Silverdale Recycling and Garbage Facility
Facility Master Plan

Prepared for
Kitsap County

October 2018

Prepared by
Parametrix

Silverdale Recycling and Garbage Facility Facility Master Plan

Prepared for

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ACRONYMS AND ABBREVIATIONS

AACE	American Association of Cost Engineers
ADA	Americans with Disabilities Act
CFC	chlorofluorocarbons
County	Kitsap County
CUP	conditional use permit
FMP	Facility Master Plan
gpm	gallons per minute
HHW	household hazardous waste
IT	information technology
LED	light-emitting diode
LID	low impact development
MSW	municipal solid waste
NPDES	National Pollutant Discharge Elimination System
OPC	opinion of probable cost
OVTS	Olympic View Transfer Station
PRC	Poulsbo Recycle Center
psi	pounds per square inch
PVDF	polyvinylidene difluoride
RAGF	recycling and garbage facility
SIP	State Implementation Plan
SWD	Solid Waste Division
UPS	uninterruptible power supply
UV	ultraviolet

1. INTRODUCTION

The Silverdale Recycling and Garbage Facility (RAGF), a solid waste drop box facility owned and operated by Kitsap County (County), provides opportunities for residents and small businesses to dispose of municipal solid waste (MSW), recyclable materials, and limited household hazardous waste (HHW) for proper disposal.

Consistent with the recommended strategies in the 2017 Kitsap County Solid and Hazardous Waste Management Plan, this Silverdale RAGF Facility Master Plan (FMP) has been prepared to provide an outline for facility improvements necessary to minimize congestion, maximize diversion opportunities, and meet operational needs for a 30-year planning period.

1.1 Purpose

Structures and facilities at the Silverdale RAGF are aging and in need of repairs, upgrades, and/or replacement to continue to provide the level of service required for the growing population of the Kitsap County region, and to meet the requirements of the County's evolving solid waste program. Silverdale RAGF is the busiest of the County's three RAGFs, and the County intends to continue operations at Silverdale RAGF for the foreseeable future. The facility needs to be redeveloped to meet future capacity needs, and provide a safe, effective, and efficient arrangement for operations.

1.2 Facility Background

Silverdale RAGF is a rural solid waste drop box facility located in unincorporated Kitsap County, Washington (Figure 1). The parcel is zoned for industrial use and drop box operations are permitted by the Kitsap Public Health District.

The County has owned the property since 1957, and leased the parcel to private entities, including Kitsap County Sanitary Landfill, Inc., who in 1981 and 1982 constructed the three existing refuse sheds and operated the site as a transfer station. The existing attendant building was also constructed in this approximate timeframe. In early 1990s, the County took control of solid waste operations at the site, providing oversight to vendor-contracted services for waste handling and disposal.

The parcel underwent a lot subdivision in 2017 that allocated approximately 9 acres of dedicated space for RAGF operations. The site is bordered by Dickey Road NW to the south and east, Kitsap Humane Society private property to the north and northeast, and Kitsap County Roads Division property to the west and northwest, with the northwest area currently used by Pyramid Materials through agreement with the County. The operational area has been developed in the high, central area of the site with downward slopes in all general directions. Undeveloped portions of the site are primarily forested.

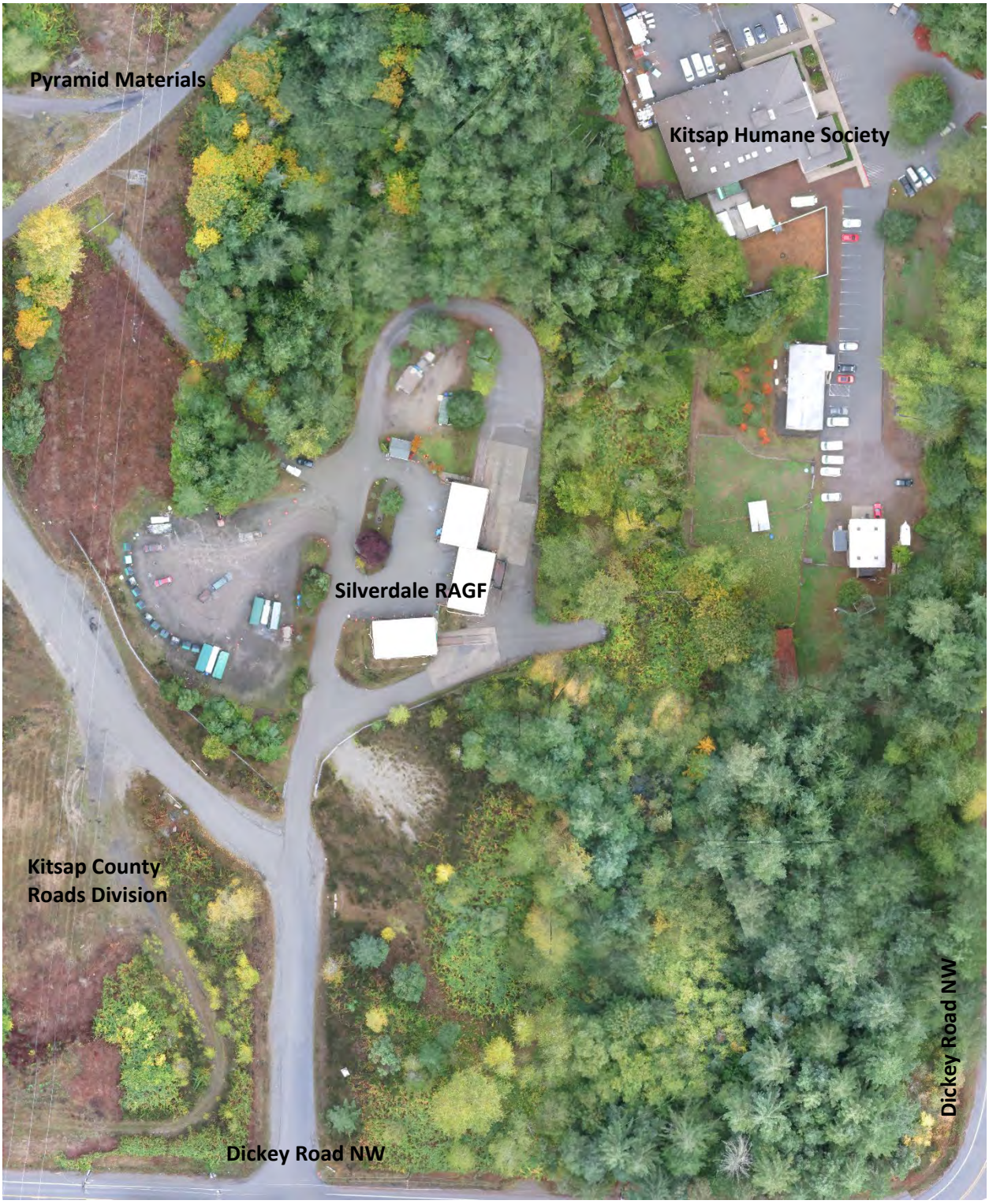


Figure 1. Silverdale Recycling and Garbage Facility Site Aerial

1.3 Existing Facility Description

The existing facilities at Silverdale RAGF include an attendant building, three refuse sheds, a recycle area, a limited HHW area, and an area for appliances (white goods) (Figure 2).

