HOUSTON SHIP CHANNEL TIDAL - SEGMENT 1006
LAND COVER
Impairment Concern No Impairments or Concerns
<table>
<thead>
<tr>
<th>Segment Number: 1006</th>
<th>Name: Houston Ship Channel Tidal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length:</strong> 28 miles</td>
<td><strong>Watershed Area:</strong> 122 square miles</td>
</tr>
<tr>
<td><strong>Designated Uses:</strong> Navigation; Industrial Water Supply</td>
<td></td>
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<tr>
<td><strong>Number of Active Monitoring Stations:</strong> 26</td>
<td><strong>Texas Stream Team Monitors:</strong> 0</td>
</tr>
<tr>
<td><strong>Permitted Outfalls:</strong> 207</td>
<td></td>
</tr>
</tbody>
</table>

**Description:**

Segment 1006 (Tidal Stream): From the confluence with the San Jacinto River in Harris County to a point immediately upstream of Greens Bayou in Harris County, including tidal portions of tributaries

Segment 1006A: Retired segment description

Segment 1006B (Perennial Stream w/ intermediate ALU): Carpenters Bayou (unclassified water body) – Perennial stream from 9.0 km upstream of Houston Ship Channel up to 0.0 km upstream of Wallisville Rd

Segment 1006C: Retired segment description

Segment 1006D (Perennial Stream w/ intermediate ALU): Halls Bayou (unclassified water body) – From the confluence with Greens Bayou upstream to Frick Road in Harris County

Segment 1006E: Retired segment description

Segment 1006F (Perennial Stream w/ intermediate ALU): Big Gulch Above Tidal (unclassified water body) – From the confluence with Greens Bayou Tidal to Wallisville Road in Harris County

Segment 1006G: Retired segment description.

Segment 1006H (Perennial Stream w/ intermediate ALU): Spring Gully Above Tidal (unclassified water body) – From confluence with Greens Bayou to US 90 in Harris County

Segment 1006I (Perennial Stream w/ limited ALU): Unnamed Tributary of Halls Bayou (unclassified water body) – From the confluence with Halls Bayou to a point 0.13 miles upstream of Richland Drive in Harris County

Segment 1006J (Perennial Stream w/ limited ALU): Unnamed Tributary of Halls Bayou (unclassified water body) – From the confluence of Halls Bayou (east of US 59 and south of Langley Road) to Mount Houston Road in Harris County

Segment 1006K (Perennial Stream w/ intermediate ALU): Unnamed tributary of Halls Bayou (unclassified water body) – From the confluence of Halls Bayou (in Tidwell Park east of Allwood St.) to Jensen west of Hwy 59
### Percent of Stream Impaired or of Concern

<table>
<thead>
<tr>
<th>Segment ID</th>
<th>PCBs/Dioxin</th>
<th>Bacteria</th>
<th>Dissolved Oxygen</th>
<th>Nutrients</th>
<th>Chlorophyll a</th>
<th>Other</th>
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<tbody>
<tr>
<td>1006</td>
<td>100</td>
<td>-</td>
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<td>100</td>
<td>21</td>
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<td>100</td>
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<td>100</td>
<td>100</td>
<td>-</td>
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<td>-</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Segment 1006

**Standards**

- **Temperature (°C/°F):**
  - Tidal Stream: 35 / 95
  - Perennial Stream: 35 / 95
- **Dissolved Oxygen (24-Hr Average) (mg/L):**
  - Tidal Stream: 2.0
  - Perennial Stream: 4.0 / 3.0
- **Dissolved Oxygen (Absolute Minima) (mg/L):**
  - Tidal Stream: 2.0
  - Perennial Stream: 3.0 / 2.0
- **pH (standard units):**
  - Tidal Stream: 6.5-9.0
  - Perennial Stream: 6.5-9.0
- **Enterococci (MPN/100mL) (30-day geometric mean > 10 samples):**
  - Tidal Stream: 168
  - Perennial Stream: 168
- **E. coli (MPN/100 mL) (grab):**
  - Tidal Stream: 399
  - Perennial Stream: 126
- **Ammonia (mg/L):**
  - Tidal Stream: 0.46
  - Perennial Stream: 0.33
- **Nitrate-N (mg/L):**
  - Tidal Stream: 1.10
  - Perennial Stream: 1.95
- **Orthophosphate Phosphorus (mg/L):**
  - Tidal Stream: 0.46
  - Perennial Stream: 0.37
- **Total Phosphorus (mg/L):**
  - Tidal Stream: 0.66
  - Perennial Stream: 0.69
- **Chlorophyll a (µg/L):**
  - Tidal Stream: 21
  - Perennial Stream: 14.1

