**4.219**± 6.553 (BDL-20.148)		
Site 3 (Donna Canal FM 1423)				
Common carp	2/2	**1.276** ± 1.063 (0.524-2.027)	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg–day EPA slope factor: 2.0 per mg/kg–day
Freshwater drum	1/1	**0.175**		
Largemouth bass	2/2	**0.056** ± 0.035 (0.032-0.081)		
All Sampled Fish, Site 3	5/5	**0.568** ±0.838 (0.032-2.027)		
Site 4 (Donna Reservoir West)				
Channel catfish	1/1	**0.057**	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg–day EPA slope factor: 2.0 per mg/kg–day
Common carp	1/1	0.043		
Largemouth bass	3/3	**0.052** ± 0.012 (0.039-0.063)		
All Sampled Fish, Site 4	5/5	**0.051** ± 0.010 (0.039-0.063)		
Site 5 (Donna Reservoir East)				
Common carp	2/2	0.031 ± 0.010 (0.024-0.038)	0.047 0.272	EPA chronic oral RfD: 0.00002 mg/kg–day EPA slope factor: 2.0 per mg/kg–day
Freshwater drum	2/2	BDL		
Largemouth bass	1/1	0.023		
All Sampled Fish, Site 5	5/5	0.025 ± 0.007 (BDL-0.038)		

Table 3 continued. Polychlorinated Biphenyls (PCBs) (mg/kg) in Fish by Species from Donna Irrigation System, 2005-2006.

Contaminant	# Detected/ # Sampled	Mean Concentration ± S.D. (Min-Max)	Health Assessment Comparison Value (mg/kg)[b]	Basis for Comparison Value
All Sites (Sample Sites Combined)				
Channel catfish	2/2	1.283 ± 1.734 (0.057-2.509)		
Common carp	10/10	1.401 ± 3.012 (0.010-9.733)		
Freshwater drum	3/3	0.072 ± 0.089 (BDL– 0.175)	0.047	EPA chronic oral RfD: 0.00002 mg/kg-day
Largemouth bass	12/12	0.090 ± 0.115 (BDL-0.401)	0.272	EPA slope factor: 2.0 per mg/kg-day
Smallmouth buffalo	3/3	9.205 ± 10.168 (0.049-20.148)		
All Sampled Fish, All Sites	30/30	1.516 ± 4.152 (BDL-20.148)		

Table 4. Hazard quotients (HQ) for PCBs in fish Collected from Lake The Donna Irrigation System in 2005-2006 along with suggested consumption rates for adults eating fish (8-oz per meal) containing PCBs at concentrations near those found in these samples.[e]

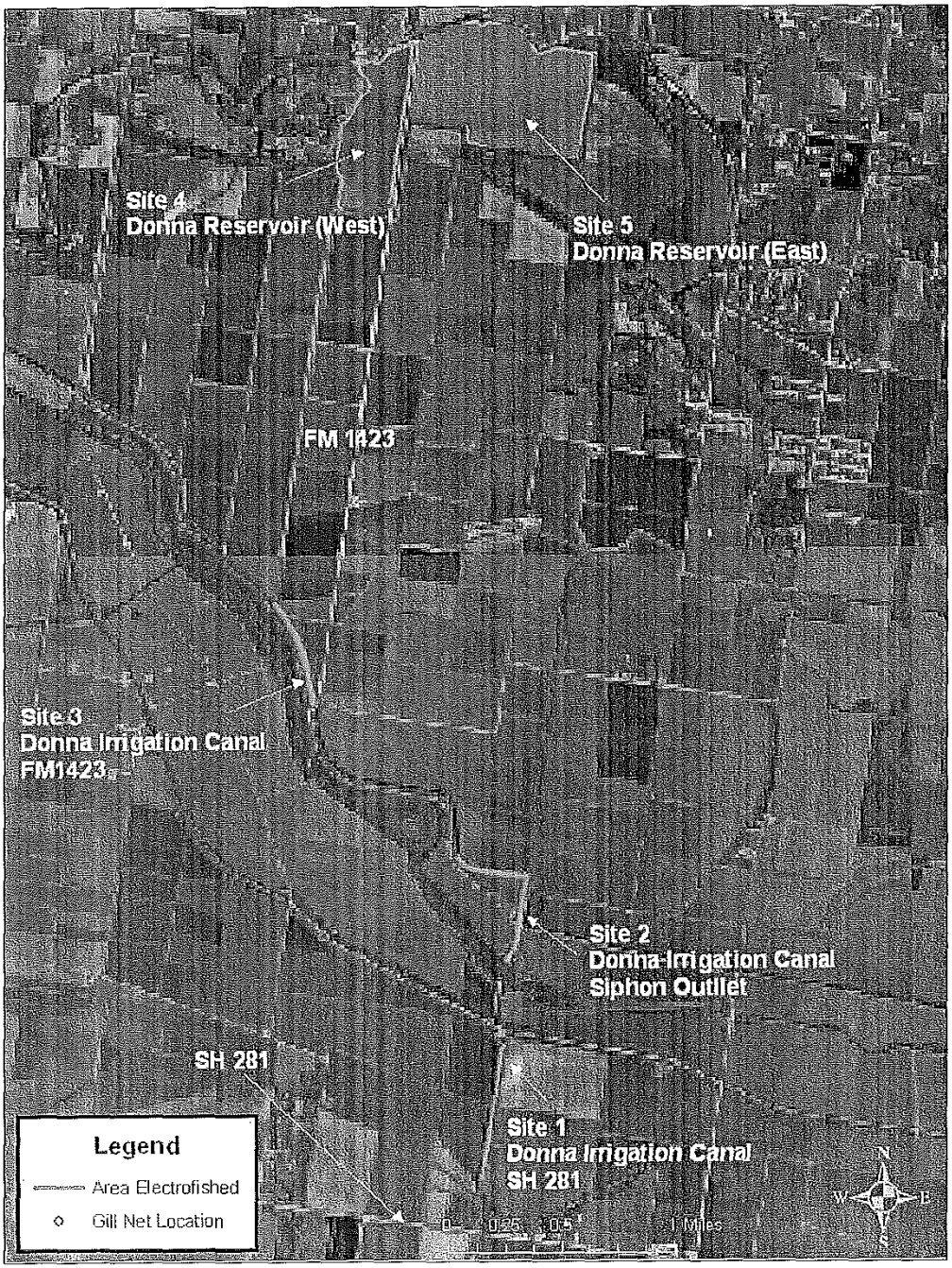
Species	Hazard Quotient	Meals per Week
Channel catfish	27.5	0.0
Common carp	30.0	0.0
Freshwater drum	1.5	0.6
Largemouth bass	1.9	0.5
Smallmouth buffalo	197.2	0.0
All Fish Combined	32.5	0.0

[e] *DSHS assumes that children under the age of 12 years and/or those who weigh less than 35 kg eat 4-ounce meals.*

Table 5. Theoretical lifetime excess cancer risk for each PCB-contaminated species collected in 2005 from the Donna Irrigation System along with suggested weekly (8 oz per meal) consumption rates for 70-kg adults who eat each species of fish.[e]

Species/Contaminant	Theoretical Lifetime Excess Cancer Risk		Meals per Week
	Risk	1 excess cancer per number of people exposed	
Channel catfish	**4.7E-04**	**2122**	**0.2**
Common carp	**5.1E-04**	**1943**	**0.2**
Freshwater drum	2.6E-05	37809	3.5
Largemouth bass	3.3E-05	30047	2.8
Smallmouth buffalo	**3.4E-03**	**296**	**0.0**
All Fish Combined	**4.4E-03**	**226**	**0.2**

Figure 1. Donna Irrigation System Sample Site Map



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[38] [DSHS] Department of State Health Services, Austin, TX. Fish Consumption Advisories and Bans. Seafood Safety Division. Austin, Texas: 2004.