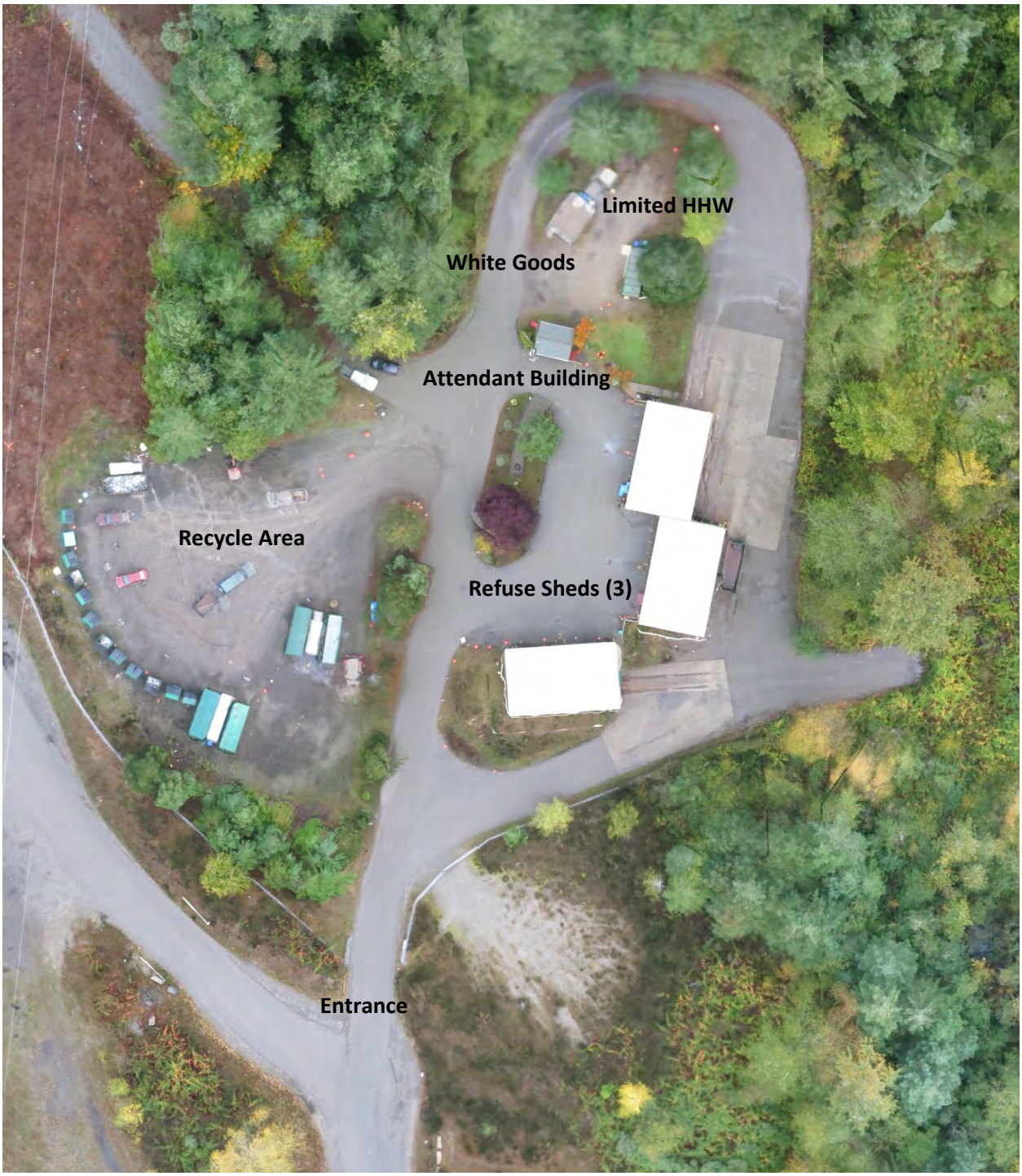


Figure 2. Existing Site Layout

Currently, Silverdale RAGF operations are overseen and performed by the County Solid Waste Division (SWD) with collected material hauled by a number of contracted parties. The facility is open to the public from 8:30 am to 4:00 pm, 6 days per week (closed on Wednesdays). The facility accepts self-hauled MSW and assorted household recyclable materials, which includes commingled recyclables (mixed containers, mixed paper, and newspaper), glass, corrugated cardboard, scrap metal, and household appliances (chlorofluorocarbons [CFC] and non-CFC). The facility does not accept curbside-collected MSW or recyclables from commercial haulers.

Limited HHW is accepted, including used motor oil, spent antifreeze, household and vehicle batteries, and compact fluorescent lamps. Separated sharps are also accepted from residents. Cooking oil is also collected at the limited HHW area.

Under several different contracts with the County, haulers pick up materials at the facility, including MSW, recyclables, appliances, and some limited HHW, for proper management and disposal. Batteries, sharps, and lamps are picked up and managed by County staff.

Fees are visually assessed by County staff at the attendant building (Figure 3) based on the volume of MSW material and number of appliances being received. Recyclables, including limited HHW material, are free of charge. Customers typically consult with the attendant staff and are then directed to the appropriate service area or areas. An additional County staff member is typically stationed in the refuse receiving area (Figures 4 and 5) to direct and assist customers.

Figure 3. Existing Attendant Building

Figure 4. Existing Refuse Shed

Figure 5. Existing Customer Refuse Drop-off Area

The County-contracted MSW hauler accesses the refuse sheds from a lower maneuvering area, separate from customer traffic (Figure 6). The hauler replaces full roll-off containers with empty containers. Full containers are delivered to the Olympic View Transfer Station (OVTS) for material compaction and transfer to intermodal containers for shipment by rail for final disposal.

Figure 6. Existing Refuse Hauler Maneuvering Area

County-contracted haulers access the recycle, limited HHW, and white goods areas, and intermingle with customer traffic (Figure 7, Figure 8, and Figure 9). Containers are exchanged and/or materials are collected for delivery to offsite processing facilities.

The developed site surface water drainage is through sheet flow, and a limited system of catch basins and conveyance pipes and culverts that discharge to adjacent undeveloped areas. Most of the paved area drains to an infiltration area southeast of the refuse area. Surface water from non-paved portions of the site drain to the surrounding areas and follow natural drainage pathways to adjacent properties.

Figure 7. Existing Recycle Area

Figure 8. Existing Limited HHW Area

Figure 9. Existing White Goods Area

As the County has improved and expanded the level of services provided at Silverdale RAGF over the years, and as the number of customers and volumes of material received have increased, the facility has encountered challenges to traffic circulation and capacity.

A summary of tonnages and customers received at Silverdale RAGF between 2014 and 2017, along with projections for 2047, are shown in Table 1.

Table 1. Tonnage and Traffic Summary 2014–2017 and 2047 Forecast

Description	2014	2015	2016	2017[1]	2047[3]
Annual MSW (Tons)	2,694	3,037	3,647	3,968	5,408
Average Daily MSW (Tons)	8	8	10	11	15
Peak Daily MSW (Tons)	18	18	21	26	36
Annual Recyclables[2] (Tons)	962	978	1,102	1,126	1,818
Average Daily Recyclables[2] (Tons)	3	3	3	3	6
Peak Daily Recyclables[2] (Tons)	5	5	6	6	12
Annual MSW Customers[4]	34,668	39,491	43,669	46,517	63,597
Average Daily MSW Customers[4]	97	109	121	129	177
Peak Daily MSW Customers[4]	234	238	250	309[8]	422
Annual MSW-Only Customers[5]	5,778	6,582	7,278	7,753	10,600
Average Daily MSW-Only Customers[5]	16	18	20	22	29
Peak Daily MSW-Only Customers[5]	39	40	42	52	70
Annual Recycle-Only Customers[6]	23,112	26,327	29,113	31,011	42,398
Average Daily Recycle-Only Customers[6]	65	73	81	86	118
Peak Daily Recycle-Only Customers[6]	156	159	167	206	282
Annual Recycle Customers[7]	52,002	59,237	65,504	69,776	95,396
Average Daily Recycle Customers[7]	146	163	181	194	265
Peak Daily Recycle Customers[7]	351	357	375	464	634
Total Annual Customers[4]	57,780	65,818	72,782	77,528	105,995
Total Average Daily Customers[4]	162	182	202	215	295
Total Peak Daily Customers[4]	390	397	417	515	704

[1] Data was available from the SWD through July 2017. Annual data is based on projections.

[2] Recyclables quantity includes glass, cardboard, commingled material, and scrap metal.

[3] Projections use a 3,275.3 annual County-wide population increase, consistent with that provided in the Capital Facilities Plan for Kitsap County, 2016 Comprehensive Plan Update, dated June 2016.

[4] MSW customers include MSW-only and MSW-with-recycling customers and is based on specific customer counts at the facility. These customers are assumed to account for 60% of facility customers.

[5] MSW-only counts are not directly tracked. Values shown are estimates based on the assumption that MSW customers (MSW-only and MSW-with-recycling) represent approximately 60% of facility customers, and 10% of facility customers are MSW-only per SWD information.

[6] Recycle-only customer counts are not tracked due to lack of a fee transaction. Values shown are estimates based on the assumption that MSW customers (MSW-only and MSW-with-recycling) represent approximately 60% of facility customers, and 40% of facility customers are recycle-only.

[7] Recycle customer counts are not tracked. Values shown include recycle-only and MSW-with-recycling customers.

[8] Excluding the one occurrence of the 309 value, peak daily MSW customers in 2017 was approximately 250.

1.4 FMP Summary

This FMP addresses immediate needs for the condition and effectiveness of the facility to meet current operational requirements, and long-range operational considerations to account for anticipated increasing tonnages and customer counts. Some objectives of the FMP include, but are not limited to:

1. Increase customer, operator, and hauler safety
2. Increase operational capacity and efficiency
3. Improve customer service and convenience
4. Allow for future flexibility to account for a changing waste stream and program requirements
5. Allocate space for future vehicle scales to support weight-based transactions

Major elements of the FMP include:

1. Preservation of the existing three refuse sheds
2. An additional refuse shed
3. A new attendant building
4. A dedicated limited HHW building
5. A consolidated, large-capacity, vertically separated recycle area
6. Space allocation for reserve roll-off containers
7. Revised traffic circulation with separation of customer and contracted hauler vehicles, and adequate queue capacity
8. Adequate access and maneuvering space for haulers
9. Upgraded site utility systems and fencing

The total planning-level opinion of probable cost (OPC) for the construction (2018 dollars) of the redeveloped Silverdale RAGF is $4,484,000, including design services, construction management services, contingency, and sales tax. The OPC is expected to have an accuracy range of -20 percent to +30 percent, representing a Class 5 estimate under the American Association of Cost Engineers (AACE) International classification matrix for the building and general construction industries. The detailed OPC is included in Appendix A.

1.5 Implementation Schedule

A preliminary project schedule is included in Appendix B. Major project milestones in the preliminary schedule are shown below.

