

San Jacinto River Waste Pits Superfund Site - Exposure Pathways Analysis

For Public Meeting 1/24/13

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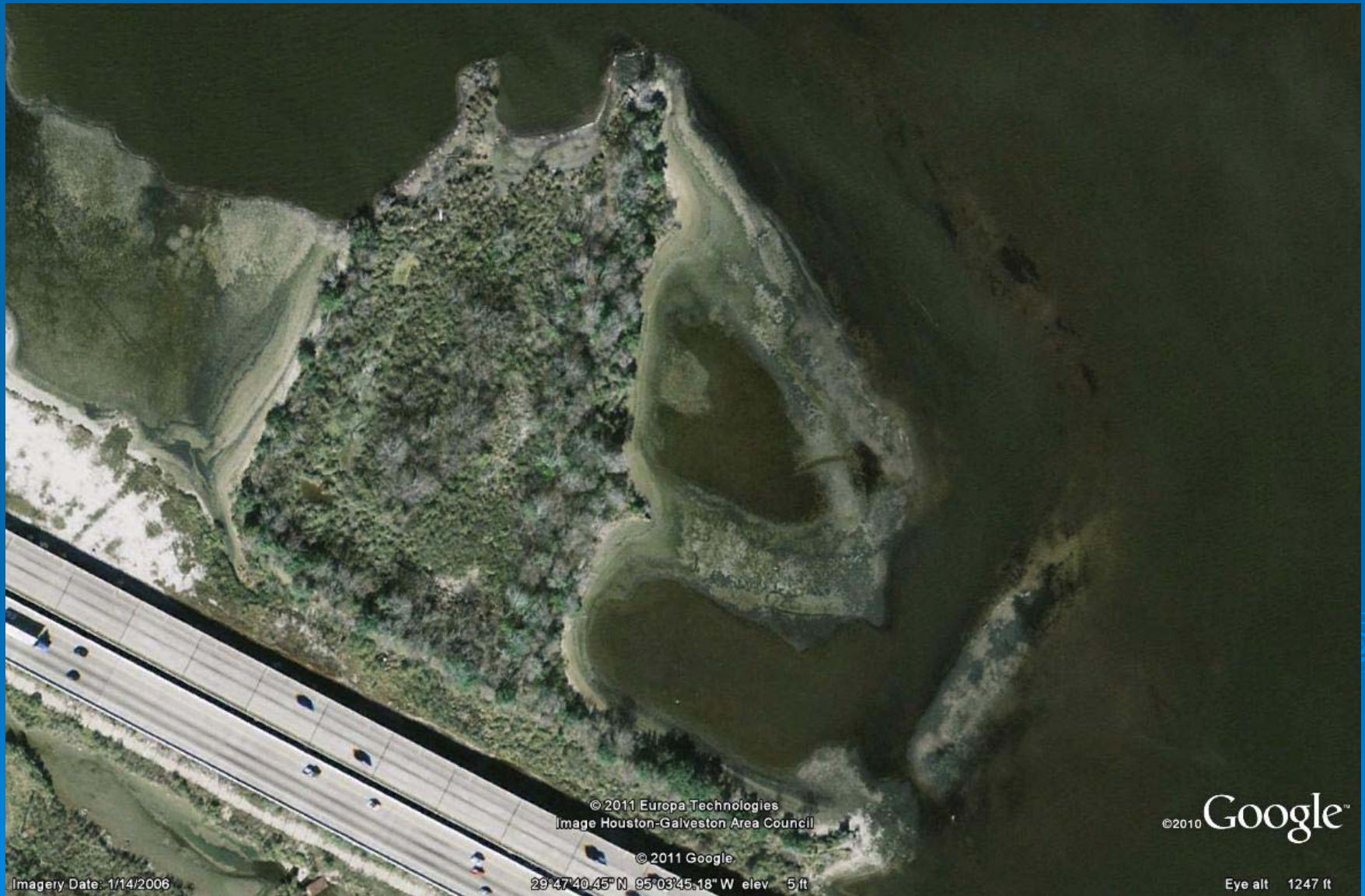
Agency for Toxic Substances & Disease Registry

