

## TECHNICAL MEMORANDUM

### GORST CREEK WATERSHED STUDY EXISTING DRAINAGE INFRASTRUCTURE DEFICIENCIES



For: City of Bremerton, WA



By: Rex Meyer, P.E.

December, 2012

## INTRODUCTION

This memorandum documents the existing drainage infrastructure deficiencies within the Gorst Creek Watershed and has been prepared as part of the Watershed Characterization Plan. Drainage system problems were identified and categorized by type as chemical, biological and physical. Some of the problems identified include erosion, pollution loading, flood problems and fish passage barriers within the watershed. To identify system deficiencies, the City of Bremerton and Kitsap County Public Works drainage complaint records were reviewed; discussions were held with the Kitsap County Public Works Surface and Stormwater Management Division; and the Kitsap Public Health District; and discussions were held with business and home owners near identified problem areas on the day after a food rainfall event of 4.09 inches within 24 hours on November 19th, 2012.

A Programmatic Stormwater Management Alternatives Technical Memorandum is scoped to address corrections and programmatic costs for the drainage infrastructure deficiencies identified in this memo.

The Gorst Creek Watershed has a drainage area of approximately 8 square miles. Gorst Creek has its source near unincorporated Sunnyslope and flows north past W. Belfair Valley Road. The creek then flows east along W. Belfair Valley Road through unincorporated Gorst where it flows into Sinclair Inlet.

## SITE SPECIFIC IDENTIFIED DRAINAGE INFRASTRUCTURE DEFICIENCIES

Drainage infrastructure deficiencies are identified by site and are located on the location map in Figure 2. General potential or observed deficiency concerns are provided in notes for each of the 16 sites in the figure. The legend identifies flooding, chemical and biological deficiency concerns for each site. All of the formal drainage complaints and records received by the County are included in Attachment B for reference. Unresolved or potential problems from the drainage complaints and records are noted in the site locations shown in Figure 2.

The 100-year flood levels for the Gorst Creek Watershed are illustrated in the FEMA Flood Insurance Map shown in Figure 1. The exhibit shows a large portion of the Urban Growth Area impacted within the 100 flood plain for Gorst Creek near Sinclair Inlet.

The stormsewer systems and creeks within the Gorst Urban Growth Area boundary are shown in Figure 3 which is provided for reference.

### Identified Existing Biological Drainage Deficiencies

#### ***Fecal Coliform Bacterium Testing***

In 2008, Kitsap Public Health began a series of four shoreline surveys that tested for fecal coliform levels along Sinclair Inlet through a Washington State Department of Ecology Centennial Clean Water Fund grant. The testing was completed within a two-year time frame as part of the Sinclair Inlet Restoration Project. Kitsap Public Health District found 39 hotspot areas in the Gorst drainage area. Seven of these were located in the Gorst urban growth area. After the sewer was constructed in 2010, six of the seven fecal coliform level hotspot areas were investigated and were downgraded to a level of no significance. The final fecal coliform hotspot near Kitsap Muffler requires Kitsap Public Health wet season investigation by December 2013.

Kitsap County is under a Department of Ecology Phase II Stormwater Permit. The permit allows for nothing but rain to runoff into Sinclair Inlet or Puget Sound. Kitsap Public Health conducted an Illicit Discharge Detection and Elimination Program through a grant with Washington State Department of Ecology. Interjurisdictional stormwater training sessions were conducted and funding was provided for joint site inspections. Predominately, target businesses that have illicit discharges are food service and auto.

### ***Sinclair Inlet Restoration Project***

In 2010, two pump stations and a sanitary sewer collection system were built in the Gorst urban growth area using funds from the American Recovery and Reinvestment Act of 2009 federal stimulus funding. The funding was also used to tie residential properties with failing or non-conforming septic systems into the sewer system in the urban growth area. Stub outs were also provided for the businesses to connect to. Kitsap Public Health required that urban growth area businesses connect to the collection system in the following cases:

1. Non-conforming septic system including those with waivers
2. No records for septic system
3. Any septic system that is failing

All residential properties and most of the businesses on septic systems in the Urban Growth Area in the Gorst area were connected to the collection system. Five businesses are not yet hooked up to the sanitary sewer collection system but have mitigating circumstances. Two of these are utilizing holding tanks. The other three businesses are negotiating an easement across a narrow strip of property that is currently in foreclosure. See Attachment A for additional reference material about the Restoration Project.