- Initiate detailed design—First Quarter 2019
- Complete detailed design—Fourth Quarter 2019
- Acquire permits—Fourth Quarter 2019
- Initiate construction—First Quarter 2020
- Complete construction—Fourth Quarter 2020

2. DEVELOPMENT CRITERIA

The functional requirements for Silverdale RAGF define the needs for the facility and are based on the needs assessment and facility programming included in Appendix C. Design criteria are specific, measurable parameters developed to ensure that the functional requirements for the facility are met. Design criteria are used as a standard and provide a checklist against which existing or proposed conditions of the facility can be assessed. Detailed facility design criteria are listed in the paragraphs following the functional requirements.

2.1 Functional Requirements

2.1.1 Waste Flow and Vehicle Forecasts

The redeveloped Silverdale RAGF should be capable of handling the tonnages and customer vehicle counts forecasted for year 2047, as indicated in Table 2.

Table 2. Projected Waste and Vehicle Flows

Description	2047 Quantities (Tons)	2047 Customer Counts
Average Daily MSW	15	177
Peak Daily MSW	36	422
Average Daily Recyclables	6	265
Peak Daily Recyclables	12	634

The projections shown in Table 2 are based primarily on forecasted annual County-wide population increase, consistent with that provided in the Capital Facilities Plan for Kitsap County, 2016 Comprehensive Plan Update, dated June 2016. Actual waste quantities and vehicle counts could vary due to future changes in the economy, in the service area, in recycling rates, and in public policy and programs directed towards waste reduction, diversion, and recycling.

Development and closure of other solid waste management facilities in the region could also affect the waste and customer flows to Silverdale RAGF, such as the recent closure of the Poulsbo Recycle Center (PRC). Silverdale RAGF should be designed to provide maximum flexibility to respond to changing conditions. Given the site's constrained area for development, the proposed redevelopment will use most of the redefined site. The facility's flexibility to respond to change will need to come from the facilities to be built during the reconstruction, and from the limited space that remains available for future growth or expansion.

2.1.2 Traffic Movement and Queuing

An essential principle in planning the site is to separate customer traffic from the contracted hauler traffic and, if possible, to use separate access and egress for each. Safety is increased by limiting interactions between the smaller customer vehicles and the larger roll-off container hauling vehicles, the latter having larger vehicle-turning swings, limited visibility, and the potential to produce more damage in the case of an incident. Safety is further increased by establishing hauler roll-off container

loading and unloading areas isolated from customer traffic. Separation also provides increased efficiency because the haulers are familiar with the site, can perform their service without interrupting customer activities, and can avoid potentially slower customer traffic and queues that can occur at the attendant building and material drop-off locations.

Customers must be routed past the attendant building as the site is entered, so that direction can be provided by the attendant and fees can be assessed. Fee transactions currently occur inbound as fees are determined by a visual assessment of the customer load. Attendant interaction with customers is also desirable for non-fee-based recycling, to better ensure the facility is used properly.

The customer exit route should also be past the attendant building in anticipation that the Silverdale RAGF would likely transition to a weight-based fee assessment system for certain materials, which would require an outbound fee transaction. If weight-based fees are incorporated, and different materials incur different disposal rates, customers may be required access the facility multiple times to accurately have fees assessed. Therefore, it is preferable to have the facility exit allow for easy re-entry to the inbound roadway.

Having both the inbound and outbound customers pass the attendant building also assists the attendant in monitoring how many and which customers may still be on site.

In general, traffic circulation through the facility should be in a counterclockwise direction in order to reduce the number of traffic crossing points because vehicles are driven on the right side of the road.

Within the refuse and recycle areas, and elsewhere where customers must perform a backing movement, it is ideal for vehicles to be oriented so that the driver can back up looking over the left shoulder. However, this is not always possible.

It is ideal for customer traffic patterns to continue in a circular movement, and not to require vehicles to double back against the traffic flow when leaving an area because this creates the potential for traffic crossings and accidents, and generally slows down traffic movements.

Providing opportunities for customers to bypass service areas that are not needed by those customers will reduce congestion and move customers through the facility more quickly and efficiently.

Adequate queuing lengths need to be included at each point where customer vehicles may be required to wait their turn, including at the inbound and outbound approaches to the attendant building, and at the entrances to the refuse, recycle, and limited HHW areas.

2.1.3 Material Handling and Processing

Loads will be screened by the attendant at the attendant building, and customers will be directed to the appropriate disposal area for acceptable materials. If appropriate, fees will be collected based on a visual assessment of the load. If unacceptable material is identified, customers will be notified and, if known, informed of options for disposal.

MSW will continue to be top loaded into 50-cubic-yard roll-off containers by customers. Load distribution within containers will be managed by an attendant to fill containers to an appropriate level and gain some efficiency in volume utilization. Mechanical compaction of materials at Silverdale RAGF is not considered to be economical based on the capital and operation and maintenance costs associated with compaction equipment and the limited benefit of reduced hauling trips for the short (16 miles) distance to OVTS, where MSW is unloaded and compacted into intermodal containers for rail export.

Haulers will continue to transport an empty roll-off container(s) to the site once notified by site staff of a full container(s). The full container(s) will be pulled from the lower level of the refuse shed and replaced with the empty container(s). Full containers will be transported to OVTS. The same hauler vehicle will perform the multiple handling and staging of containers.

Recycling will generally be unattended by County staff. Based on material type being deposited, customers will top load materials into appropriate roll-off containers that are positioned in a well-defined configuration, accessed by the haulers from a vertically separated (lower) area isolated from customers. Similar to the MSW process, once containers are filled, containers will be exchanged with empty containers by the hauler.

Limited HHW will be deposited by customers in an array of containers specific to the material being collected. Containers will be housed in an open-faced building that provides weather protection and spill containment. County staff will attend customers throughout the process; however, the building will be designed for unattended service. Typically, full containers will be collected or emptied by the hauler, with materials being transferred to the hauler vehicle.

White goods will be dropped off by customers into a fenced enclosure. The process will be attended by County staff when necessary. The hauler will collect the appliances on a regular basis and once a sufficient amount has accrued.

When hauler vehicles access the limited HHW building and white goods area, customer access to work areas will be secured to avoid conflict between the haulers and customers and prevent customer injury.

2.1.4 Refuse Area

The refuse area currently consists of three top-load, grade-separated refuse sheds, each with capacity to hold two 50-cubic-yard roll-off containers. The sheds enclose and cover the containers and also cover the customer drop-off area. Customers access the sheds from the top level, and haulers access the sheds from the lower level. Customers use delineated stalls and deposit materials over a guardrail. The guardrail is a fall prevention measure for safety. Additionally, there are hinged plates used to bridge the gap between the shed and container that prevent waste material from falling to the lower floor of the shed.

The existing shed configuration has been successful at Silverdale RAGF, with the primary concern being the limited capacity provided by three sheds. The redevelopment will increase capacity by adding a fourth refuse shed using the existing shed configuration. The existing three sheds will be cleaned, repaired, and upgraded to improve items such as fall prevention, lighting, and remote monitoring by cameras. Washdown hoses will also be provided at each shed.

In addition to the fourth refuse shed, a container storage area will be added with a minimum capacity of four containers. The storage of empty containers on site will provide the opportunity for a single hauler vehicle to replace multiple full containers with empty containers, temporarily storing the full containers in the storage area until the full containers can be replaced by empty spare containers. The container storage area will add resiliency to the facility by prolonging the disposal operation if there are periods when the hauler is not able to effectively transport empty containers to the site.

The refuse area will be paved with asphalt in the customer and hauler areas. Locations that will receive roll-off containers for use, staging, or storage will be paved with concrete pavement. The hauler maneuvering area will be extended to the east to increase maneuverability in the area.

A covered, warming station will be provided in the vicinity of the customer area to provide shelter to the attendant between interaction times with customers and while carrying out other responsibilities.

2.1.5 Recycle Area

The recycle area will be configured to provide the following containers with grade separation to increase convenience for top loading by the customers:

- Four 40-cubic-yard roll-off containers for commingled recyclables
- Two 50-cubic-yard roll-off containers for cardboard
- Two 30-cubic-yard roll-off containers for metals
- One 30-cubic-yard roll-off container for glass

The area will be grade separated to provide for convenient customer access, safety for customers from hauler activities, and increased hauler efficiency. Containers will be accessed by customers and haulers from opposite directions. The area will be paved with asphalt in the customer and hauler areas. Locations that will receive roll-off containers will be paved with concrete pavement.

Lighting and washdown water should be provided to the area, along with cameras for remote monitoring.

Additional space will be provided in the vicinity of the recycle area to provide for future expansion and flexibility in services.

2.1.6 Limited HHW Area

The limited HHW area will include a three-sided, open-front, covered enclosure. The building will house the limited HHW containers, and provide additional environmental protection by reducing weather impacts and adding a blind sump for spill containment. The open-front will include coiling overhead grills, or doors, that are lockable, which will provide the option to require an attendant present for customer access.

The building will include user facilities such as a sink, hose bib, spill kit, and an emergency eye wash. The building will have an attached room to provide shelter for an attendant between interaction times with customers and while carrying out other responsibilities.