San Jacinto River Waste Pits

Background & Contaminants of Concern

- Approximately 20 acre tract of land
- Situated on west bank San Jacinto River
- Immediately north of I-10 Bridge
- Three surface impoundments (pits)
- Received paper mill waste 1964-1973
- Contaminated with polychlorinated dibenzodioxins and dibenzofurans (PCDDs & PCDFs)
- Land subsided since then and two pits were inundated by water from the San Jacinto River

San Jacinto River Waste Pits (2006)



San Jacinto River Waste Pits (2007)



San Jacinto River Waste Pits (2007)



San Jacinto River Waste Pits

EPA Time-Critical Removal Action (TCRA)

- Starting in 2010, EPA fenced the site,
- Erected warning signs, &
- Installed a remote camera surveillance system
- In Feb 2011, the EPA began the TCRA
- Purpose: to stabilize the waste pits and prevent further erosion of waste pit contaminants
- EPA cleared all vegetation from the site, and
- Put down geotextile and/or geomembrane & “armor caps” over the entire site extending out 50-100 yards or more into the river.

San Jacinto River Waste Pits (2011)



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Imagery Date: 3/10/2011

29°47'40.26" N 95°03'47.42" W elev 5 ft

Eye alt 1005 ft

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San Jacinto River Waste Pits (SJRWP)

Public Health Assessment – Data Sources

- DSHS evaluated 7 on-site samples and 4 off-site samples from the Hazard Ranking System (HRS) Documentation Record collected by the TCEQ
- Also evaluated 2 on-site samples and 208 off-site samples from 84 locations in the SJR, HSC, & UGB collected by the University of Houston under the Dioxin TMDL Project (2002-2005)
- Also evaluated 9 fish & crab samples collected near the site & the I-10 bridge by the DSHS SALG (2004)

SJRWP Public Health Assessment

TCDD TEQ Levels in Sediments

Sediment Sample Collection General Location	Count	Avg (pg/g)	Min (pg/g)	Max (pg/g)
SJRWP, On-Site Samples	9	15,594	80.92	34,028
Down-Stream from SJRWP, in SJR, HSC, & UGB	59	13.75	0.739	86.16
SJRWP Site-Vicinity, SJR Near the SJRWP	31	82.24	1.997	572.5
Houston Ship Channel, Above/West of SJR	62	65.69	4.904	856.8
Up-Stream & Tributaries to SJR, HSC, or UGB	56	15.97	0.759	102.9
All Off-Site Samples	208	40.04	0.739	856.8

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Dioxin Levels in Fish/Crabs

Fish or Shellfish Species	Count	Average (pg/g)
Blue Crab	2	3.107
Blue Catfish	2	6.04
Spotted Seatrout	2	0.233
Hybrid Striped Bass	1	1.541
Red Drum	2	0.097
All Fish Species	7	2.04
All Species	9	2.277

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Exposure Pathway Analysis

- Living near the SJRWP Superfund Site does not necessarily equate to an exposure to site contaminants.
- Exposure requires more than just proximity to a contaminant reservoir.
- There must be a mechanism for contaminant to move from the reservoir (site) into a person's body in sufficient quantities to be of toxicological concern.
- There are a limited number of ways that toxicants get into the body: inhalation, ingestion, and skin absorption.

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Exposure Pathway Analysis - Air

- PCDDs/PCDFs (dioxins) have very low volatility, so dioxin vapor exposures are not a concern.
- Site is in tidal area of river & never really dries out to the point where wind-blown dust would be a concern.
- Before the TCRA, site was covered with thick vegetation which also minimizes the potential for dust formation.
- But what if?

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Exposure Pathway Analysis – Air (cont.)

- What if scenario:
- Sediment with average site dioxin level of 15,594 pg/g soil dried out and converted into dust.
- Strong wind was blowing dioxin dust from site to nearby neighborhoods at 100 µg dust per m³ air.
- Constantly, 24 hours per day, 365 days per year, for 70 years.
- Inhalation rate, 20 m³/day; body weight, 70 kg; Ca slope factor, 1.5E5.
- Theoretical cancer risk would be 6.68E-5 (roughly 1 in 14,900 people exposed)
- $(15,594 \times 100 \times 1E-6 \times 20 / 70 \times 1E-9 \times 1.5E5 = 6.68E-5)$
- Conclusion: dioxin vapor exposures or wind-blown dust exposures are of absolutely no concern for the SJRWP site.