The properties in Gorst were predominately developed during World War II. The estuary area where highway (Hwy) 3 and Hwy 16 meet is known as a septic system failure zone. Much of the soil within this zone is fill. Properties were developed on small lots with septic systems built on poor and shallow soils with high water tables.

In the case of two sites, septic systems were designed earlier than established standards were developed and before the 60's when reporting requirements from permitting began. While no observed problem is evident, hillside seepage and flooding can potentially pose a condition where septic systems could conceivably be compromised.

Additional sites with potential biologic issues include cases of observed cloudy creek water at fish rearing ponds and several waterfowl residing within a backyard residential pond.

### **Identified Existing Chemical Drainage Infrastructure Deficiencies**

According to the Kitsap Public Health District, Kitsap County chemical issues are generally being noted in runoff coming off parking lots. The Gorst area has not traditionally required water quality treatment facilities or drainage flow control detention or retention storage facilities.

### **Identified Additional Physical Drainage Infrastructure Deficiencies Fish Passage Barriers**

Existing fish passage barriers are known to exist in the Gorst Creek Watershed. These are located and identified in the Parametrix Technical Memorandum called "Fish Passage Barrier Preliminary Engineering" dated December 30<sup>th</sup>, 2011.

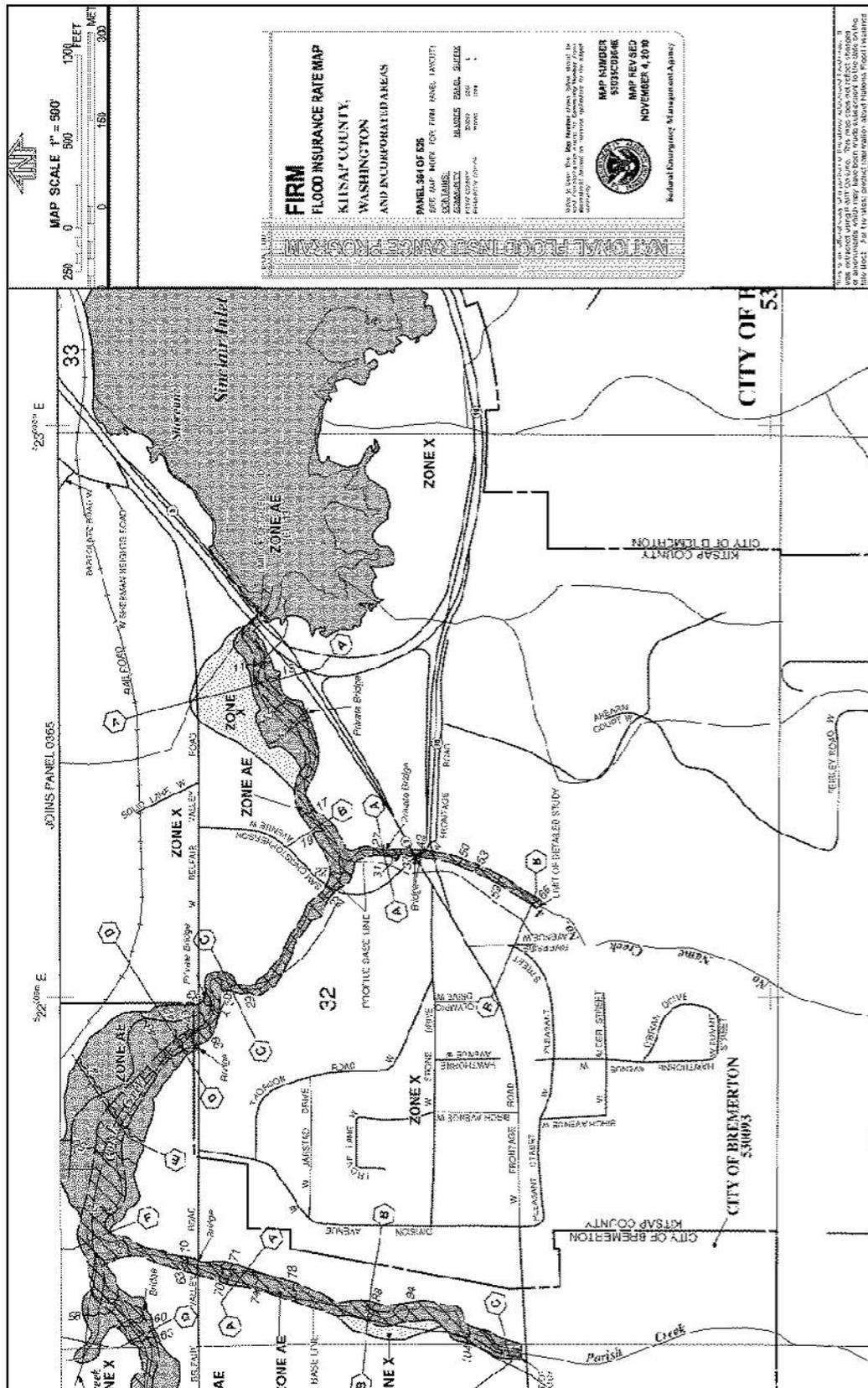
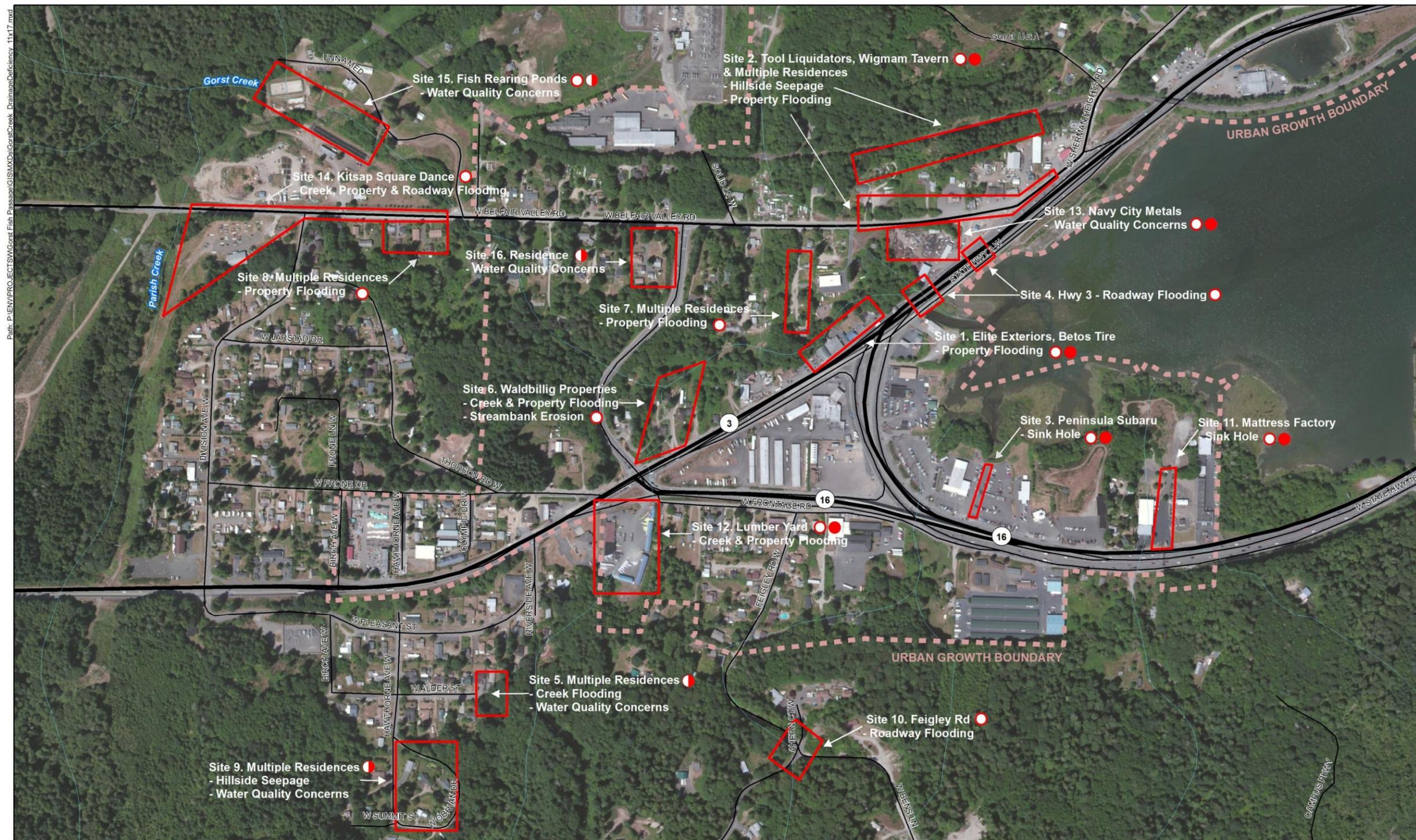