### FY 2016 Active Monitoring Stations

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Description</th>
<th>Frequency</th>
<th>Monitoring Entity</th>
<th>Parameter Groups</th>
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<tbody>
<tr>
<td>11126</td>
<td>Halls Bayou at Jensen Drive</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>11127</td>
<td>Halls Bayou at Tidwell Road</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
</tr>
<tr>
<td>11175</td>
<td>Carpenters Bayou at East Belt Drive</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria</td>
</tr>
<tr>
<td>11264</td>
<td>Houston Ship Channel at San Jacinto Park</td>
<td>Monthly</td>
<td>HCPCS</td>
<td>Field, Conventional, Bacteria, Chlorophyll a (Qrtrly)</td>
</tr>
<tr>
<td>11264</td>
<td>Houston Ship Channel at San Jacinto Park</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria, Chlorophyll a, Metals</td>
</tr>
<tr>
<td>Code</td>
<td>Location</td>
<td>Frequency</td>
<td>Agency</td>
<td>Tests Conducted</td>
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<tr>
<td>---------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
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<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>11264</td>
<td>Houston Ship Channel at San Jacinto Park</td>
<td>Twice / Year</td>
<td>TCEQ</td>
<td>Metals in Sediment</td>
</tr>
<tr>
<td>11271</td>
<td>HSC at Greens Bayou Cm 152</td>
<td>Monthly</td>
<td>HCPCS</td>
<td>Field, Conventional, Bacteria, Chlorophyll a (Qrtrly)</td>
</tr>
<tr>
<td>11271</td>
<td>HSC at Greens Bayou Cm 152</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria, Chlorophyll a</td>
</tr>
<tr>
<td>11272</td>
<td>Carpenters Bayou Tidal at S Sheldon Rd</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Filed, Conventional, Bacteria</td>
</tr>
<tr>
<td>11272</td>
<td>Carpenters Bayou Tidal at S Sheldon Rd</td>
<td>Once / Year</td>
<td>TCEQ</td>
<td>Metals &amp; Organics in Sediment</td>
</tr>
<tr>
<td>11273</td>
<td>Patrick Bayou at Tidal Road</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria, Chlorophyll a</td>
</tr>
<tr>
<td>11273</td>
<td>Patrick Bayou at Tidal Road</td>
<td>Twice / Year</td>
<td>TCEQ</td>
<td>Metals in Water</td>
</tr>
<tr>
<td>11277</td>
<td>Patrick Bayou at Tidal Road</td>
<td>Once / Year</td>
<td>TCEQ</td>
<td>Benthics, Metals &amp; Organics in Sediment</td>
</tr>
<tr>
<td>11279</td>
<td>Greens Bayou at Green River Rd</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>15862</td>
<td>Halls Bayou at Homestead Road</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>15863</td>
<td>Halls Bayou at Hirsch Road</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>15864</td>
<td>Halls Bayou at Mesa Drive</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>16617</td>
<td>HSC at Cargill Terminal</td>
<td>Monthly</td>
<td>HCPCS</td>
<td>Field, Conventional, Bacteria, Chlorophyll a (Qrtrly)</td>
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<tr>
<td>16662</td>
<td>Big Gulch at Wallisville Rd</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>16663</td>
<td>Spring Gully at Barnesworth Dr</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>16664</td>
<td>Goodyear Creek Tidal at IH-10</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>16665</td>
<td>Trib Halls Bayou at Langley Rd</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>16666</td>
<td>Trib Halls Bayou at Talton St</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
</tr>
<tr>
<td>16667</td>
<td>Trib Halls Bayou at Woodlyn Rd</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
</tr>
<tr>
<td>16981</td>
<td>Greens Bayou Tidal at Isk Ditch</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria, Chlorophyll a</td>
</tr>
<tr>
<td>16981</td>
<td>Greens Bayou Tidal at Isk Ditch</td>
<td>Once / Year</td>
<td>TCEQ</td>