A fenced enclosure for the collection of white goods will be located adjacent to the limited HHW building. Haulers will be able to access the limited HHW building and white goods area from non-customer areas reducing customer and hauler interactions.

The area will be paved with asphalt, and will be provided lighting and cameras, for remote monitoring.

Additional space will be provided in the vicinity of the limited HHW area to provide for future expansion and flexibility in services.

2.1.7 Attendant Building

The attendant building will be the primary employee facility with two workstations, break area, kitchenette, restroom, and mechanical and electrical equipment spaces. The building will be oriented to have inbound customer traffic travel parallel to the inbound side of the building, and have outbound customer traffic travel parallel to the outbound side. The two workstations will be configured with one workstation on each side of the building to allow attendant interactions with inbound and outbound customers.

The attendant building will be the control center for the site with computer systems, telephone, fee transaction capability, and remote monitoring of cameras and service call buttons. The building will be provided an uninterruptible power supply (UPS) equipment and a dedicated backup generator to allow for continued operation throughout power outages.

The layout of the attendant building area will provide level and straight approaches with adequate distances that can accommodate future installation of 50-foot-long, low-profile above-grade or pit-type vehicle scales. Attendant vehicle parking spaces will be provided in the vicinity of the attendant building.

A standby electrical generator that operates automatically in the event of loss of utility company power to the site will be located near the southern end of the building.

2.1.8 Site Access and Security

The site will continue to be accessed from the south along the existing roadway from Dickey Road NW. A second access will be developed farther east of the existing access point to provide exclusive hauler entrance to the site, and an opportunity for customers waiting in the entrance queue to exit the site without passing the attendant building and progressing through the operating areas. The entrance queue exit will allow customers to exit the facility entrance queue in the case of long wait times, preferring to return later. The operations area will be fully fenced with automated gates at the access locations. The current roadway to the Pyramid Materials use area that shares the existing Silverdale RAGF access road will be terminated to provide an exclusive access road to the Silverdale RAGF site. There will be an array of cameras and lights throughout the site.

2.1.9 Storage Shed

A storage shed will be provided for landscape maintenance equipment, mower, cones, rakes, brooms, spare equipment, and supplies.

2.1.10 Surface Water Management

The developed site will continue to drain through sheet flow and a system of catch basins, conveyance pipes, and detention basins that will discharge to adjacent wetlands and undeveloped areas that are part of the Strawberry Creek and Koch Creek watersheds. The site surface water resulting from 50 percent of the 2-year, 24-hour peak flow up to the 50-year, 24-hour peak flow will be managed to avoid negatively impacting downstream systems as required by the 2016 Kitsap County Stormwater Design Manual.

Runoff distribution, to the two basins (Strawberry Creek and Koch Creek) that the site currently flows to, will be maintained through the grading of the redeveloped site. Also, because the project will result in more than 10,000 square feet of hard surface area in each drainage basin, stormwater detention will be provided to control flows to match a historic forested condition, as required by the 2016 Kitsap County Stormwater Design Manual.

Basic water quality treatment of site runoff is required by the 2016 Kitsap County Stormwater Design Manual and should be selected as part of detailed project design. In addition, point-source contamination of stormwater will be prevented through the provision of cover over refuse and limited HHW containers. Under typical operations, only the recycling and empty refuse containers will be exposed to rain events.

2.1.11 Permitting and Regulatory Issues

Implementation of the Silverdale RAGF project will require various environmental permits and approvals from federal, state, and county jurisdictions. These requirements are summarized in Appendix D. Several of the key permits and approvals are discussed below.

- Zoning and Land Use: The project site is located within unincorporated Kitsap County. Considering the unique nature of the facility, a conditional use permit (CUP) may be required, and would require a Board of County Commissioners public hearing.
- Redevelopment of the facility will likely require Notice of Construction review by the Puget Sound Clean Air Agency. Based on expected forecasted traffic volumes, a conformity analysis to determine compliance with the State Implementation Plan (SIP) is not likely to be required.
- The surface water management system for the redeveloped site will involve three different drainage sub-basins. This system will require approvals from Kitsap County, and possibly from the U.S. Army Corps of Engineers, and other agencies involved in flood control issues.
- The Washington State Department of Ecology will require a National Pollutant Discharge Elimination System (NPDES) permit for stormwater related to construction activities such as clearing, grading, and excavation.
- A Solid Waste Handling Permit will be required from the Kitsap Public Health District.
- Sensitive areas review and approval will be required from Kitsap County. State and federal agencies also regulate projects that directly fill or impact wetlands. The majority of the site is mapped as a geologic hazard area by Kitsap County. The entire site is currently mapped by Kitsap County as being within a critical aquifer recharge area. Three potential wetlands were identified on the site. A wetland determination, delineation, and functional assessments according to Kitsap County Code will be required to determine the final size, jurisdictional status, and rating of the three potential onsite wetlands. Each of the potential wetlands appear consistent with a Category III wetland with moderate habitat value. Project elements that result in impacts to regulated wetlands or buffers will require compensatory mitigation.
- Approvals may be needed from Kitsap County for tree removal.
- A Clearing/Grading Permit, Tree Clearing Permit, and a Building Permit will also be required from Kitsap County. This will include utilities installation; however, utilities will also need to be coordinated with the service providers and in the case of fire service, the Fire Marshal.
- Approvals and/or use permits will be needed for any construction activities occurring within Kitsap County rights-of-way.
- An easement will be needed through the adjacent Kitsap Humane Society property for connection to the municipal sanitary sewer system if that disposal option is pursued. Connection to the municipal system will also require a connection permit through Kitsap County. Alternatively, if onsite disposal of wastewater is pursued, which is the current disposal method, then the new septic system will need to be permitted through the Kitsap Public Health District.

2.2 Design Criteria

Design criteria provide site-specific standards that when met will ensure that the Silverdale RAGF satisfies the functional requirements set out above and in the Facility Programming/Needs Statement, as shown in Appendix C.

2.2.1 General Site Development Criteria

Criteria for general site development are:

1. New facility development with minimized interference with ongoing operations.
2. Facility design life in accordance with Table 3.

Table 3. Facility Design Life

Description	Design Life[1] (years)
Buildings and Structures	25
Site Roads and Pavements	20
Site Utility Systems	30
Fencing, Signage, and Site Appurtenances	20

[1] Useful life before major renewal or replacement.

3. Minimized visual impacts to adjacent properties and the right-of-way.
4. Surface water management in compliance with Title 12 Storm Water Drainage requirements of the Kitsap County Code.

2.2.2 Site Access and Circulation Criteria

Criteria for site access and circulation are:

1. Fenced operations area with gated entrance and exit points.
2. Queue bypass lanes for authorized County and emergency vehicles; bypass lanes should extend beyond the attendant building area to allow for potential double-lane, alternating queues, if needed.
3. Entrance queue exit opportunity back to Dickey Road NW.
4. Traffic queuing on site.
5. Inbound queue to accommodate current inbound fee transactions.
6. Outbound queue to accommodate potential future outbound transactions.
7. All inbound customers to interact with the attendant at the attendant building.
8. Minimized crossing traffic.
9. Minimum lane width of 12 feet.
10. Maximum road grade of 8 percent.

11. Existing pavement to be planed and overlain with grade correction in areas with poor drainage.
12. Drive-through, one-way traffic in disposal and hauler areas.
13. Separate hauler traffic from customer traffic.
14. Separate hauler maneuvering areas from customer traffic.
15. Separate hauler entrance from customer traffic.
16. Adequate maneuvering space for refuse and recycle haulers to temporarily stage empty and full roll-off containers during the changeout process.
17. Minimized customer pedestrian traffic.
18. Vehicle design criteria in accordance with Table 4.

Table 4. Vehicle Design Criteria

Vehicle Type	Length[1] (ft)	Width (ft)	Nominal Height (ft)	Extended Height (ft)	Minimum Turning Radius (ft)
Car or Pickup Truck	12-35	7	5-7	NA	21-24
Roll-Off Truck	20-40	8	7-21	24-30	21-60
WB-65 Semi Truck	74	8.5	13.5	NA	60-75

[1] Length ranges consider trailers and tandem trailers.

NA = Not Applicable

2.2.3 Attendant Building Criteria

Criteria for the attendant building are:

1. Equipped with two workstations, one for each inbound and outbound customer interaction location. Workstations should be ergonomic, adjustable height with a computer, monitor, cash register, and UPS.
2. Workstation configuration should allow for viewing of inbound and outbound traffic while attendant desk orientation is facing the driver of oncoming traffic.
3. Equipped with a break area consisting of:
    a. Table and chairs to accommodate four people
    b. Kitchenette with sink, microwave, refrigerator with water dispenser, and a place on the counter for a coffee maker
    c. Restroom with a sink and toilet (unisex and Americans with Disabilities Act (ADA) compliant); shower not required
4. Electrical/telecommunications room for the site information technology (IT) server, security, and Ethernet routing equipment.
5. HVAC: Forced-air handling unit; provide attic space or room for furnace. Heat-pump; provide space outside for pad. Temperature-controlled with air conditioning and general heating and overhead workstation spot heating.