Figure 1 Gorst Creek 100 Year Flood Boundaries (draining to Sinclair Inlet)

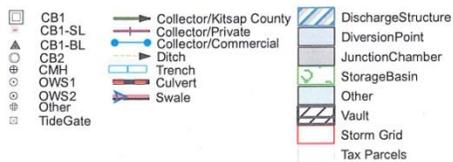


**Drainage Infrastructure Deficiency Category**

- FLOODING
- CHEMICAL
- ◐ BIOLOGICAL



**Figure 2** Gorst Creek Identified Infrastructure Deficiencies



### KITSAP COUNTY PUBLIC WORKS Surface and Stormwater Management

Note: The information presented in the map comes from several sources and varies in data quality. This map provides information on the type and relative location of components which comprise the surface water drainage system of Kitsap County. It should not be used as a basis for developing engineering designs. For more information, contact Kitsap County Surface and Storm Water Management Program at 360-337-5777.



Figure 3

# Gorst Creek Watershed Existing Drainage Deficiencies

Technical Memorandum

AECOM

**Site 1 – Elite Exteriors and Betos Tire**, 3987 State Highway 3 W, Bremerton, WA 98312-4940. Elite Exteriors and Betos Tire are businesses located along the north side of Hwy 3, north of the viaduct. At a recent public meeting, a representative of Elite Exteriors reported frequent flooding of his commercial buildings built in 1925 and 1938. The proprietor of Betos Tire noted to me that when Hwy 3 floods during high tides and heavy rains, runoff channels along the road shoulder to a sag point in the road profile near the properties of Elite Exteriors and Betos Tires. It then floods the two properties as it drains north to Gorst Creek.



**Photo 1** Looking NW at Elite Exteriors



**Photo 2** Same spot looking SE along Betos Tire

**Site 2 – Multiple business and residential sites, along W. Belfair Valley Road**, north of the Navy City Metals property. Seepage from the upland hillside flows to the back of Tool Liquidators (3476 W. Belfair Valley Road) and Winners Circle Bar and Grill (3548 W. Belfair Valley Road, or old Wigwam Tavern) after day long rains (see photo 4). The seepage can generate as much as 2 inches that has streamed through the building of Tool Liquidators. The owner has installed one sump pump and will add another at the rear of the property. From discussion with the owner of Tool Liquidators, The Winner's Circle Bar and Grill property also corrected rear property hillside drainage problems under previous ownership. The new owner has not been available to determine what specific repairs were made.



**Photo 3** Creek floods to front step of Tool Liquidators



**Photo 4** Hillside seepage floods through back of Tool Liquidators

The unnamed tributary flow from the north runs east along the north side of W. Belfair Valley Road in 7' wide x 8' deep ditches and then outlets through a 36" culvert into Sinclair Inlet across Hwy 3. The ditch is overwhelmed due to rising tides and heavy rain at this roadway sag location (see photo 5). Business for Winner's Circle Bar and Grill shuts down when the road is closed by the high water and when the lot floods (see photo 6).



**Photo 5** Belfair Valley Road 36 IN Culvert crosses roadway at Wigwam Tavern



**Photo 6** Winner's Circle Bar and Grill flooded to doorstep and flooded parking lot

Tool Liquidators and the Winner's Circle Bar and Grill and west adjacent residential properties reported ditch overflow flooding up to the foundation footing of their buildings during high tides and high intensity storms. Tool Liquidators has had up to 18 inches of flood waters within their building. East of the flooding, the owner of Tool Liquidators claimed that the adjacent Kitsap muffler business was not affected by the street flooding due to their raised foundation level. The west flood limits appears established by a Kitsap County Public Works drainage complaint for flooding of a driveway at 3652 W. Belfair Valley Road.