[39] [TPWD] Texas Parks and Wildlife Department. 2006-2007 Outdoor Annual: hunting and fishing regulations. Ed. J. Jefferson. Texas Monthly Custom Publishing, a division of Texas Monthly, Inc. 2006.

ATTACHMENT 5

USGS Fact Sheet 016-02 (April 2002)

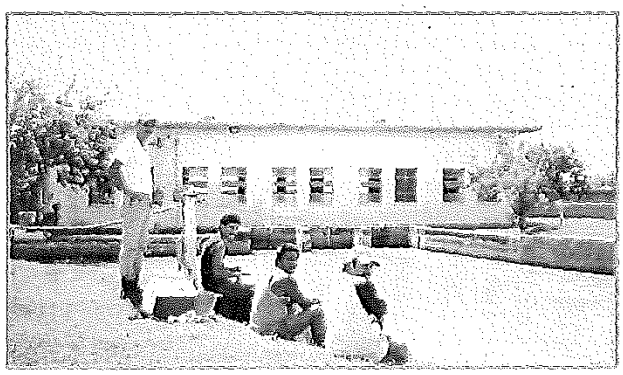
USGS
science for a changing world

In cooperation with the Texas Natural Resource Conservation Commission

Occurrence of Polychlorinated Biphenyls (PCBs) on Suspended Sediment in the Donna Canal, Hidalgo County, Texas, 1999–2001

Some fish in the Donna Canal contain PCBs at levels that might pose a risk to human health if the fish are eaten. Early attempts to locate the source of PCBs in the canal were unsuccessful. An innovative method of sampling and analyzing suspended sediment helped scientists detect PCBs in suspended sediment and narrowed the probable PCB source area(s) from the entire 11-kilometer canal to a 600-meter reach.

The Donna Canal is a popular fishing spot for residents of Hidalgo County. The 11.3-kilometer-long irrigation canal and water-supply system is home to some of the best bass and catfish angling in the Rio Grande Valley of South Texas, and fish from the Donna Canal often end up on dinner tables. The fish, however, might be contaminated with PCBs, a group of toxic and carcinogenic (cancer-causing) compounds. PCBs are hydrophobic (meaning "water fearing"). These kinds of chemicals do not dissolve in water but instead adsorb to sediment and become incorporated into animal tissue. Small animals living in or around sediment contaminated with PCBs accumulate these toxic chemicals in their bodies. These creatures are eaten by other animals, which concentrate the PCBs in their tissue, and in this way, PCBs work their way up the food chain. Often the final consumers and concentrators of PCBs are humans.



Local fishermen at the Donna Canal pumphouse.

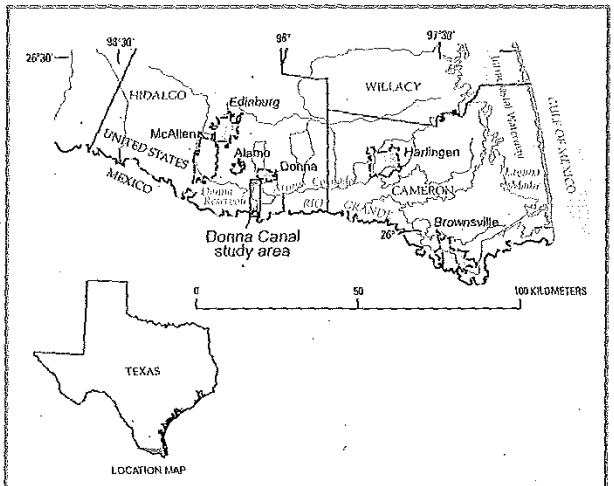


Figure 1. Location of the Donna Canal study area.

Water is pumped from the Rio Grande into the Donna Canal at an average rate of about 3.4 cubic meters per second. The Donna Canal carries the water north by simple gravity flow. The water from the canal is used for irrigation of nearby farmland. On its way north, the canal carries the water underneath a perennial stream, the Arroyo Colorado, by way of an underground siphon. The Donna Canal ultimately flows into Donna Reservoir, which supplies drinking water to the nearby municipalities of Donna and Alamo.

PCBs in the Donna Canal were first detected in 1993 by the U.S. Environmental Protection Agency (USEPA) during an environmental study of the Lower Rio Grande Valley. As part of the study, the USEPA tested samples of cooked fish from nine representative households, as well as samples of blood and urine from the individuals who consumed the fish. One carp fillet from a fish reportedly caught in the Donna Canal had a PCB concentration of 399 milligrams per kilogram, more than 1,500 times higher than the concentration thought to pose a health risk to an adult (U.S. Environmental Protection Agency, 1994). The individuals who consumed the fish had elevated levels of PCBs in their blood.

During 1994–2000, the Texas Department of Health (TDH) and the Texas Natural Resource Conservation Commission (TNRCC) sampled more fish and found many with elevated concentrations of PCBs, although none were as high as those in

the first fish analyzed in 1993 by the USEPA. The risk of cancer was calculated to be 1 in 174 for adults consuming two 8-ounce meals per week of fish caught from the Donna Canal (Buchanan, 1997). Possession of fish from the Donna Canal was banned while the TDH and the TNRCC tried to find the source of the PCBs.

During 1994–97, more than 75 samples of water and bed sediment from the canal, the reservoir, surrounding reservoirs, the Rio Grande, public water supplies, and a ground-water monitoring well were analyzed. The only PCB detection was in a sample from a drainage ditch 0.3 kilometer from the canal (Webster and others, 1998).

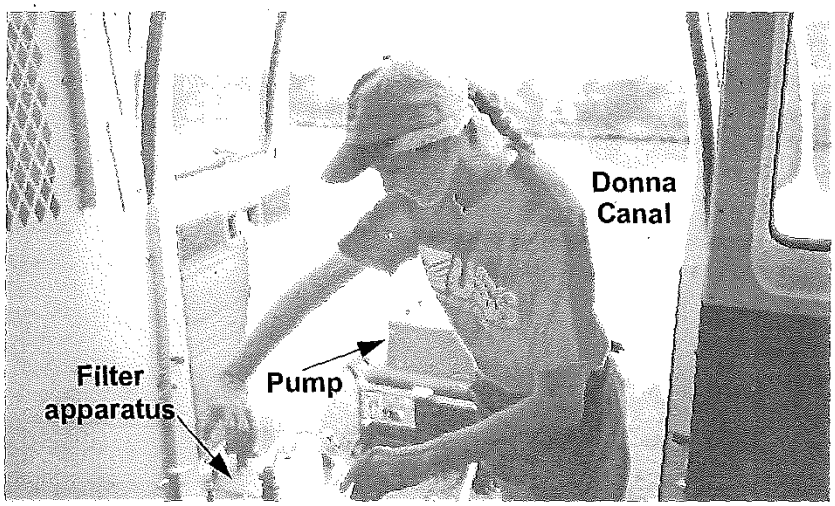
In 1997, the TNRCC asked the U.S. Geological Survey (USGS) for assistance in detecting the source of the PCBs. This report summarizes the results of the USGS investigation.