6. Building should be pressurized to minimize infiltration of vehicle exhaust through building openings, especially through the transaction windows.
7. Attendant building access that provides an attendant door facing incoming traffic to allow for attendant exit of the building into a safe, non-traffic area for load inspection. Provide door access with electric hinge and lockset through coded keypad or card scanner.
8. Storage closet with at least 20 square feet for supplies.
9. Full wall height cabinetry, eight half-sized lockers, and a concealed safe, bolted to the floor or interior wall.
10. Monitors for remote monitoring of onsite cameras.
11. Carbon monoxide and nitrogen dioxide monitoring inside attendant building.
12. Power-actuated high-use operable transaction windows allowing attendants to interact with customers driving vehicles. Typically, this would be a standing height configuration. Windows should be double-pane laminated glazing, but not bulletproof, with integral laminated tinting or reflective laminate glazing.
13. Standby engine generator to power the attendant building and selected site lighting.
14. Align and grade adjacent inbound and outbound roadways to accommodate a transaction and bypass lane in each direction. Alignment and grading should be able to accommodate a potential future vehicle scale in each direction while maintaining the bypass lanes.
15. Future vehicle scales option will be a minimum 50-foot long, low-profile, above grade or shallow pit-type scales, with an imbedded foundation, allowing vehicles to drive on to and off of the scales level with the surround grade.
16. Attendant building foundation should be compatible with the option for addition of future scale foundations.
17. Five attendant/visitor parking stalls, including one ADA compliant stall, with sidewalk access to the attendant building.

2.2.4 Refuse Receiving Criteria

Criteria for refuse receiving are:

1. Maintain and upgrade the existing three top-load refuse sheds. Clean and repair structures and siding. Replace fall prevention, bollards, litter flaps, and the existing lighting with new light-emitting diode (LED) lights. Add remote monitoring cameras.
2. Grade-separated fourth refuse shed in a similar metal-sided, clear-span, structural configuration to the existing refuse sheds. Shed should hold two 50-cubic-yard roll-off containers with the tops level with the customer top-load area. Top-load area should include four customer tipping stalls with wheel stops, fall prevention railing, and litter flaps.
3. Fourth refuse shed to have bollards at corner locations.
4. Fourth refuse shed to have raised concrete roll-off container guides with armor plating in the lower bay.
5. Fourth refuse shed lower bay door height to accommodate the trailer height of a WB-65 vehicle classification (interstate semitrailer).

6. Fourth refuse shed to have LED lighting and cameras to allow remote monitoring.
7. Total of 16 tipping stalls for customers (800 vehicles per hour at average 12-minute unloading time).
8. Total of eight active 50-cubic-yard roll-off containers, with a total capacity of 400 cubic yards, or 36 tons, based on a 4.5-ton per container average.
9. Four spare 50-cubic-yard roll-off containers, with a total reserve capacity of 200 cubic yards, or 18 tons, based on a 4.5-ton per container average (approximately 1.5 days of reserve capacity, based on the 2017 average 11 tons per day received).
10. Washdown hoses at each refuse shed.
11. Attendant notification button in refuse area with alert and light beacon.
12. Provide concrete surfacing in the hauler maneuvering area to increase the area's resistance to wear from roll-off container handling.
13. Extend the hauler maneuvering area to the east by approximately 5 feet to increase area maneuverability.

2.2.5 Recycling Receiving Criteria

Criteria for recycling receiving are:

1. Vertically separated drop-off area for nine roll-off containers with defined stalls that can accommodate containers up to 50 cubic yards in size.
2. Vertical separation provided by a 4-foot, 6-inch high finger pier wall (finger wall) with 10 finger piers.
3. The top of the finger piers to be at the customer parking level to provide tipping access along the sides of the container. The lower level of the wall will be at the hauler drive elevation.
4. The finger wall designed to be able to accommodate a future canopy.
5. Finger piers with 3-foot, 6-inch tall railing for fall prevention. The grade separation and rail height will equal 8 feet, matching the height of the largest roll-off containers.
6. Rub rails along container stalls.
7. Minimum of 10 customer stalls, minimum 10 feet wide (120 vehicles per hour at average 5-minute unloading time).
8. Reserve space in the vicinity of the finger wall for additional containers.
9. Attendant notification button in the recycle area with alert and light beacon.
10. Cameras for remote monitoring of customers and container capacities.
11. Hose bib for access to washdown water.

2.2.6 Limited HHW Receiving criteria

Criteria for limited HHW receiving are:

1. Three-sided, open-front, metal-sided, clear-span limited HHW building with an approximate 60-foot by 13-foot building footprint, including fully enclosed attendant warming station and storage area.
2. The open area of the building to have easy access for portable limited HHW containers, a customer sink with heated water, emergency eyewash station with tempered water supply, drainage to a blind sump, and overhead roll-down grills, or doors, to secure the building.
3. Bollards at building corner locations.
4. LED lighting and cameras to allow remote monitoring.
5. Attendant notification button in the limited HHW area with alert and light beacon.
6. Hose bib for access to washdown water.
7. Fully fenced white goods area with an approximate footprint of 600 square feet. Fencing should be 6-foot tall chain link with separate customer and hauler access gates.

2.2.7 Additional Facilities Criteria

Criteria for additional facilities are:

1. Attendant warming station within the refuse area. The station should be centrally located, stand-alone, and provide cover, light, and heat.
2. Two portable, waterless restrooms for customer use, one located in the refuse area and one located in the recycle/limited HHW area.
3. Storage shed for landscape maintenance equipment, mower, cones, rakes, brooms, spare equipment, and supplies. Shed should be approximately 100 square feet and be provided power for lighting.

2.2.8 Site Utilities Criteria

Criteria for site utilities are:

1. Fire service routed from the south entrance to a central site location and terminated at one fire hydrant servicing a 400-foot radius. Pipe size should be 6-inch to 8-inch. Existing water within Dickey Road NW includes a 10-inch waterline with 22 pounds per square inch (psi) water pressure. Fire flow analyses were performed on the waterline in January 2018 for 1,000 gallons per minute (gpm) and 1,500 gpm with residual pressures of 20 psi and 18 psi, respectively.
2. Water service to the attendant building, refuse sheds, limited HHW building, and recycle area. Backflow prevention provided where the system is potentially exposed to cross-contamination risks.
3. Sewer connection from the attendant building and limited HHW building to offsite sanitary sewer is available east of the site, within Dickey Road NW. If offsite sewer connection is preferred, the pipe should be 8 inch to accommodate additional flows from elsewhere on site, if needed. If an onsite septic facility is preferred, a central septic location will need to be selected.

4. Telecommunications fiber optics and copper to support information systems for the site, including internet, telephone, electronic fee transactions, alarms, and camera systems. Conduits should be routed underground through common pathways from the south entrance to the attendant booth, to a central site location, to the remote areas of the site. Conduit routes should incorporate spare conduits for future use.
5. Storm drainage to utilize minimum 12-inch pipes and culverts. Infiltration and detention ponds sized to maintain the current runoff condition, without impacts to the downstream systems.
6. Site lighting to be LED; photocell controlled with manual activation when needed.

3. PREFERRED FACILITY MASTER PLAN ALTERNATIVE

3.1 Alternative Site Plan Review Process

The County initiated facility master planning for the redevelopment of the Silverdale RAGF in September of 2017. The project began with a site assessment to evaluate and document the condition of the facility and to identify potential redevelopment opportunities and constraints. The Assessment Summary of Findings is included in Appendix E. In conjunction with the facility assessment, a facility programming and needs assessment was performed and is included as Appendix C. Along with the needs assessment, weighted evaluation criteria were established, which are included in Appendix F. The facility programming and evaluation criteria were developed in a workshop with input from the SWD Senior Program Manager, SWD program manager, SWD operations manager, SWD HHW manager, SWD attendant building representative, Public Works Assistant Director, Public Works utilities representative, County information systems representative, contracted refuse hauler, and the facility master planning consultant.

Based on these three initial project elements, a primary redevelopment site layout was generated, which was accompanied by a number of alternatives to the layout. The layout and alternatives were discussed in an Alternative Identification Memorandum that included a planning-level OPC. The memorandum is included in Appendix G. After review by the County, and in comparison to the facility needs and evaluation criteria, a preferred alternative was determined and documented in an Alternatives Analysis Memorandum, which is included in Appendix H. The Preferred Site Plan is shown in Figure 10. The following sections discuss the FMP, including preliminary facility design and planning-level OPC.

3.2 Facility Master Plan

The Preferred Site Plan uses an approximate 9-acre portion of the larger Kitsap County Public Works-owned parcel. The facility boundary is defined by the Kitsap County Roads Division area and current sand and gravel operation limits within the larger parcel; a lot subdivision for the Kitsap Humane Society; and Dickey Road NW. Access to the site will continue to be from the south, off Dickey Road NW. There will be two access points dedicated for Silverdale RAGF access only, with sand and gravel activities elsewhere on the larger parcel accessed from an existing north access road.

The developed portion of the 9-acre site will be approximately 3.9 acres. The remaining portion of the site will be used for stormwater management, preserved site screening, and preserved wetlands.