<td>Metals &amp; Organics in Sediment</td>
</tr>
<tr>
<td>17490</td>
<td>Halls Bayou at Airline Road</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
</tr>
<tr>
<td>17491</td>
<td>Halls Bayou at Deer Trail Dr</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>18322</td>
<td>Tucker Bayou at First Bend</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria, Chlorophyll a</td>
</tr>
<tr>
<td>18322</td>
<td>Tucker Bayou at First Bend</td>
<td>Twice / Year</td>
<td>TCEQ</td>
<td>Metals in Water</td>
</tr>
<tr>
<td>18322</td>
<td>Tucker Bayou at First Bend</td>
<td>Once / Year</td>
<td>TCEQ</td>
<td>Metals in Sediment</td>
</tr>
<tr>
<td>18362</td>
<td>Greens Bayou at Market Street</td>
<td>Quarterly</td>
<td>TCEQ</td>
<td>Field, Conventional, Bacteria, Chlorophyll a</td>
</tr>
<tr>
<td>20455</td>
<td>Halls Bayou at Intersection of Kowis St and Shady Ln</td>
<td>Quarterly</td>
<td>H-GAC</td>
<td>Field, Conventional, Bacteria</td>
</tr>
<tr>
<td>20797</td>
<td>Carpenters Bayou at mouth of barge canal 32 M west and 666 M south of intersection of DeZavalla Rd and Harding Rd in Harris Co</td>
<td>Monthly</td>
<td>HCPCS</td>
<td>Field, Conventional, Bacteria, Chlorophyll a (Qrtrly)</td>
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<td>21008</td>
<td>Greens Bayou at Wallisville Rd approx 150 M NE of the intersection of Dattner Rd and Wallisville Rd</td>
<td>Nine Times / Year</td>
<td>COH / HHS</td>
<td>Field, Conventional, Bacteria</td>
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<tr>
<td>Issue</td>
<td>2014 Assessment</td>
<td>Possible Causes / Influences / Concerns Voiced by Stakeholders</td>
<td>Possible Solutions / Actions To Be Taken</td>
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<td>-------</td>
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<td>---------------------------------------------------------------</td>
<td>-----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1006D</td>
<td>I</td>
<td>▪ Constructed stormwater controls failing</td>
<td>▪ Improve compliance and enforcement of existing stormwater quality permits</td>
<td></td>
</tr>
<tr>
<td>1006F</td>
<td>I</td>
<td>▪ Direct and dry weather discharges</td>
<td>▪ Improve construction oversight to minimize TSS discharges to waterways</td>
<td></td>
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<tr>
<td>1006H</td>
<td>I</td>
<td>▪ Waste haulers illegal discharges/improper disposal</td>
<td>▪ Add water quality features to stormwater systems</td>
<td></td>
</tr>
<tr>
<td>1006I</td>
<td>I</td>
<td>▪ Poorly operated or undersized WWTFs</td>
<td>▪ Install and/or conserve vegetative buffer areas along all waterways</td>
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<tr>
<td>1006J</td>
<td>I</td>
<td>▪ WWTF non-compliance, overflows, and collection system by-passes</td>
<td>▪ Regionalize chronically non-compliant WWTFs</td>
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<tr>
<td></td>
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<td>▪ Improper or no pet waste disposal</td>
<td>▪ Require all systems to develop and implement a utility asset management program and protect against power outages at lift stations</td>
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<td></td>
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<td>▪ Animal waste from domestic animal facilities</td>
<td>▪ Increase monitoring requirements for self-reporting</td>
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<td>▪ Developments with malfunctioning OSSFs</td>
<td>▪ Impose new or stricter bacteria limits than currently designated by TCEQ</td>
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<td>▪ More public education on pet waste disposal</td>
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<tr>
<td>Elevated Levels of Indicator Bacteria</td>