Sampling of Suspended Sediment

Water in the Donna Canal is pumped directly from the Rio Grande and flows north about 11 kilometers to Donna Reservoir. The pumping rate is set at the beginning of each day. On the days samples were collected, the pumping rate ranged from 1,420 to 4,530 liters per second, and the flow rate ranged from about 0.07 to 0.14 meter per second. The water in the canal looks cloudy or murky because the constant flow of water keeps sediment in suspension in the water. Some of the suspended sediment is pumped into the canal from the Rio Grande, and some of the sediment comes from erosion of the sides of the canal.

To try to find the source of the PCBs, the USGS used a different type of sampling approach—collection and analysis of the suspended sediment. Because PCBs do not dissolve readily in water but instead stick to sediment, they usually are not detected in water samples, even in contaminated environments. By removing the suspended sediment from the water and analyzing it directly, the PCBs are more likely to be detected. In other words, the USGS approach was to look for the PCBs where they were expected to be.

Suspended sediment from Donna Canal collected on a filter.



Collecting a suspended sediment sample from the Donna Canal.

Suspended sediment was collected for analysis by filtering. At each sampling site, tubing was suspended in the canal about 2.5 meters from the bank at a depth of about 1 meter, and water was pumped from the canal with a peristaltic pump; at bridges and at the mouth of a siphon in the canal, the tubing was suspended in the center of the canal. For all but the final round

• What are PCBs?

PCBs are synthetic compounds that were used in the United States in the 1950s to 1970s for many industrial purposes. They were used mostly as coolants and lubricants in transformers, capacitors, and other electrical equipment. PCBs also were used as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and in many other products (U.S. Environmental Protection Agency, 2001). Because of the threat they pose to human health, the U.S. Government banned PCB production and use in 1976. PCBs break down to other, less-harmful compounds extremely slowly, and PCBs that were released to the environment decades ago are still a threat to human health today. The fate of many PCBs used before the ban is largely unknown. PCBs have been found in a variety of residential and industrial locations and dumpsites throughout the United States and Canada. Some PCBs were illegally dumped or buried after their use was banned. The exact location of the PCB source contaminating the Donna Canal is unknown, but the effect of these chemicals on the local environment is seen in contaminated fish in the Donna Canal.

• How does eating PCB-contaminated fish affect humans?

PCBs concentrate in the skin and fatty tissue of human consumers and most animals and can affect the skin, liver, stomach, and thyroid gland. It also can affect the nervous system causing severe degenerative conditions. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects. Rats that ate food containing high levels of PCBs for 2 years developed liver cancer. The EPA and the International Agency for Research on Cancer have determined that PCBs are probably carcinogenic to humans. Studies have shown that babies born to women who ate PCB-contaminated fish have shown abnormal responses in tests of infant behavior (Agency for Toxic Substances and Disease Registry, 2001).

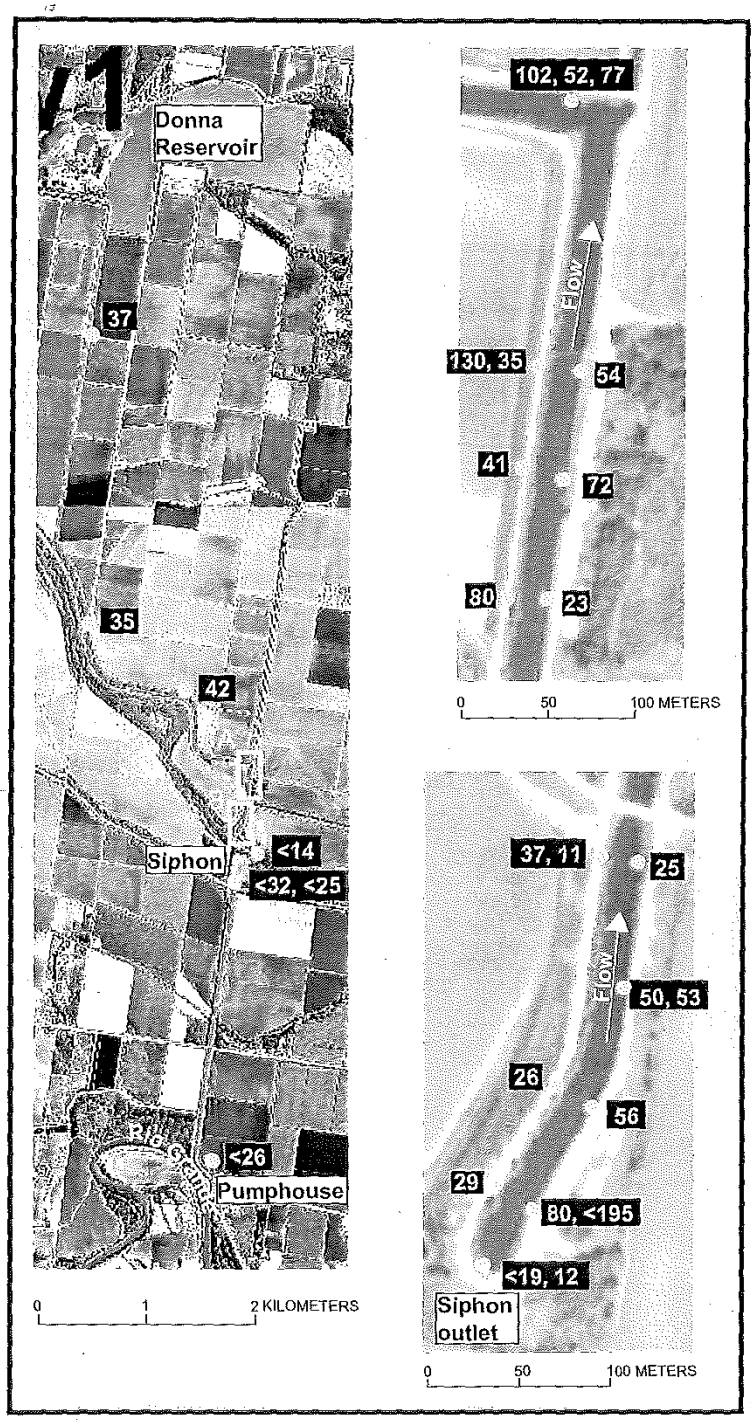


Figure 2. Aerial photographs of the Donna Canal (indicated by the dashed blue line), sampling sites, and concentrations detected. Flow is to the north from the pumphouse toward the reservoir. To the right are enlarged images of two areas of the canal chosen for more closely spaced sampling. Sampling sites are indicated with yellow dots, and results of samples collected during the same sampling trip are shown in the same color: white (February 1999), yellow (July 1999), pink (January 2000), blue (July 2000), and green (April 2001). All concentrations are in micrograms per kilogram of sediment collected.

of sampling, water was pumped through a 298-millimeter-diameter glass fiber filter with a nominal pore size of 0.5 micrometer. For the final round of sampling, water was pumped through similarly sized PTFE (Teflon) filters. Water was pumped through the filter until the filter clogged; three filters were used at each site, and a total of 25 to 140 liters of water was filtered. The filters were put inside a baked glass jar and chilled until sent to the laboratory for analysis. Unfiltered water samples also were submitted for analysis of total suspended sediment concentration. PCBs were analyzed by gas chromatography/mass spectrometry (GC/MS) following the method of Foreman and others (1995).