The street inlet and drainage line in the front of the Tool Liquidators building silts up from high tides in Sinclair Inlet that can reverse the pipe flow and sediment. This short drain line empties into the drainage ditch.

**Site 3 - Peninsula Subaru**, 3888 State Highway 16 W, Bremerton, WA, 98312. Peninsula Subaru has developed a sink hole on the northeast side of the property. This lot has two outlets at the rear of the lot into Sinclair Inlet for two separate drainage lines running north and south through the property. One outlet drains the parking lot and is the responsibility of Peninsula Subaru and the other drains Hwy 16 runoff and collects the drainage flows from an unnamed tributary from the south side of Hwy 16. The owner claims that this culvert is set within an easement established in the 20's and the 50's. The maintenance responsibility of the second drain line could not be verified as of this writing. The City of Bremerton does not have ownership or honors the maintenance responsibility for a storm drainage line within the easement.



**Photo 7** Patched sink hole location

The owner has tried to correct two previous sink holes by repairing the drain line for the parking lot drainage (see photo 7) until it was discovered that a second CMP drain line next to it was causing the sink holes. The second CMP culvert pipe runs through the lot. The outlet for this pipe is set lower and includes a tee diffuser. A

manhole on the south side of Peninsula Subaru was opened and inspected. It connects an 18" CMP WSDOT culvert crossing Hwy 3 with the culvert within Subaru (see photo 8). An unnamed tributary from the south is drained by these culvert pipes into Sinclair Inlet. The CMP culvert within Subaru has corroded and the sink holes are likely the result of culvert piping or exterior flows undermining and eroding out the bedding around the pipe.



**Photo 8** Manhole in Subaru parking where roadway storm drain connects



**Photo 9** Tributary south of Hwy 3

**Site 4 – State Highway 3 W**, two locations to the south and to the east of the Navy City Metals property at 3805 Hwy 3 W. Bremerton. Several lanes of Hwy. 3 have closed down at these two culvert crossings for several hours due to a simultaneous high tide and high rainfall intensity near the culvert outlets of Gorst Creek and the 36" culvert north that cross Hwy 3 W and drain to Sinclair Inlet.

**Site 5 – Multiple residences**, east end of W. Alder Street (Outside of the Gorst Urban Growth Area). Residences may flood from creek overflows. Septic systems in this old part of town could be under stress during peak flow periods creating a concern for water quality by the Kitsap Public Health District. Many of the septic systems were designed earlier than established standards were developed and before the 60's when reporting requirements from permitting began.

**Site 6 – Waldbillig Properties**. These properties include the residences of 4159 and 4177 Hwy 3 and a commercial property at 4163 Hwy 3 that are all located on the north side of the highway and east of Sam Christopherson Avenue W. A 24" culvert beginning at the Washington Cedar lumber yard crosses the intersection and outlets on the upstream southern property point on Waldbillig Properties. A ditch carries this outflow to the west side of the property and then drains north to Gorst Creek. This perched elevated ditch overtops its banks and floods both homes. The ditch adjacent to the affected homes on the west side requires sandbagging to contain ditch flows (see photos 10 through 13).

A drainage complaint was received by the Kitsap Public Works that the two residences flood due to installation of a 24" private driveway culvert upstream along Sam Christopherson Road. The County inspected the site and noted that the culvert and driveway was on private property.

The Kitsap Public Health District thought that the owner claimed that the residence at 4159 Hwy 3 was almost lost to streambank erosion in Gorst Creek three to four years ago.



**Photo 10** Waldbillig Property looking south at unnamed tributary



**Photo 11** Looking north (tributary on left)



**Photo 12** Looking south



**Photo 13** Gorst stream bank at Waldbillig property at 4159 Hwy 3

**Site 7 – Old Belfair Valley Road properties.** These properties are southeast of Old Belfair Valley Road and Sam Christopherson Avenue W. and west of Navy City Metals. Flooding was reported to have occurred in this area in the past. Many homes in the area are now abandoned. Homes appear to be within the Gorst Creek 100-year flood plain according to the FEMA flood plain Flood Insurance Rate Mapping shown in Figure 1.