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<td>▪ Create and implement Water Quality Management Plans for individual domestic animal facilities</td>
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<tr>
<td>1006F</td>
<td>C</td>
<td>▪ Excessive nutrients and organic matter from SSOs, malfunctioning OSSFs, illegal disposal of grease trap waste, and biodegradable solid waste (e.g., grass clippings and pet waste)</td>
<td>▪ More public education regarding disposal of household fats, oils, and grease</td>
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<tr>
<td>1006I</td>
<td>C</td>
<td>▪ Vegetative canopy removed</td>
<td>▪ Improved OSSF maintenance and education</td>
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</tr>
<tr>
<td>1006J</td>
<td>C</td>
<td></td>
<td>▪ Improve compliance and enforcement of existing stormwater quality permits</td>
<td></td>
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<tr>
<td>Dissolved Oxygen Concentrations</td>
<td></td>
<td></td>
<td>▪ More public education on pet waste disposal</td>
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<tr>
<td>Elevated</td>
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<td></td>
<td>▪ Conserve or restore trees and habitat along waterways to maintain/create shade to cool water</td>
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</tr>
<tr>
<td>1006</td>
<td>C</td>
<td>▪ Fertilizer runoff from urbanized properties,</td>
<td>▪ Implement YardWise and Watersmart landscape</td>
<td></td>
</tr>
<tr>
<td>Nutrients</td>
<td>1006B</td>
<td>C</td>
<td>such as landscaped areas, residential lawns, and sport fields</td>
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<td>-----------</td>
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<tr>
<td>1006D</td>
<td>C</td>
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<td>- SSOs and malfunctioning OSSFs</td>
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<tr>
<td>1006F</td>
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<td></td>
</tr>
<tr>
<td>1006J</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| PCBs/Dioxin in Edible Fish Tissue | 1006 | I | Legacy pollutants in sediment \nConcentrated deposits outside boundaries of the waste pits located adjacent to San Jacinto River and I-10 bridge \nWaste pit located along the San Jacinto River immediately upstream of I-10 bridge is now a National Priority List Superfund site managed by regulators \nUnknown industrial or urban sources | Continue to contain, remove, and monitor known contaminated sites \nEncourage regulators and responsible parties to work together to remediate Superfund site \nRemove or contain contamination from locations already identified \nEncourage additional testing to locate all unknown sources/deposits |
|---------------------------------|------|---|----------------------------------------------------------|
| Pesticides in Edible Fish Tissue | 1006 | I | Fertilizer runoff from urbanized properties, such as landscaped areas, residential lawns, and sport fields | Implement YardWise and Watersmart landscape practices |
| Mercury in Water | 1006 | I | Legacy pollutants in sediment \nUnknown industrial or urban sources, possibly including coal fired power plants, coal and wood-fired industrial boilers, hazardous waste combustion, chlorine production, and offshore oil and gas drilling \nSpills at industrial facilities \nDredging of the channel | Continue to contain, remove, and monitor known contaminated sites \nSupport efforts aimed at reducing mercury emissions from coal-fired power plants \nSupport the reduced use of industrial mercury |
| Toxicity in Sediment | 1006 | I | Legacy pollutants in sediment \nUnknown industrial or urban sources \nSpills at industrial facilities \nDredging of the channel | Continue to contain, remove, and monitor known contaminated sites |