The three existing refuse sheds will be incorporated into the redeveloped site with the construction of one additional refuse shed. The recycle area will remain on the western portion of the site, and be shifted farther to the north to provide space for a limited HHW area and white goods collection to the south, including a new limited HHW building. A new attendant building will be located south of the service areas and will be the interaction and transaction point for inbound and outbound customer traffic. The attendant building and adjacent roadways configuration will accommodate the future addition of inbound and outbound vehicle scales. The attendant building will be the primary staff facility with a break area, kitchenette, restroom, and adjacent parking.

3.2.1 Site Access and Circulation

The sitewide traffic flow is as depicted in Figure 11. All vehicles enter the site from the south through separate entrances for customers and haulers. Contracted haulers (vehicles dropping off empty

containers and picking up full containers) will be routed around the perimeter of the site to access the different service areas in a counter-clockwise loop. Self-haul customers will continue along the main entrance road to the attendant building. After interaction with the attendant, customers will continue north to the service areas where traffic will follow an interior counter-clockwise loop starting with the refuse area and proceeding to the recycle area, and then to the limited HHW area and white goods location. There is an intersection within the center of the service areas, which provides for bypass of either the refuse area, or other areas. The intersection represents the lone area on site that has the potential for crossing traffic. Customers will exit the site by passing the attendant building once more, and the interior loop and perimeter road will merge at the facility exit back onto Dickey Road NW.

Traffic circulation is primarily one-directional with complete separation of customer and hauler traffic.

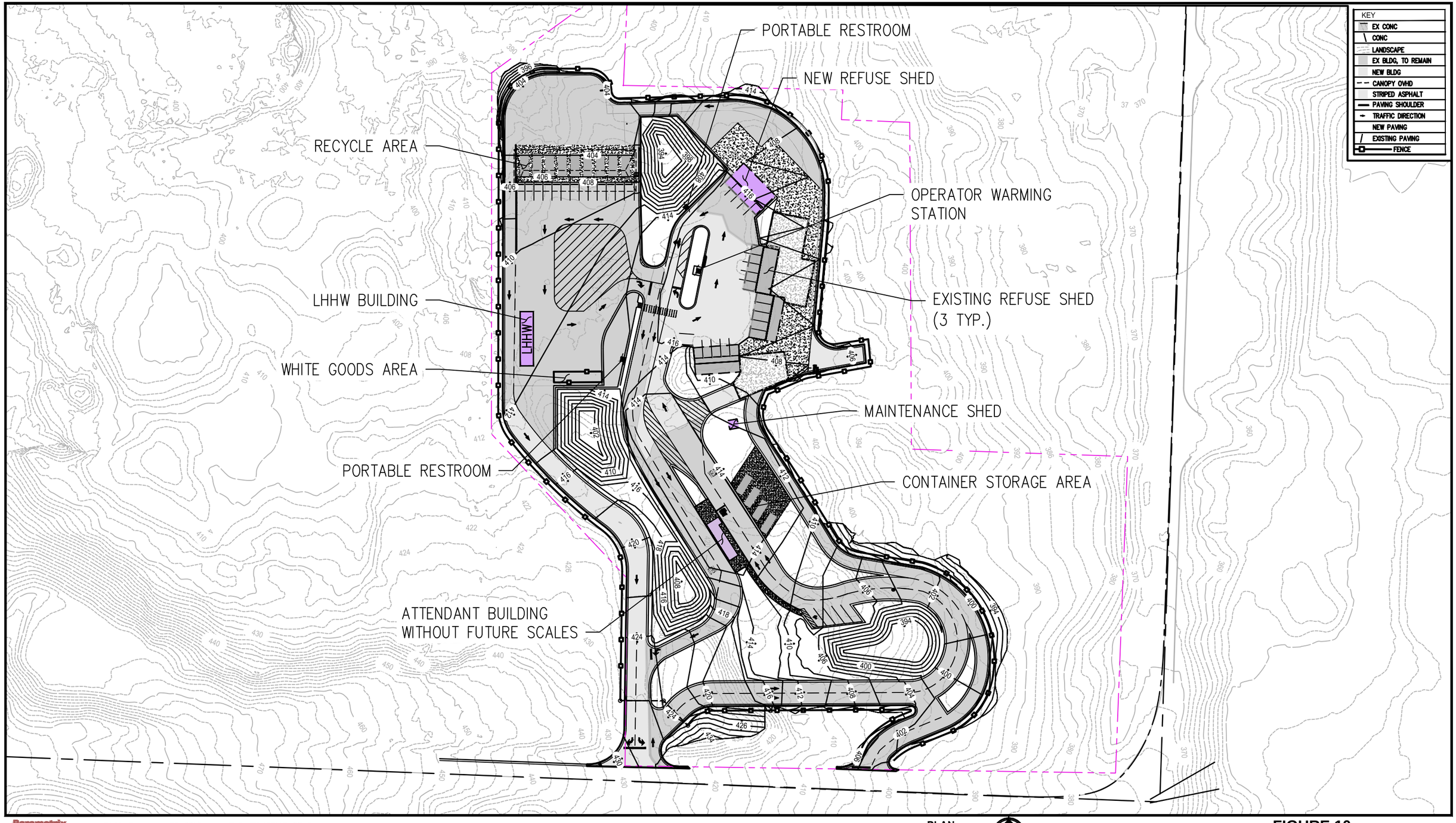
Customer routes provide for an inbound queue resulting from an inbound transaction based on a visual load assessment and fee. Customer routes also provide for an outbound queue that will result from future weight-based transactions as customers exit the site, when and if vehicle scales are installed adjacent to the attendant building. The customer exit, past the attendant building, will allow for customers with mixed loads to reenter the inbound queue for multiple passes through the facility, if weight-based transactions are established with variable fees for different disposal items. Customers in the entrance queue will have one exit opportunity prior to arriving at the attendant building.

3.2.2 Attendant Building

A detailed attendant building facility arrangement plan has been developed for a scenario without vehicle scales and with vehicle scales, as shown in Figure 12. Both configurations include an inbound and outbound bypass lane for authorized vehicles to avoid the customer queue when entering or exiting the site. Authorized vehicles could include County staff and representatives, emergency vehicles, and exiting customers not requiring an outbound transaction.

Inbound and outbound queue lengths utilizing a single lane approach will be approximately 700 feet (~33 customer vehicles) and 240 feet (~11 customer vehicles), respectively. As queue demand increases, portions of the bypass lanes can be utilized for a double queue with alternating access to the attendant building. This will increase the inbound and outbound maximum queue lengths to approximately 1,400 feet (~67 customer vehicles) and 480 feet (~23 customer vehicles), respectively. Control of alternating access movements could be by static signage or red-green lights.

If the County decides to install vehicle scales, the 50-foot scales shown in Figure 12 could be low-profile, above-grade scales installed over a recessed foundation, as shown at a similar attendant building and scale configuration in Figure 13, or could be shallow pit-type scales that take up less overall space laterally. The low-profile above-grade scales are generally preferable because they avoid creating confined spaces and are easier to service.



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PLAN
SCALE IN FEET
0 50 100

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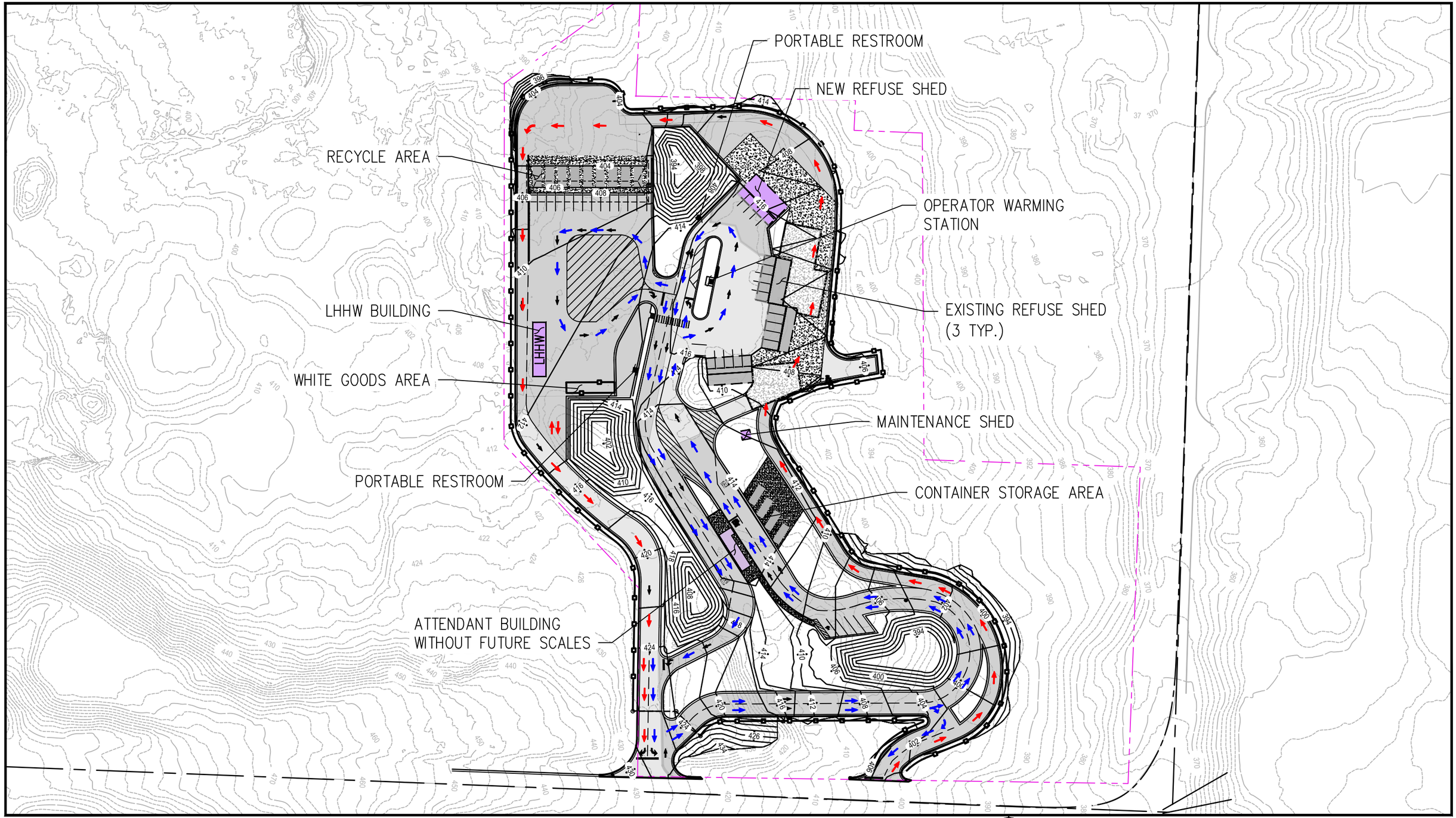
FIGURE 10
PREFERRED SITE PLAN
SILVERDALE RAGF
KITSAP COUNTY