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Exposure Pathway Analysis - Groundwater

- PCDDs/PCDFs (dioxins) have very low solubility, (dioxins do not dissolve readily in water)
- Dioxins attach firmly to soil/sediment particles & do not migrate significantly in groundwater.
- Only shallow (<60 feet) GW directly under site showed any significant dioxin levels.
- Deeper GW (>80 feet) on-site showed no significant contamination.
- Off-site shallow GW and off-site deeper GW showed no significant dioxin contamination.
- Conclusion: There is no evidence to indicate that GW exposures are a significant possibility for this site (even for nearby residents using private wells).
- But what if?

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Pathway Analysis – Groundwater (cont.)

- Residents have expressed concern Re dioxins in surface water moving up-stream or crossing the river and getting into GW in Channelview or Highlands as a result of flooding or Hurricane Ike.
- In regular flooding events, water is predominantly moving slowly down-stream.
- The river “backs-up” figuratively, due to rainwater run-off flowing in faster than the river can carry it down-stream to the Gulf.
- Storm-surge during Hurricane Ike caused millions (billions?) of gallons seawater to flow up-stream, causing major flooding in the Channelview/Highlands area.
- Scouring of contaminated sediments from the site would have been massively diluted and most would have moved back down-stream as the flood waters subsided.
- Conclusion: There is no evidence to indicate that GW is likely to have been significantly affected in Channelview or Highlands as a result of these flooding events.

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Exposure Pathway Analysis – Surface Water

- PCDDs/PCDFs (dioxins) have very low solubility, (dioxins do not dissolve readily in water).
- Dioxins attach firmly to soil/sediment particles & would appear in surface water primarily as suspended sediments.
- The highest level of dioxin found in the Dioxin TMDL Study was collected from beneath the I-10 bridge (immediately down-stream of the SJRWP site).
- This level was 3.09 pg/L of water.
- A person consuming 2 L/day of this water for a lifetime would have a theoretical increased risk for cancer of 6.6E-6 (roughly 1 in 152,000 persons exposed).
- The exposure for a person swimming in the water would be considerably lower than for drinking the water.
- Conclusion: There is no evidence to indicate that SW exposures are a significant risk for this site (even for people drinking or swimming in the water).

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Pathway Analysis – Soil/Sediment Ingestion

- Dioxins in site sediments averaged 15,594 pg/g (highest levels were in the pits, with much lower levels along the berm).
- Off-site sediment levels around the Riverside Inn Marina and the railroad trestle are approximately 1,000 times lower.
- Risk for people visiting the site would be from transferring sediments from hands to the mouth.
- Young children may transfer up to 200 mg of soil/sediment to the mouth per day (older children & adults generally ingest 100 mg/day or less).
- Maximum exposures would be for people visiting the site 260 or more days per year for 37 years (up to before the TCRA).
- The theoretical increased risk for cancer would be approximately 2.37E-3 (roughly 1 in 423 people exposed).
- Conclusion: There is clear evidence that on-site sediment ingestion exposures could cause excessive Ca risk. Off-site/up-stream exposures, however would not produce a significant excess risk.

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Pathway Analysis – Soil/Sediment Dermal

- Dioxins in site sediments averaged 15,594 pg/g (highest levels were in the pits, with much lower levels along the berm).
- Off-site sediment levels around the Riverside Inn Marina and the railroad trestle are approximately 1,000 times lower.
- Risk for people visiting the site would be from getting sediments on the hands, forearms, feet, and legs with subsequent dermal absorption of dioxins.
- Maximum exposures would be for people visiting the site 260 or more days per year for 37 years (up to before the TCRA).
- The theoretical increased risk for cancer would be approximately $4.43E-3$ (roughly 1 in 226 people exposed).
- Conclusion: There is clear evidence that on-site sediment exposures could cause excessive risk through dermal absorption. Off-site/up-stream exposures, however would not produce a significant excess risk through dermal absorption.