**Segment Discussion**

**Watershed Characteristics:** The tidal portion of the Houston Ship Channel is heavily developed. The lower portion of the watershed includes the Cities of Deer Park, Channelview, Houston, Pasadena, and parts of unincorporated Harris County. Heavy industrial complexes line both sides of the channel in the lower part of the watershed. The eastern end of this segment is Carpenters Bayou, which has four tributaries: Tucker Bayou, Patrick Bayou, Boggy Bayou, and Glenmore Ditch. On the south shore of the western end of the watershed is the confluence with Greens Bayou which also receives heavy barge traffic.
Tributaries to Greens Bayou include: Goodyear Creek, Jordan Gully, Big Gulch, Spring Gully, Halls Bayou, and an unnamed tributary. The Halls Bayou area is predominantly residential and commercial with some light industry. The majority of the area is on sanitary sewer, however there are scattered on-site sewer facilities scattered throughout the watershed.

**Water Quality Issues:** Recreation use is prohibited in the classified portion of the watershed (the main channel, segment 1006), but all of the unclassified tributaries to 1006 have designated recreational uses. None of these support recreation use due to elevated levels of bacteria. The seven-year geometric mean standard is 126/MPN/100 mL, and the grab standard is 399 MPN/100 mL.

<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td></td>
<td>Geomean (MPN/100 mL) / % Grab Exceedance</td>
<td>Geomean (MPN/100 mL) / % Grab Exceedance</td>
<td>Geomean (MPN/100 mL) / % Grab Exceedance</td>
</tr>
<tr>
<td>1006D_01</td>
<td>623 / 91.2</td>
<td>1298 / 91.2</td>
<td>397 / 76.9</td>
</tr>
<tr>
<td>1006D_02</td>
<td>795 / 91.4</td>
<td>1442 / 91.4</td>
<td>677 / 81.3</td>
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<tr>
<td>1006F_01</td>
<td>357 / 77.8</td>
<td>968 / 92.5</td>
<td>326 / 59.0</td>
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<tr>
<td>1006H_01</td>
<td>258 / 90.4</td>
<td>542 / 92.5</td>
<td>195 / 63.3</td>
</tr>
<tr>
<td>1006I_01</td>
<td>737 / 77.8</td>
<td>968 / 92.5</td>
<td>731 / 87.5</td>
</tr>
<tr>
<td>1006J_01</td>
<td>957 / 97.3</td>
<td>2359 / 97.3</td>
<td>464 / 79.0</td>
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</table>

In general, bacteria levels have fallen over time but remain well above the current water quality standard. Seven-year bacteria geomean plots for segments 1006D and 1006J show the highest geometric mean concentrations over time compared to other segment assessment units (AU).

Several AUs in the main channel are also impaired for enterococci. The seven-year geometric mean standard for this segment is 35 MPN/100 mL (enterococci) and the single-sample (grab) standard is 104 MPN/100 mL.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Geomean (MPN/100 mL) / % Grab Exceedance</td>
<td>Geomean (MPN/100 mL) / % Grab Exceedance</td>
<td>Geomean (MPN/100 mL) / % Grab Exceedance</td>
</tr>
<tr>
<td>1006_01</td>
<td>43.9 / 26.5</td>
<td>60 / 26.5</td>
<td>36 / 17.7</td>
</tr>
<tr>
<td>1006_03</td>
<td>70.1 / 28.6</td>
<td>69 / 28.6</td>
<td>100 / 36.7</td>
</tr>
<tr>
<td>1006_05</td>
<td>170 / 41.7</td>
<td>204 / 41.7</td>
<td>228 / 54.1</td>
</tr>
<tr>
<td>1006_06</td>
<td>35.4 / 5.9</td>
<td>21 / 5.9</td>
<td>56 / 25.0</td>
</tr>
<tr>
<td>1006_07</td>
<td>46.0 / Insufficient Data</td>
<td>Insufficient Data</td>
<td>80 / 36.3</td>
</tr>
</tbody>
</table>

There are 15 AUs in this watershed. The 2014 IR identified concerns for aquatic life support due to dissolved oxygen (DO) grab results in 3 AU and sediment toxicity in 2 AUs. Mercury was also found in the water of assessment unit 1006_04.