Sampling Results and Conclusion

Five separate sampling trips to the Donna Canal were made to collect suspended sediment. The overall strategy was to narrow the search for the PCB source area(s) from the entire 11-kilometer length to a much shorter distance by collecting samples at more closely spaced intervals. The sampling sites and spacing were chosen on the basis of the results from the previous event (fig. 2).

Round 1: February 1999

No PCBs were detected during the first round of sampling when samples were collected from sites near the pumphouse, at the siphon inlet, at the siphon outlet, and in the Arroyo Colorado (results shown in white, fig. 2). These results suggested that the source of the PCBs must be downstream (north) of the siphon outlet.

Round 2: July 1999

The results of the second sampling round (shown in yellow, fig. 2) confirmed that the source was in or downstream of the siphon outlet, and that it was probably upstream (south) of the 90-degree bend. On the basis of these detections, samples were collected at more closely spaced intervals in the reach downstream of the siphon to try to pinpoint the PCB source.

Round 3: January 2000

The results of the third sampling round (shown in pink, fig. 2) indicated a possible PCB source in the 200-meter reach downstream of the siphon outlet and a possible second source at least 150 meters upstream of the 90-degree bend.

Round 4: July 2000

On the basis of previous results, the fourth sampling round samples were collected at about 50-meter intervals on both banks of the canal downstream of the siphon outlet. The results (shown in blue, fig. 2) indicated a potential PCB source on the right bank of the canal, just downstream of the siphon outlet.

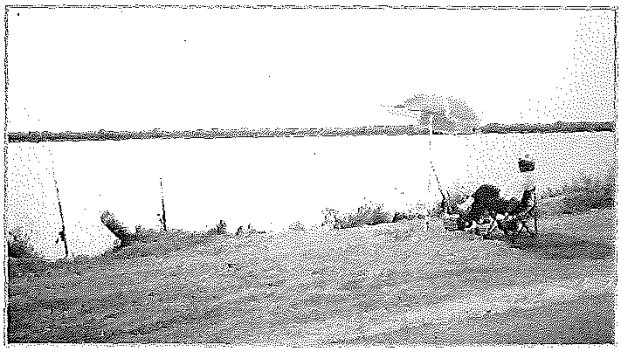
Round 5: April 2001

In an attempt to pinpoint the location of an additional source or sources upstream of the 90-degree bend, the fifth sampling-round samples were collected

at about 50-meter intervals in the reach upstream of the 90-degree bend. The results (shown in green, fig. 2) confirmed the presence of PCBs in suspended sediment along this section of the canal but do not identify any one location as a probable PCB source. One or several sources of PCBs might be present along this stretch of the canal.

The TNRCC also participated in the fifth and final sampling round, collecting whole water and bed sediment at selected locations in the canal and extracting two soil borings from the area of the canal just downstream of the siphon outlet. However, no PCBs were detected in the TNRCC water or sediment samples, and this additional sampling was unsuccessful in further pinpointing the location of the PCB source(s).

In conclusion, the source or sources of the PCBs must be located between the siphon outlet and the 90-degree bend in the Donna Canal.



Fisherman at Donna Reservoir, Hidalgo County.

What is the future of the Donna Canal?

Using the information gathered from the suspended sediment sampling during 1999–2001, the TNRCC has begun a multiphase project to investigate and remediate all sources of PCBs in the Donna Canal. Efforts will be concentrated in the 600-meter reach identified by the USGS as the most likely reach of the canal to contain the source(s) of the PCB contamination. The first phase of the TNRCC project began in August 2001 and involves additional assessment and delineation of the PCB source. Subsequent phases of the project will involve the development of a remediation plan and implementation of remedial actions in the canal.

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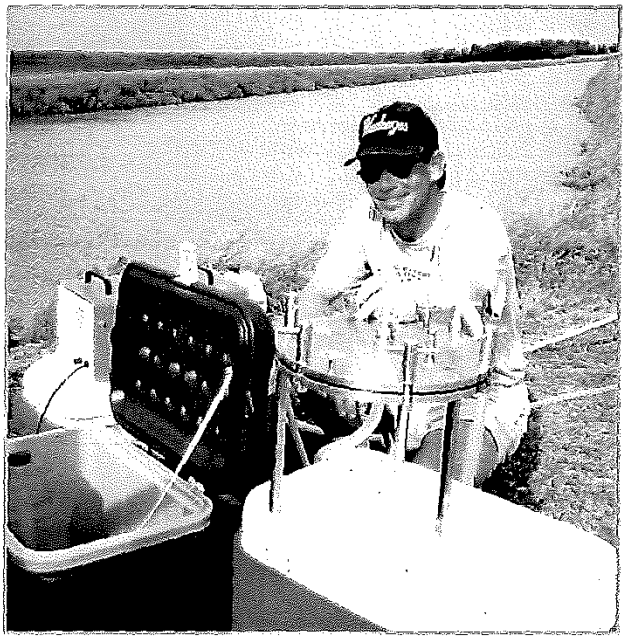

Sampling suspended sediment at Donna Canal.

— B.J. Mahler, P.C. Van Metre, and R.M. Miranda

Photographs by B.J. Mahler and M.P. Cordell

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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ATTACHMENT 6

ATSDR Public Health Statement for PCBs

PUBLIC HEALTH STATEMENT
POLYCHLORINATED BIPHENYLS (PCBS)

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Division of Toxicology **November 2000**

This Public Health Statement is the summary chapter from the Toxicological Profile for Polychlorinated Biphenyls (PCBs). It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about polychlorinated biphenyls (PCBs) and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. PCBs have been found in at least 500 of the 1,598 current or former NPL sites. However, the total number of NPL sites evaluated for PCBs is not known. As more sites are evaluated, the sites at which PCBs are found may increase. This information is important because exposure to PCBs may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance, or by skin contact. If you are exposed to PCBs, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with them. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT ARE POLYCHLORINATED BIPHENYLS (PCBs)?

PCBs are a group of synthetic organic chemicals that can cause a number of different harmful effects. There are no known natural sources of PCBs in the environment. PCBs are either oily liquids or solids and are colorless to light yellow. Some PCBs are volatile and may exist as a vapor in air. They have no known smell or taste. PCBs enter the environment as mixtures containing a variety of individual chlorinated biphenyl components, known as congeners, as well as impurities. Because the health effects of environmental mixtures of PCBs are difficult to evaluate, most of the information in this toxicological profile is about seven types of PCB mixtures that were commercially produced. These seven kinds of PCB mixtures include 35% of all the PCBs commercially produced and 98% of PCBs sold in the United States since 1970. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor. For example, the name Aroclor 1254 means that the mixture contains approximately 54% chlorine by weight, as indicated by the second two digits in the name. Because they don't burn easily and are good insulating materials, PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of

PCBs stopped in the United States in August 1977 because there was evidence that PCBs build up in the environment and may cause harmful effects. Consumer products that may contain PCBs include old fluorescent lighting fixtures, electrical devices or appliances containing PCB capacitors made before PCB use was stopped, old microscope oil, and old hydraulic oil.