**Site 8 – Multiple residential homes, W. Belfair Valley Road at Gorst Creek** (Outside of the Urban Growth Area). It was reported by Kitsap Public Health District that Gorst Creek has flooded near the fish hatchery as the creek crosses Belfair Valley Road. During visual observation of the area, several homes at 4277, 4259 and 4273 W Belfair Valley Road on the south side of the road and west of the Gorst Creek crossing had to be sandbagged next to the road shoulder. It appears that most of the runoff impacts come from overflow from the Kitsap Square Dance property where Parish Creek overtopped its banks.

**Site 9 – Multiple residences** between W. Summit Street and O'Brian Drive, Gorst, WA (Outside of Gorst Urban Growth Area), Stress on septic systems is a water quality concern by the Kitsap Public Health District for this neighborhood from hillside seepage and raised water tables during peak rain events. The septic systems were designed earlier than established standards were developed and before the 60's when reporting requirements from permitting began. Monitoring of septic systems is not normally completed during peak flow

events so the performance of these systems is uncertain under these circumstances. Residences were provided a formal letter from the Kitsap Public Health District that they were not in non-conformance.

**Site 10 – Multiple residences along Feigley Road switchback** (Outside of Gorst Urban Growth Area). Flooding occurred when a frontage road crossing culvert was plugged on this moderately sloped street of Feigley Road. This location was not specified and the problem was reportedly resolved by removing the debris blockage and may not be an ongoing problem.

**Site 11 - The Mattress Ranch**, 3650 Hwy. 16 W., Port Orchard. The owner currently has a sink hole developing approximately 25 feet from the back of the parking lot in line with drainage structures at the Mattress Factory. Kitsap Public Works storm sewer mapping shows a stormsewer under the Mattress Ranch parking lot that is connected to a WSDOT stormsewer and two upstream Hwy 3 catch basins. A Kitsap County Public Works drainage complaint shows that the stormsewer under the Mattress Ranch is a 30" CMP private line that is the responsibility of the owner. The complaint notes a sink hole problem in 2003. The stormsewer section that is maintained by the Mattress Ranch likely has a problem with piping or the undermining of culvert bedding that causes the sink holes. The County maintains the outfall swale at the end of the Mattress Ranch drain pipe.

Kitsap Public Works reports that sediment filled up the WSDOT catch basins and connecting stormsewer quickly after a recent maintenance cleaning. The upstream runoff from the south side hillsides can carry sand and gravel unto the highway. The County suspects that the private line may have silt deposits as a result. The County is averse to taking responsibility for cleaning this private drainage line.

The driveway entrance of this property used to flood and was reported previously as a drainage problem. The driveway has since been regraded and ponding on the driveway is no longer an issue.

**Site 12 – Washington Cedar lumber yard**, 4041 Hwy 3 W, Bremerton (junction of Hwy 16 and Hwy 3). Kitsap Public Works and the Kitsap Public Health District noted previous flooding from an upstream unnamed tributary that caused property damage in the lumber yard from an overwhelmed culvert entrance upstream of the parking lot edge. Flows enter the site from an upstream unnamed creek from the south (see photo 14). To avoid flooding, the manager has to maintain a screen at the culvert entrance that prevents debris from entering the 24-inch culvert pipe. Silt has not been an issue with the 24-inch culvert.

The business is required by the County to clean sediment from a second adjacent 12-inch CMP surface drainage line for the parking lot runoff once a year.



**Photo 14** Culvert entrance at the upstream edge of the lumber yard



**Photo 15** Culvert entrance at the downstream edge of lumber yard

**Site 13 – Navy City Metals, 3805 Hwy 3 W. Bremerton.** This site is monitored by the Department of Ecology through an industrial permit. The ditch on the north side of W. Belfair Valley Road (see photo 5) is connected to a second continuing downstream ditch by a 36” culvert crossing under the road. This ditch is drained by a 36” culvert crossing Hwy 3 to Sinclair Inlet. The second ditch (see photo 16) is adjacent to this active metal recycling facility. Backwater from high tides and heavy rainfall floods the properties noted in Site 2 and the yard at Navy City Recycling. Employees report that flooding as deep as 3 feet has been seen in the yard. All yard drainage leaves through an oil water separator and is released into the ditch by a 6-inch pipe. Metal laden runoff released into Sinclair Inlet is a concern where copper and zinc levels are already high.