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FILE: PS1578148-C2

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LEGEND

HAULER VEHICLES

CUSTOMER VEHICLES

PLAN
SCALE IN FEET
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FIGURE 11
TRAFFIC CIRCULATION PLAN
SILVERDALE RAGF
KITSAP COUNTY

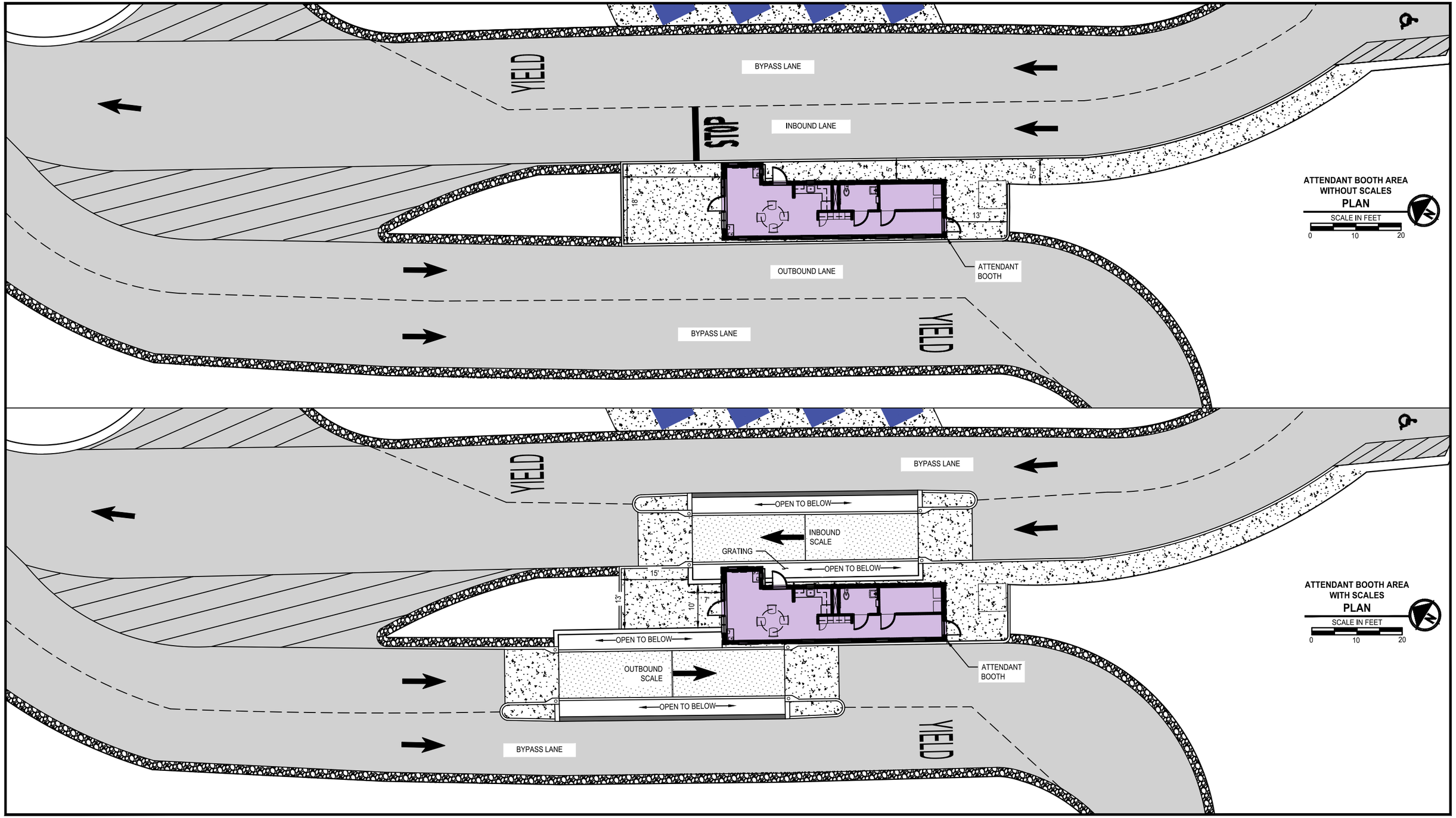

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FIGURE 12
ATTENDANT FACILITY ARRANGEMENT PLANS

SILVERDALE RAGF
KITSAP COUNTY

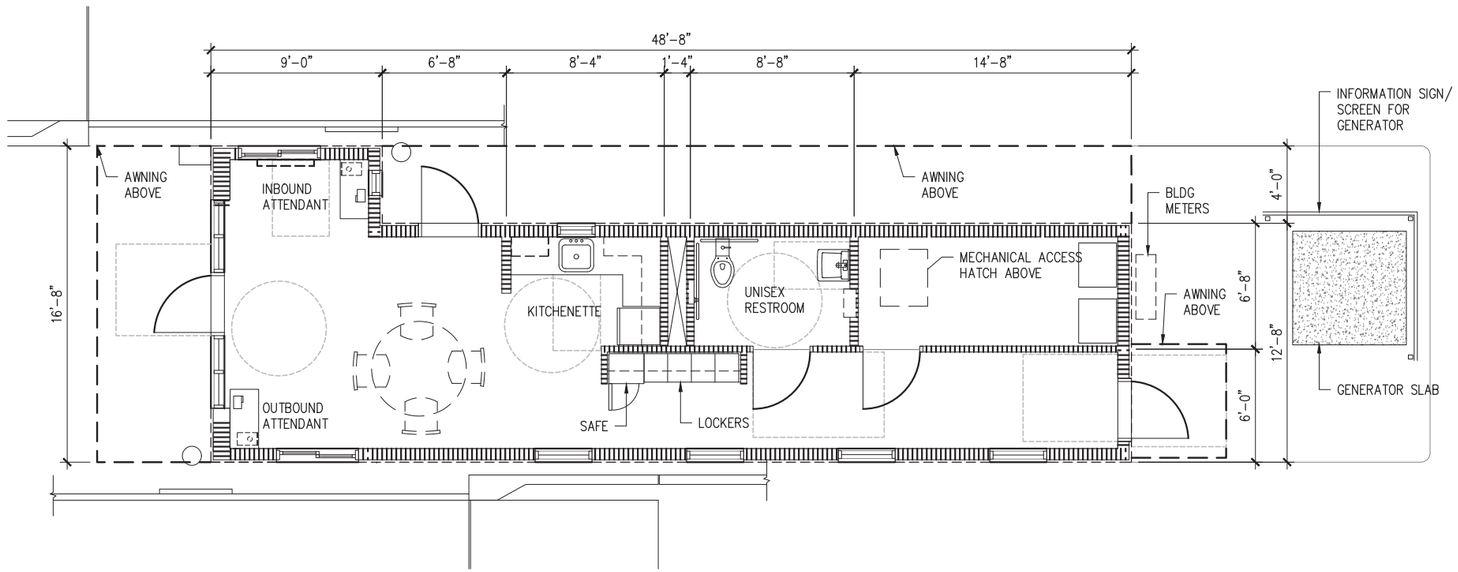
Figure 13. Bow Lake Recycling and Transfer Station Scale House and Scale

A detailed attendant building floor plan and building exterior elevations are shown in Figure 14. The attendant building has a layout positioned to provide views of the site and outbound customers as shown in Figure 12, and as indicated by the location of windows shown on Figure 14. The building has two workstations with sliding attendant windows, a break area with seating for up to four site staff, a small kitchenette, restroom, and an IT room for security and IT equipment. A mechanical air handling unit is located in an attic space above the ceiling, accessed by a mechanical access hatch. The potential for a vehicle striking the building is reduced by not having overhangs protrude into the drive lanes, and by careful placement of building protective elements in the form of curbs and bollards. Screening for elements such as the generator may be accomplished using site information signage.