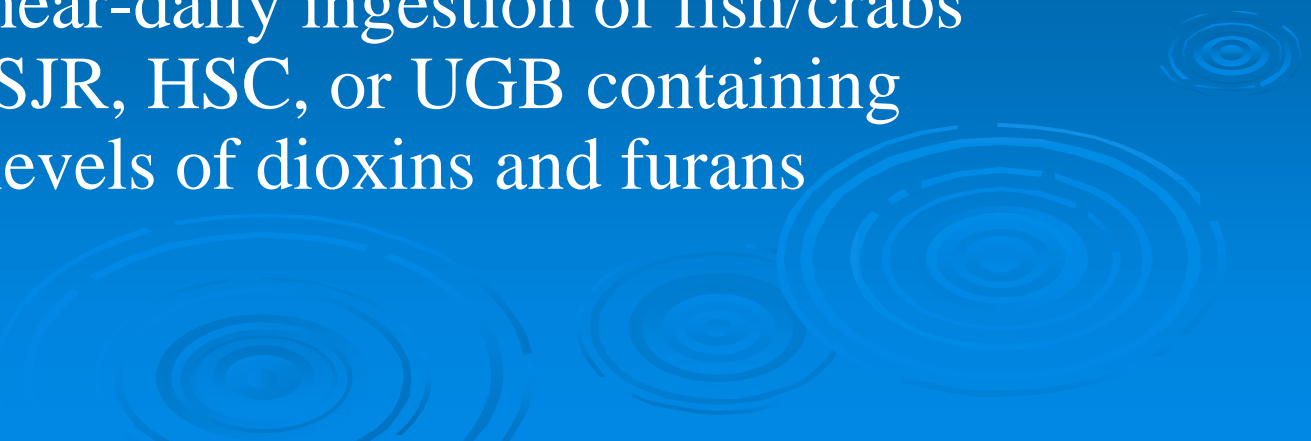
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Pathway Analysis – Fish/Crab Consumption

- Dioxins in fish & crabs caught near the I-10 bridge contained an average of 2.277 pg/g of edible fish tissue.
- Risk may result from people catching and eating fish caught anywhere near the I-10 bridge (fish may swim considerable distances up or down-stream).
- Maximum exposures would be for subsistence fishermen eating fish/crabs caught near the site 260 or more days per year for 47 years (Dioxin levels are not expected to change dramatically in the near future, due to numerous additional off-site dioxin sources throughout the SJR, HSC, & UGB waterways).
- The theoretical increased risk for cancer would be approximately $3.91E-4$ (roughly 1 in 2,560 people exposed).
- Conclusion: There is clear evidence that daily consumption of fish/crabs caught from the SJR, HSC, or UGB could cause excessive risk for cancer through the ingestion pathway.

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Most Likely Pathways for Significant Exposure

- Daily or near-daily oral contact with contaminated on-site sediments through hand-to-mouth transfer
 - Daily or near-daily dermal absorption of contaminants through skin contact with on-site sediments
 - Daily or near-daily ingestion of fish/crabs from the SJR, HSC, or UGB containing elevated levels of dioxins and furans
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Eliminated Pathways for Exposure

- Airborne contaminated dust is unlikely due to heavy vegetation cover on site & low volatility for congeners with dioxin-like toxicity
- Groundwater exposure unlikely – few nearby wells used as drinking water source, shallow groundwater brackish, dioxins tightly bound to sediments, no significant dioxin migration to potable aquifer.
- GW unlikely to have been significantly affected due to regular flooding or Hurricane Ike flooding.
- Surface water ingestion unlikely – waters are brackish & dioxins tightly bound to sediments, surface water dioxin concentrations are very low.

SJRWP Public Health Assessment

- The Public Health Assessment document (Final Release) is available on-line at:
- www.dshs.state.tx.us/epitox/posted and at
- Stratford Branch Library
- 509 Stratford Street
- Highlands, Texas 77562-2547
- Pasadena Public Library
- 1201 Jeff Ginn Memorial Drive
- Pasadena, TX 77506