**Photo 16** Ditch and 36” culvert crossing at Hwy 3



**Photo 17** Looking north at ditch and Wigwam in background and Navy City Recycle’s north drive is shown on the left



**Photo 18** North drive of Navy City Recycle



**Photo 19** South drive of Navy City Recycle

**Site 14 –Kitsap Square Dance Association, 6800 W. Belfair Valley Road, Gorst, WA** (Outside Urban Growth Area). The Parish Creek sub-basin drainage area is 1.8 square miles. Parish Creek flows northward beneath Highway 3 west of Division Street and crosses beneath the West Belfair Valley Road just before joining Gorst Creek. During high flows, Parish Creek jumps the narrow and shallow creek bed channel into surrounding floodplain areas to the east, approximately 400 feet upstream of the West Belfair Valley Road culvert. The stream channel profile and surrounding area grade changes within the area of the Kitsap Square Dance Hall facility and becomes quite flat. Over the years, high flow events have brought sediment into this area causing loss of the main channel due to filling, and creating braiding and broad floodplain overflows into the adjacent

areas (see photos 20 and 21). From this location, floodplain drainage tends to flow through the Kitsap Square Dance Association gravel parking lot to the NE corner. In the past four storms within seven years, the sheet flow from the dance hall facility washes over W. Belfair Valley Road and down both road shoulders toward the roads sag point at the Gorst Creek crossing, 800' to the east. West of the dance hall facility, the main Parish Creek channel flows through a 5-foot diameter CMP culvert under the West Belfair Valley Road.

The Association, which has owned the property for the last seven years, noted that significant increases of sand and gravel from upstream have filled in Parish Creek near the square dance facility. Parish Creek was four feet deep seven years ago, but it is no deeper than one foot today.

Flooding flows down W. Belfair Valley Road significantly erode the four to eight foot gravel shoulders and threatens to flood approximately three homes on the south side near Gorst Creek (see photos 24 and 25). The cost of pumping as much as 50,000 gallons of water in the crawlspace of the dance hall and replacement of gravel in the parking lot is absorbed by the Association after each one of these storm events (see photos 22 and 23).



**Photo 20** Creek bank overflow from behind first row of trees upstream of the Association's property



**Photo 21** Creek and floodplain overflow onto the Association's property



**Photo 22** Kitsap Square Dance Association parking



**Photo 23** Runoff overtops Belfair Valley Road



**Photo 24** Belfair Valley Road at Gorst Creek 800' away



**Photo 25** Sandbags along property and shoulder erosion

**Site 15 – Fish Rearing Ponds** (Outside Urban Growth Area), A Kitsap County Public Works drainage complaint was received for the fish rearing facility downstream of Parish Creek in 1996. The complaint cited a concern for silt clouding up the creek water twice in one week. The County suspected that a large slide occurred up Parish Creek Canyon due to heavy rain. Confirmation by the County was not established since it would have required hiking up the canyon to the source to investigate. This documented event also coincides with the report given from the managers of the Kitsap Square Dance Association upstream that Parish Creek began to silt in at about this time with land development activities upstream in Sunnyslope. Additional investigation will be needed to fully understand siltation of Parish Creek upstream.

**Site 16 – Residence, 4052 Old Belfair Valley Highway, Gorst, WA**

A formal drainage complaint received from the Kitsap County Public Works addressed possible water quality pollution by animals and autos on this private property. The concern was that pollution could end up in Gorst Creek (KCPW Ref#100876). The property has a pond with resident waterfowl. The property was inspected but no corrective action was requested by Kitsap County Public Works at that time.

**ATTACHMENTS**

**Attachment A – Kitsap Public Health District meeting notes and Sinclair Inlet Improvement Project Information**

**Attachment B – Kitsap Public Works Surface and Stormwater Management meeting notes, testing data for W. Belfair Valley Road and nine drainage complaint records**

**Attachment C – City of Bremerton November 26<sup>th</sup> email on available drainage complaint records**