1.2 WHAT HAPPENS TO POLYCHLORINATED BIPHENYLS (PCBs) WHEN THEY ENTER THE ENVIRONMENT?

Before 1977, PCBs entered the air, water, and soil during their manufacture and use in the United States. Wastes that contained PCBs were generated at that time, and these wastes were often placed in landfills. PCBs also entered the environment from accidental spills and leaks during the transport of the chemicals, or from leaks or fires in transformers, capacitors, or other products containing PCBs. Today, PCBs can still be released into the environment from poorly maintained hazardous waste sites that contain PCBs; illegal or improper dumping of PCB wastes, such as old transformer fluids; leaks or releases from electrical transformers containing PCBs; and disposal of PCB-containing consumer products into municipal or other landfills not designed to handle hazardous waste. PCBs may be released into the environment by the burning of some wastes in municipal and industrial incinerators.

Once in the environment, PCBs do not readily break down and therefore may remain for very long periods of time. They can easily cycle between air, water, and soil. For example, PCBs can enter the air by evaporation from both soil and water. In air, PCBs can be carried long distances and have been found in snow and sea water in areas far away from where they were released into the environment, such as in the arctic. As a consequence, PCBs are found all over the world. In general, the lighter the type of PCBs, the further they may be transported from the source of contamination. PCBs are present as solid particles or as a vapor in the atmosphere. They will eventually return to land and water by settling as dust or in rain and snow. In water, PCBs may be transported by currents, attach to bottom sediment or particles in the water, and evaporate into air. Heavy kinds of PCBs are more likely to settle into sediments while lighter PCBs are more likely to evaporate to air. Sediments that contain PCBs can also release the PCBs into the surrounding water. PCBs stick strongly to soil and will not usually be carried deep into the soil with rainwater. They do not readily break down in soil and may stay in the soil for months or years; generally, the more chlorine atoms that the PCBs contain, the more slowly they break down. Evaporation appears to be an important way by which the lighter PCBs leave soil. As a gas, PCBs can accumulate in the leaves and above-ground parts of plants and food crops.

PCBs are taken up into the bodies of small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs especially accumulate in fish and marine mammals (such as seals and whales) reaching levels that may be many thousands of times higher than in water. PCB levels are highest in animals high up in the food chain.

1.3 HOW MIGHT I BE EXPOSED TO POLYCHLORINATED BIPHENYLS (PCBs)?

Although PCBs are no longer made in the United States, people can still be exposed to them. Many older transformers and capacitors may still contain PCBs, and this equipment can be used for 30 years or more. Old fluorescent lighting fixtures and old electrical devices and appliances, such as television sets and refrigerators, therefore may contain PCBs if they were made before PCB use was stopped. When these electric devices get hot during operation, small amounts of PCBs may get into the air and raise the level of PCBs in indoor air. Because devices that contain PCBs can leak with age, they could also be a source of skin exposure to PCBs.

Small amounts of PCBs can be found in almost all outdoor and indoor air, soil, sediments, surface water, and animals. However, PCB levels have generally decreased since PCB production stopped in 1977. People are exposed to PCBs primarily from contaminated food and breathing contaminated air. The major dietary sources of PCBs are fish (especially sportfish that were caught in contaminated lakes or rivers), meat, and dairy products. Between 1978 and 1991, the estimated daily intake of PCBs in adults from dietary sources declined from about 1.9 nanograms (a nanogram is a billionth part of a gram) to less than 0.7 nanograms. PCB levels in sportfish are still high enough so that eating PCB-contaminated fish may be an important source of exposure for some people. Recent studies on fish indicate maximum concentrations of PCBs are a few parts of PCBs in a million parts (ppm) of fish, with higher levels found in bottom-feeders such as carp. Meat and dairy products are other important sources of PCBs in food, with PCB levels in meat and dairy products usually ranging from less than 1 part in a billion parts (ppb) of food to a few ppb.
Concentrations of PCBs in subsurface soil at a Superfund site have been as high as 750 ppm. People who live near hazardous waste sites may be exposed to PCBs by consuming PCB-contaminated sportfish and game animals, by breathing PCBs in air, or by drinking PCB-contaminated well water. Adults and children may come into contact with PCBs when swimming in contaminated water and by accidentally swallowing water during swimming. However, both of these exposures are far less serious than exposures from ingesting PCB-contaminated food (particularly sportfish and wildlife) or from breathing PCB-contaminated air.

Workplace exposure to PCBs can occur during repair and maintenance of PCB transformers; accidents, fires, or spills involving PCB transformers and older computers and instruments; and disposal of PCB materials. In addition to older electrical instruments and fluorescent lights that contain PCB-filled capacitors, caulking materials, elastic sealants, and heat insulation have also been known to contain PCBs. Contact with PCBs at hazardous waste sites can happen when workers breathe air and touch soil containing PCBs. Exposure in the contaminated workplace occurs mostly by breathing air containing PCBs and by touching substances that contain PCBs.

1.4 HOW CAN POLYCHLORINATED BIPHENYLS (PCBs) ENTER AND LEAVE MY BODY?

If you breathe air that contains PCBs, they can enter your body through your lungs and pass into the bloodstream. We do not know how fast or how much of the PCBs that are breathed will pass into the blood. A common way for PCBs to enter your body is by eating meat or fish products or other foods that contain PCBs. Exposure from drinking water is less than from food. It is also possible that PCBs can enter your body by breathing indoor air or by skin contact in buildings that have the kinds of old electrical devices that contain and can leak PCBs. For people living near waste sites or processing or storage facilities, and for people who work with or around PCBs, the most likely ways that PCBs will enter their bodies are from skin contact with contaminated soil and from breathing PCB vapors. Once PCBs are in your body, some may be changed by your body into other related chemicals called metabolites. Some metabolites of PCBs may have the potential to be as harmful as some unchanged PCBs. Some of the metabolites may leave your body in the feces in a few days, but others may remain in your body fat for months. Unchanged PCBs may also remain in your body and be stored for years mainly in the fat and liver, but smaller amounts can be found in other organs as well. PCBs collect in milk fat and can enter the bodies of infants through breast-feeding.

1.5 HOW CAN POLYCHLORINATED BIPHENYLS (PCBs) AFFECT MY HEALTH?

Many studies have looked at how PCBs can affect human health. Some of these studies investigated people exposed in the workplace, and others have examined members of the general population. Skin conditions, such as acne and rashes, may occur in people exposed to high levels of PCBs. These effects on the skin are well documented, but are not likely to result from exposures in the general population. Most of the human studies have many shortcomings, which make it difficult for scientists to establish a clear association between PCB exposure levels and health effects. Some studies in workers suggest that exposure to PCBs may also cause irritation of the nose and lungs, gastrointestinal discomfort, changes in the blood and liver, and depression and fatigue. Workplace concentrations of PCBs, such as those in areas where PCB transformers are repaired and maintained, are higher than levels in other places, such as air in buildings that have electrical devices containing PCBs or in outdoor air, including air at hazardous waste sites. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs. The possible health effects of PCBs in children are discussed in Section 1.6.