Segment 1006 was deemed to not support the fish consumption use in the 2014 IR. Elevated levels of PCBs, dioxin, mercury, and several other pesticides were found in the edible tissue of fish in 7 AUs. Aquatic life use in AU 1006_04 is impaired due to high levels of mercury in the water.
General uses are unsupported in about half of the watershed- there are ammonia concerns in 4 AUs, nitrate-nitrogen (nitrate) concerns in 11 AUs, total phosphorus (TP) in 11 AUs, and chlorophyll a concerns in 2 AUs. Details regarding percent exceedances for each segment and/or AU can be found in the data summaries in the appendix.

**Special Studies/Projects:** This segment has been included in three TMDL projects: the Houston Metro TMDL for bacteria, the Houston Ship Channel and Upper Galveston Bay TMDL for PCBs in Fish Tissue and the Houston Ship Channel TMDL for Dioxin. The unclassified segment 1006D (Halls Bayou Below U.S. Highway 59) has also been subject to the Failing Onsite Sewage Facility Initiative and Westfield Estates Watershed Protection Plan. Additionally, This segment is a part of a larger geographic area covered under several TMDLs, collectively known as the Bacteria Implementation Group (BIG) I-Plan. For more information, please refer to the detailed discussions of Dioxin and PCB contamination, the BIG, and the Westfield Estates WPP located in the Public Involvement and Outreach section of the 2016 Basin Summary Report.

**Trends:** Eight significant parameter trends were detected for the entire classified portion of the Houston Ship Channel (HSC) Tidal watershed including increasing salinity, Secchi transparency, specific conductance (SPCond), sulfate, and total dissolved solids (TDS) while total suspended solids (TSS) and bacterial concentrations are decreasing over time. The most common trend seen throughout the watershed is a gradual increase in dissolved constituents in water. This is reflected in the regression plots for salinity, Secchi transparency, TDS, and SPCond for all classified segments and unclassified water bodies showing increases over time while TSS decreases. Reasons for these trends may include an increased volumetric contribution of wastewater effluent, improvements to storm water controls in the area, or increased tidal influences from Galveston Bay and the Gulf of Mexico.

Bacteria concentrations for the entire segment have been gradually decreasing since the early 2000s; however, the majority of samples are still significantly higher than the water quality standard for tidal and freshwater streams. *E. coli* levels have measured greater than 1,000 MPN/100 mL several times since 2014 and *enterococci* concentrations have reached levels greater than 10,000 MPN/100 mL during the period of record. The slight decrease in bacterial concentrations over time may be related to the implementation of best management practices (BMPs) developed by the BIG group in Halls Bayou and adjacent watersheds. The only DO concern for this segment is on AU 1006J which is an unclassified tributary of Halls Bayou. Station data for 1006J shows a slight decrease in DO concentrations over time with samples frequently measuring at or below 4.0 mg/L. Continued monitoring of DO concentrations in 1006J is recommended to ensure conditions do not worsen to the point where a DO impairment is required.

**Nitrate**, total Kjeldahl nitrogen (TKN), and **total phosphorous (TP)** concentrations are increasing in freshwater streams within the watershed including stations located on 1006D (Halls Bayou) and 1006F (Big Gulch Above Tidal). The only station with decreasing nutrient trends for nitrate and TP is station 16665 located on 1006J. Additionally, a decrease in ammonia was detected in Halls Bayou and its two unclassified tributaries (1006I and 1006J). The tributary feeding into the HSC Tidal segment with a concern for chlorophyll a shows no significant change in chlorophyll a concentrations since 2000. However, only 50 samples have been collected during the period of record. Additional data is necessary to better evaluate chlorophyll a trends over time.
<table>
<thead>
<tr>
<th>Recommendations</th>
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<tbody>
<tr>
<td>Address concerns found in this segment summary through stakeholder participation.</td>
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<tr>
<td>Complete the BIG plan and the TMDL for Halls Bayou.</td>
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<tr>
<td>Continue collecting water quality data to support actions associated with any future watershed protection plan development and possible modeling.</td>
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</tbody>
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