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat

research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Rats that ate food containing large amounts of PCBs for short periods of time had mild liver damage, and some died. Rats, mice, or monkeys that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia, acne-like skin conditions, and liver, stomach, and thyroid gland injuries. Other effects caused by PCBs in animals include reductions in the immune system function, behavioral alterations, and impaired reproduction. Some PCBs can mimic or block the action of hormones from the thyroid and other endocrine glands. Because hormones influence the normal functioning of many organs, some of the effects of PCBs may result from endocrine changes. PCBs are not known to cause birth defects. Only a small amount of information exists on health effects in animals exposed to PCBs by skin contact or breathing. This information indicates that liver, kidney, and skin damage occurred in rabbits following repeated skin exposures, and that a single exposure to a large amount of PCBs on the skin caused death in rabbits and mice. Breathing PCBs over several months also caused liver and kidney damage in rats and other animals, but the levels necessary to produce these effects were very high.

Studies of workers provide evidence that PCBs were associated with certain types of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate commercial PCB mixtures throughout their lives developed liver cancer. Based on the evidence for cancer in animals, the Department of Health and Human Services (DHHS) has stated that PCBs may reasonably be anticipated to be carcinogens. Both EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

1.6 HOW CAN POLYCHLORINATED BIPHENYLS (PCBs) AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans.

Children are exposed to PCBs in the same way as are adults: by eating contaminated food, breathing indoor air in buildings that have electrical devices containing PCBs, and drinking contaminated water. Because of their smaller weight, children's intake of PCBs per kilogram of body weight may be greater than that of adults. In addition, a child's diet often differs from that of adults. A Food and Drug Administration (FDA) study in 1991 estimated dietary intakes of PCBs for infants (6 months) and toddlers (2 years) of less than 0.001 and 0.002 µg/kg/day. Children who live near hazardous waste sites may accidentally eat some PCBs through hand-to-mouth behavior, such as by putting dirty hands or other soil/dirt covered objects in their mouths, or eating without washing their hands. Some children also eat dirt on purpose; this behavior is called pica. Children could also be exposed by playing with old appliances or electrical devices that contain PCBs.

It is possible that children could be exposed to PCBs following transport of the chemical on clothing from the parent's workplace to the home.

PUBLIC HEALTH STATEMENT
POLYCHLORINATED BIPHENYLS (PCBS)

Division of Toxicology **November 2000**

House dust in homes of workers exposed to PCBs contained higher than average levels of PCBs. PCBs have also been found on the clothing of firefighters following transformer fires. The most likely way infants will be exposed is from breast milk that contains PCBs. Fetuses in the womb are also exposed from the exposed mother.

In one study of women exposed to relatively high concentrations of PCBs in the workplace during pregnancy, their babies weighed slightly less at birth than babies born to women exposed to lower concentrations of PCBs. Studies of women who consumed high amounts of fish contaminated with PCBs and other chemicals also had babies that weighed less than babies from women who did not eat fish. Similar observations have been made in some studies of women with no known high exposure to PCBs, but not all studies have confirmed these findings. Babies born to women who ate fish contaminated with PCBs before and during pregnancy showed abnormal responses to tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, persisted for several years. However, in these studies, the women may have been exposed to other chemicals. Other studies suggest that the immune system may be affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects in humans caused by exposure to PCBs or of health effects of PCBs in older children. It is not known whether PCB exposure can cause in skin acne and rashes in children as occurs in some adults, although it is likely that the same effects would occur at very high PCB exposure levels.

Animal studies have shown harmful effects in the behavior of very young animals when their mothers were exposed to PCBs and they were exposed in the womb or by nursing. In addition, some animal studies suggest that exposure to PCBs causes an increased incidence of prenatal death and changes in the immune system, thyroid, and reproductive organs. Studies in monkeys showed that young animals developed skin effects from nursing after their mothers were exposed to PCBs. Some studies indicate that very high doses of PCBs may cause structural birth defects in animals.

Children can be exposed to PCBs both prenatally and from breast milk. PCBs are stored in the mother's body and can be released during pregnancy, cross the placenta, and enter fetal tissues. Because PCBs dissolve readily in fat, they can accumulate in breast milk fat and be transferred to babies and young children. PCBs have been measured in umbilical cord blood and in breast milk. Some studies have estimated that an infant who is breast fed for 6 months may accumulate in this period 6–12% of the total PCBs that will accumulate during its lifetime. However, in most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk. You should consult your health care provider if you have any concerns about PCBs and breast feeding. Because the brain, nervous system, immune system, thyroid, and reproductive organs are still developing in the fetus and child, the effects of PCBs on these target systems may be more profound after exposure during the prenatal and neonatal periods, making fetuses and children more susceptible to PCBs than adults.

1.7 HOW CAN FAMILIES REDUCE THEIR RISK OF EXPSOURE TO POLYCHLORINATED BIPHENYLS (PCBs)?

If your doctor finds that you have been exposed to significant amounts of polychlorinated biphenyls, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued fish and wildlife advisories to warn people about PCB-contaminated fish and fish-eating wildlife. These advisories will tell you what types and sizes of fish and game animals are of concern. An advisory may completely ban eating fish or game or tell you to limit your meals of a certain fish or game type. For example, an advisory may tell you not to eat a certain type of fish or game more than once a month. The advisory may tell you only to eat certain parts of the fish or game and how to prepare or cook the fish or game to decrease your exposure to PCBs. The fish or wildlife advisory may have special restrictions to protect pregnant women, nursing mothers, and young children. To reduce your children's exposure to PCBs, obey these advisories. Additional information on fish and wildlife advisories for PCBs, including states that have advisories, is provided in Chapter 6 (Section 6.7) and Chapter 8 of the toxicological profile. You can consult your local and state health departments or state natural resources department on how to obtain PCB advisories, as well as other important information, such as types of fish and wildlife and the locations that the advisories apply to.

Children should be told that they should not play with old appliances, electrical equipment, or transformers, since they may contain PCBs. Children who live near hazardous waste sites should be discouraged from playing in the dirt near these sites and should not play in areas where there was a transformer fire. In addition, children should be discouraged from eating dirt, and careful handwashing practices should be followed.

As mentioned in Section 1.3 of the profile, workplace exposure to PCBs can still occur during repair and maintenance of old PCB transformers; accidents, fires, or spills involving these transformers or other PCB-containing items; and disposal of PCB materials. If you are exposed to PCBs in the workplace, it may be possible to carry them home from work. Your occupational health and safety officer at work can tell you whether the chemicals you work with may contain PCBs and are likely to be carried home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO POLYCHLORINATED BIPHENYLS (PCBs)?

Levels of PCBs in the environment were zero before PCBs were manufactured. Now, all people in industrial countries have some PCBs in their bodies. There are tests to determine whether PCBs are in the blood, body fat, and breast milk. These are not regular or routine clinical tests, such as the one for

cholesterol, but could be ordered by a doctor to detect PCBs in people exposed to them in the environment and at work. If your PCB levels are higher than the background levels, this will show that you have been exposed to high levels of PCBs. However, these measurements cannot determine the exact amount or type of PCBs that you have been exposed to, or how long you have been exposed. Although these tests can indicate whether you have been exposed to PCBs to a greater extent than the general population, they do not predict whether you will develop harmful health effects. Blood tests are the easiest, safest, and probably the best method for detecting recent exposures to large amounts of PCBs. Results of such tests should be reviewed and carefully interpreted by physicians with a background in environmental and occupational medicine. Nearly everyone has been exposed to PCBs because they are found throughout the environment, and people are likely to have detectable amounts of PCBs in their blood, fat, and breast milk. Recent studies have shown that PCB levels in tissues from United States population are now declining.

1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health . Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals; then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors. Recommendations and regulations are periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for PCBs include the following:
The EPA standard for PCBs in drinking water is 0.5 parts of PCBs per billion parts (ppb) of water. For the protection of human health from the possible effects of drinking the water or eating the fish or shellfish from lakes and streams that are contaminated with PCBs, the EPA regulates that the level of PCBs in these waters be no greater than 0.17 parts of PCBs per trillion parts (ppt) of water. States with fish and wildlife consumption advisories for PCBs are identified in Chapter 6 (Section 6.7) and Chapter 8 of the toxicological profile.

The FDA has set residue limits for PCBs in various foods to protect from harmful health effects. FDA required limits include 0.2 parts of PCBs per million parts (ppm) in infant and junior foods, 0.3 ppm in eggs, 1.5 ppm in milk and other dairy

products (fat basis), 2 ppm in fish and shellfish (edible portions), and 3 ppm in poultry and red meat (fat basis).

OSHA regulates that workers not be exposed by inhalation over a period of 8 hours for 5 days per week to more than 1 milligram per cubic meter of air (mg/m^3) for 42% chlorine PCBs, or to 0.5 mg/m^3 for 54% chlorine PCBs.

NIOSH recommends that workers not breathe air containing 42 or 54% chlorine PCB levels higher than 1 microgram per cubic meter of air ($\mu g/m^3$) for a 10-hour workday, 40-hour workweek.

EPA requires that companies that transport, store, or dispose of PCBs follow the rules and regulations of the federal hazardous waste management program. EPA also limits the amount of PCBs put into publicly owned waste water treatment plants. To minimize exposure of people to PCBs, EPA requires that industry tell the National Response Center each time 1 pound or more of PCBs have been released to the environment.

1.10 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333

Information line and technical assistance:
Phone: 888-422-8737
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ATTACHMENT 7

CDC International Chemical Safety Cards for PCBs

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

ICSC # 0939
CAS # 11097-69-1
RTECS # TQ1360000
UN # 2315
EC # 602-039-00-4
October 20, 1999 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
•INHALATION		Ventilation.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Headache. Numbness.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do	Separated from food and feedstuffs Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.

NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Severe marine pollutant. Note: C Xn symbol N symbol R: 33-50/53 S: 2-35-60-61 UN Hazard Class: 9 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
LIGHT YELLOW VISCOUS LIQUID.

PHYSICAL DANGERS:

CHEMICAL DANGERS:
The substance decomposes in a fire producing irritating and toxic gases

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.5 mg/m³ as TWA (skin) A3 (ACGIH 2004).
MAK: 0.05 ppm 0.70 mg/m³ H
Peak limitation category: II(8) Carcinogen category: 3B Pregnancy risk group: B (DFG 2004).
OSHA PEL: TWA 0.5 mg/m^3 skin
NIOSH REL*: Ca TWA 0.001 mg/m^3 See Appendix A *Note: The REL also applies to other PCBs.
NIOSH IDLH: Ca 5 mg/m^3 See: IDLH INDEX

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES	Relative density (water = 1): 1.5 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.01 Octanol/water partition coefficient as log Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment. 	

N O T E S

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C.

Transport Emergency Card: TEC (R)-90GM2-II-L

ADDITIONAL INFORMATION

ICSC: 0939 **POLYCHLORINATED BIPHENYL (AROCLOR 1254)**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

Attachment 4

Request for Approval of an Exemption from the One-Year Statutory Limitation at the Donna Reservoir And Canal System Site Action Memorandum Addendum of September 6, 2012

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

SEP 0 6 2012

MEMORANDUM

SUBJECT: Request for Approval of an Exemption from the One-Year Statutory Limitation at the Donna Reservoir and Canal System Site Donna, Hidalgo County, Texas

FROM: Valmichael Leos, Federal On-Scene Coordinator (OSC)
Emergency Readiness Section (6SF-PE)

TO: Pam Phillips, Acting Director
Superfund Division (6SF)

THRU: for Robert R. Broyles, Associate Director
Prevention and Response Branch (6SF-P)

I. PURPOSE

This memorandum requests approval for an exemption from the one-year statutory limit pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§9601 et seq., at the Donna Reservoir and Canal System Site Donna, Hidalgo County, Texas. The proposed action involves the removal and offsite disposal of fish contaminated with polychlorinated biphenyls (PCBs) above the U.S. Food and Drug Administration (FDA) allowable levels that are actively being caught and consumed by local residents.

A Time Critical Removal Action was previously approved and conducted by the On-Scene Coordinator (OSC) per Delegation of Authority Chapter 14, Delegation 2 and subsequent Regional Delegation. This action meets the criteria for initiating a removal action under the National Contingency Plan (NCP), 40 CFR §300.415. Subsequently, approval for a response action was provided by Samuel Coleman, P.E., Director, Superfund Division.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS #	TX0000605363
Category of removal:	Time Critical
Site ID #	06NS
Latitude:	26.096547 N
Longitude:	98.072556 W

A. Site Description

1. Removal Site Evaluation

An EPA-lead removal action was completed at the Donna Reservoir and Canal System Site Donna, Hidalgo County, Texas. The action was approved by Samuel Coleman, P.E., Director of the Superfund Division in an Action Memo dated August 6, 2008 (See Attachment 1). The Site conditions were described in that Action Memorandum.

2. Site Characteristics

Donna Reservoir is a 400-acre impoundment located southwest of the city of Donna in southeast Hidalgo County, within the Arroyo Colorado watershed. Water for the Donna Reservoir is pumped from the Rio Grande, through a seven mile elevated earthen Main Canal, to the reservoir, which is used for water supply and irrigation storage by the city of Donna and surrounding areas. The area around the reservoir and canal is primarily irrigated crops and pastureland, with scattered residences.

3. Releases or threatened release into the environment of a hazardous substance, pollutant or contaminant

During the August 2009 EPA lead removal action, limited sampling of PCB contaminated fish was conducted along with the removal and offsite disposal. The whole body and fillet fish samples were analyzed for PCBs as Aroclors using EPA method 8082. Fish samples were also analyzed for percent lipids. PCB congener analysis (19 congeners) was conducted on the fish samples containing the highest concentrations of Aroclors using EPA method 8082. Aroclor 1524 was the predominant Aroclor detected in the fish samples, Aroclor 1260 was detected in one sample, as a mixture with Aroclor 1254. PCBs were detected ranging from 26 to 3000 ug/kg. No PCBs were detected in any of the fish collected from the reservoirs. In addition to fish samples, surface water samples were collected at various locations along the Donna Canal to confirm the presence or absence of PCBs. All surface water samples were analyzed for PCBs as Aroclors using EPA method 8082. No PCBs were detected in any of the surface water samples collected. All these are hazardous substances as designated in Section 101(14) of CERCLA, 42 U.S.C. §9601(14) and 40 CFR §302.4.

According to the Agency for Toxic Substances and Disease Control (ATSDR) and the Centers for Disease Control and Prevention (CDC), these substances are associated with various health-affects that attack the different bodily systems. The major hazards from exposure to PCBs relate to their toxicological properties. As a group they are generally thought to be carcinogenic by ingestion, and readily accumulated in the body. There is evidence to suggest that PCBs also may cause reproductive disorders and behavioral defects in newborns and infants. The primary target organ is the liver. Effects of overexposure may include skin acne and cancer. Effects on animals and

marine life are thought to be similar, and food and other aquatic organism bioaccumulate PCBs and pass them up to consumers, including larger predators and humans.

4. Maps, Pictures and other graphic representations

Attachment 1 Action Memorandum, Approval of Removal Action at Donna Reservoir and Canal System Site, 08/06/2008.

B. Other Actions to Date

1. Previous actions

In August 6, 2008 an action memorandum was signed and approved by EPA Region 6 for the removal of contaminated fish in the Donna Reservoir and Canal (Site). The contaminated fish have been identified to have concentrations of polychlorinated biphenyls (PCBs) above the 2.0 parts per million (ppm) safe consumption Food and Drug Administration level. The removal action involved the depopulation of edible size PCB-contaminated fish from the canal area. The removal was conducted in a two phase event.

The first phase of the fish removal event began on August 23, 2008. The second phase began on February 16, 2009, to ensure that response action goals were being met. The collected fish were sampled as needed for hazardous waste categorization. A total of approximately 7,800 fish were collected, 22 different species were identified by USFWS, the smallest fish caught was a mosquito fish (2.8 cm in length, weighing <1 gram) and the largest fish was a Smallmouth Buffalo (76 cm in length, weighing approximately 7 kilograms or 15.4 lb.). Of the 22 different species identified, a total of 22 whole body, and 19 fillets from 9 different species of fish were sent to a laboratory for analysis of PCBs. The samples of fish were taken from three separate areas along the entire length of an 8 mile stretch of the canal. On September 19, 2008 a roll off box (10 fish, 1 PPE, 6 trash) containing 17 55-gallon drums of non-hazardous PCB-contaminated fish were disposed of at an EPA approved landfill whose plans are for immediate burial to minimize odor.

On February 16, 2009, EPA, USFWS, and EPA contractors re-mobilized to the site to conduct Phase 2 of the fish depopulation work. This phase mirrored the work done in Phase 1 and was conducted to remove fish missed during the first phase. A total of approximately 15,182 fish were collected and 25 different species identified by USFWS during the Phase 2 work. Whole body and fillet samples collected from several different edible species of fish were sent to a laboratory last week for analysis of PCBs and % Lipids (Whole body only). Three surface water samples from Donna Canal and one drinking water sample from the City of Donna Water Treatment Plant were also collected and submitted to the laboratory for analysis last week.

The removal was coordinated with US Fish and Wildlife Service (FWS), Agency for Toxic Substances and Disease Registry (ATSDR), Texas Department of State Health Services (DSHS), Texas Commission on Environmental Quality (TCEQ), and the Donna Irrigation District (DID). This action was conducted to not prevent long-term recontamination of the

remaining fish as they grow in size, but it will assist in removing the immediate health threat to the public and allow EPA along with other state and local authorities the opportunity to continue work on a long-term management and removal of the contamination source. All collected fish were properly disposed of at an appropriate permitted facility.

In 2011 and February 2012, respectively, the EPA met with officials from the cities of Donna and Alamo to discuss the door-to-door campaigns and the status of the investigation of the Site. The EPA held community meetings on March 27 and March 29, 2012, in Donna and Alamo Texas, respectively, to inform the residents about the contaminated fish and the planned activities for the RI/FS. The meeting in Alamo was conducted in Spanish.

Other community meetings will be scheduled in the near future to provide the public an update on the current activities at the Site. Fact sheets have been prepared, and will continue to be prepared, as necessary during the planning and implementation of the RI/FS. These fact sheets have been filed at the Site's repository and distributed to people on the mailing list.

2. Current actions

The EPA is in the process of conducting a Remedial Investigation and Feasibility Study (RI/FS) for the Site. The purpose of the RI/FS is to determine the nature and extent of contamination and to gather sufficient information about the Site to support an informed risk management decision regarding which remedy is the most appropriate for the Site. The EPA expects to begin field sampling activities in September 2012. The RI/FS is expected to be completed in the latter part of 2013.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Threats to the public health or welfare are documented in the previous Action Memo. The magnitude of the threat has been reduced significantly as a result of the removal action. However, the threats still exist from the contaminated fish that have repopulated in the canal since the previous removal action conducted in 2008. Consultation with fisheries biologists with the USFW service has confirmed that certain species of fish such as tilapia, carp, drum, and gar will be a potential threat for consumption due to their edible size and bioaccumulation of contaminated sediment from the canal.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances, pollutants or contaminants from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

Consistency Exemption:

The removal and offsite disposal of fish contaminated with PCBs from the Donna Canal will not interfere with the likely remedial alternatives that will address the source of contamination in the bed sediment of the canal. The removal action is also appropriate because despite best efforts by the EPA, state, and local agencies to raise awareness about the hazards associated with the consumption of the contaminated fish, local residents continue to ignore warning signs and the active TDSHS fish ban by continuing to catch and consume fish at the Donna Canal site. Moreover, proposed fish removal will be consistent with any conceivable remedial responses at this site. Eliminating potential sources of exposure (fish) will temporarily mitigate imminent threats health, welfare or the environment.

VI. ACTIONS AND ESTIMATED COSTS

A. Action Description

The only change to the anticipated action will involve a more target area of the removal action. Sampling analysis has confirmed that EPA labeled geographic area segment #2 contains the highest concentration of contaminated fish along the entire length of canal. Therefore, this removal action will focus its fish removal efforts along the segment of the canal.

1. Project Schedule

The duration of activities is expected to be one to two months. The removal of edible size contaminated fish will be evaluated within 6 months from completion of the action. The schedule for the depopulation event will be contingent upon weather conditions, personnel scheduling, availability of disposal options, and contractor support.

B. Estimated Costs

The cost associated with the delays will not significantly impact the cost of the action.

Extramural Costs	Current Ceiling	Proposed Ceiling
USFW	$ 150,000	$ 150,000
Cleanup Contractor	$ 250,000	$ 350,000
START	$ 75,000	$ 125,000
Extramural Contingency	$ 25,000	$ 62,500
Total Extramural		$ 687,500
TOTAL CEILING		**$ 687,500**

VII. OUTSTANDING POLICY ISSUES

There are no known outstanding policy issues associated with this site.

VIII. ENFORCEMENT

For administrative purposes, information concerning confidential enforcement strategy for this Site is contained in the Enforcement (*see* Attachment #1). The total cost for this removal action based on full-cost accounting practices that will be eligible for cost recovery are estimated to be $365,376.45

(Direct Cost) + (Other Indirect costs) + 52.61% (Direct + Indirect Costs) = Estimated EPA Cost

$687,500 + $7,000 + (.5261 x $694,500) = $365,376.45

Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2002. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only, and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor the deviation of actual total costs from this estimate will affect the right of the United States to seek cost recovery.

X. RECOMMENDATION

This decision document represents the approval of the exception to the one-year statutory limitation for the Donna Reservoir and Canal Site in Donna, Hidalgo County, Texas, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the criteria as defined by 40 CFR Section 300.415(b)(2) of the NCP for a removal and the CERCLA Section 104(c) emergency exception from the one-year limitation, and I recommend your approval of the waiver. The total project ceiling, if approved, will be $687,500.

APPROVED _____ DATE 9/10/12