The elevations depicted in Figure 14 indicate a rectangular shape with minimal to no horizontal projections beyond the envelope. A long awning to protect attendants from weather when measuring inbound vehicle loads is indicated on the inbound elevation. The awning extends only as wide as the widest portion of the building. Windows and a door providing views of the site are indicated on the Exit Elevation, and windows are also indicated on the Outbound Transaction Window Elevation. A view of traffic from the inbound attendant station is provided by a window facing oncoming traffic, as shown in the Entry Elevation.

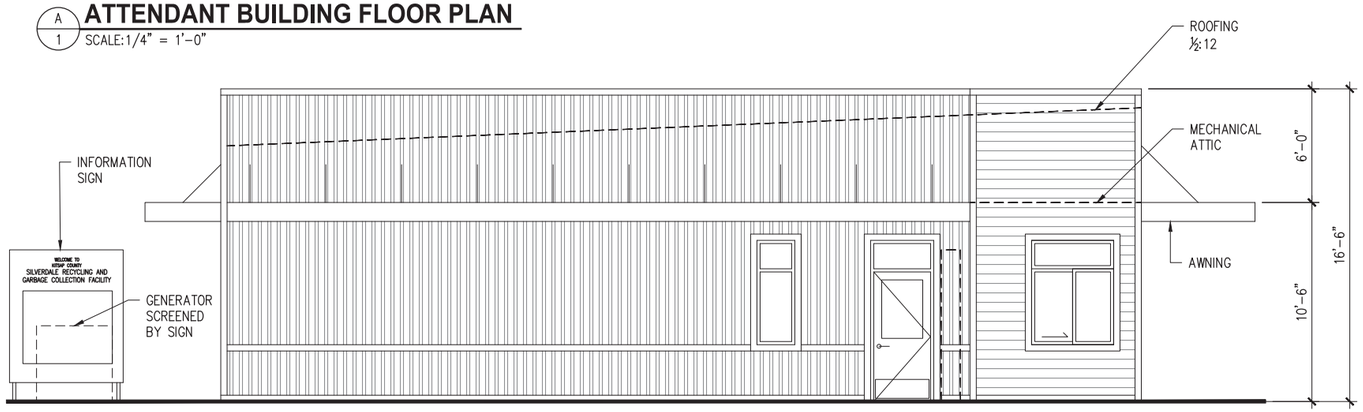
Focusing on materials and durability, it is recommended to use 22-gauge metal siding coated with polyvinylidene (PVDF), ultraviolet (UV) resistant factory finishes providing longevity, durability, and ease of maintenance. Glazing units should have aluminum frames with insulated glazing. Doors should be insulated fiberglass faced in aluminum frames, or insulated hollow metal doors and frames. A similar clad building is depicted on Figure 13.

Inbound customers leaving the attendant building will travel north to the service areas. The roadway between the attendant building and the service areas provides a shared queue length of approximately 200 feet (~10 customer vehicles).



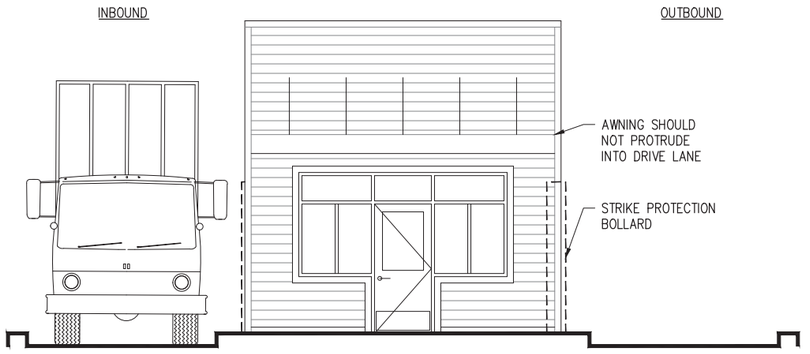
A/1 ATTENDANT BUILDING FLOOR PLAN

SCALE: 1/4" = 1'-0"



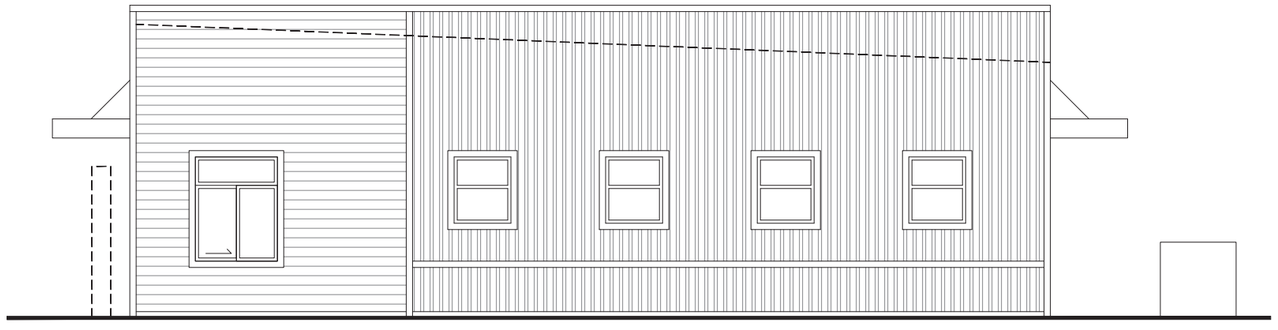
B/1 INBOUND TRANSACTION WINDOW

SCALE: 1/4" = 1'-0"



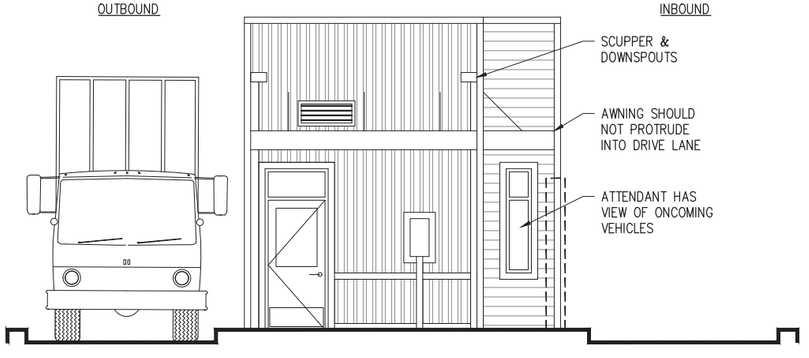
C/1 EXIT ELEVATION

SCALE: 1/4" = 1'-0"



D/1 OUTBOUND TRANSACTION WINDOW

SCALE: 1/4" = 1'-0"



E/1 ENTRY ELEVATION

SCALE: 1/4" = 1'-0"

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FIGURE 14
ATTENDANT BUILDING

SILVERDALE RAGF

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SCALE: ONE INCH AS DRAWN

Approved By

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PROJECT MANAGER S. FISCHER	DATE
PROJECT ARCHITECT	DATE

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3.2.3 Refuse Area

The refuse area consists of a bi-level top-load system comprising four individual refuse sheds, each with four customer stalls on the upper level and two, in series, 50-cubic-yard roll-off containers on the lower level. The bi-level is created by cast-in-place, stepped concrete foundation and retaining walls that provide an 8-foot grade separation between the tipping level and the roll-off container parking level. In total, the refuse area will provide 16 customer stalls and 400 cubic yards of active disposal capacity.

The three existing refuse sheds will continue to be used with some repairs and upgrades. The fourth shed will be new and designed to match the original three buildings in size and configuration. The new refuse shed will be a steel-framed, clear-span, open-fronted structure with metal skin and metal low-slope gable roof. The metal siding and roofing will be 22-gauge factory coated with PVDF over zinc-coated base metal to provide longevity, durability, and ease of maintenance. The primary and secondary framing will receive a high-performance coating to protect against corrosion. The structure will not require blanket insulation. The roof rakes will be fitted with gutters and water will be conducted to the ground in rectangular downspouts that discharge to grade.

The tipping level will have vehicle wheel stops and fall prevention safety railing. There will also be bridge plates to prevent refuse from falling between the retaining wall and container. The lower level, which is accessed through an opening at one end, will be concrete with raised concrete roll-off guides with armor plating.

The fourth refuse shed will be located to provide operational continuity with the other three sheds, and convey customer traffic through the area in a counterclockwise flow. The customer traffic area will be paved with asphalt and the lower hauler area will be paved with concrete. The concrete pavement will provide a longer lasting surface, resistant to damage from the staging, loading, and unloading of steel-wheeled roll-off containers. The lower hauler area will be widened by approximately 5 feet to the east in selected areas to provide improved maneuverability in the lower yard.

In addition to the containers within the four refuse sheds, four spare containers will be located on a concrete pad in the vicinity of the refuse area. The containers will allow a hauler to replace multiple full containers during one site visit, maintaining the site's level of service during periods when additional empty containers have not been delivered to the site.

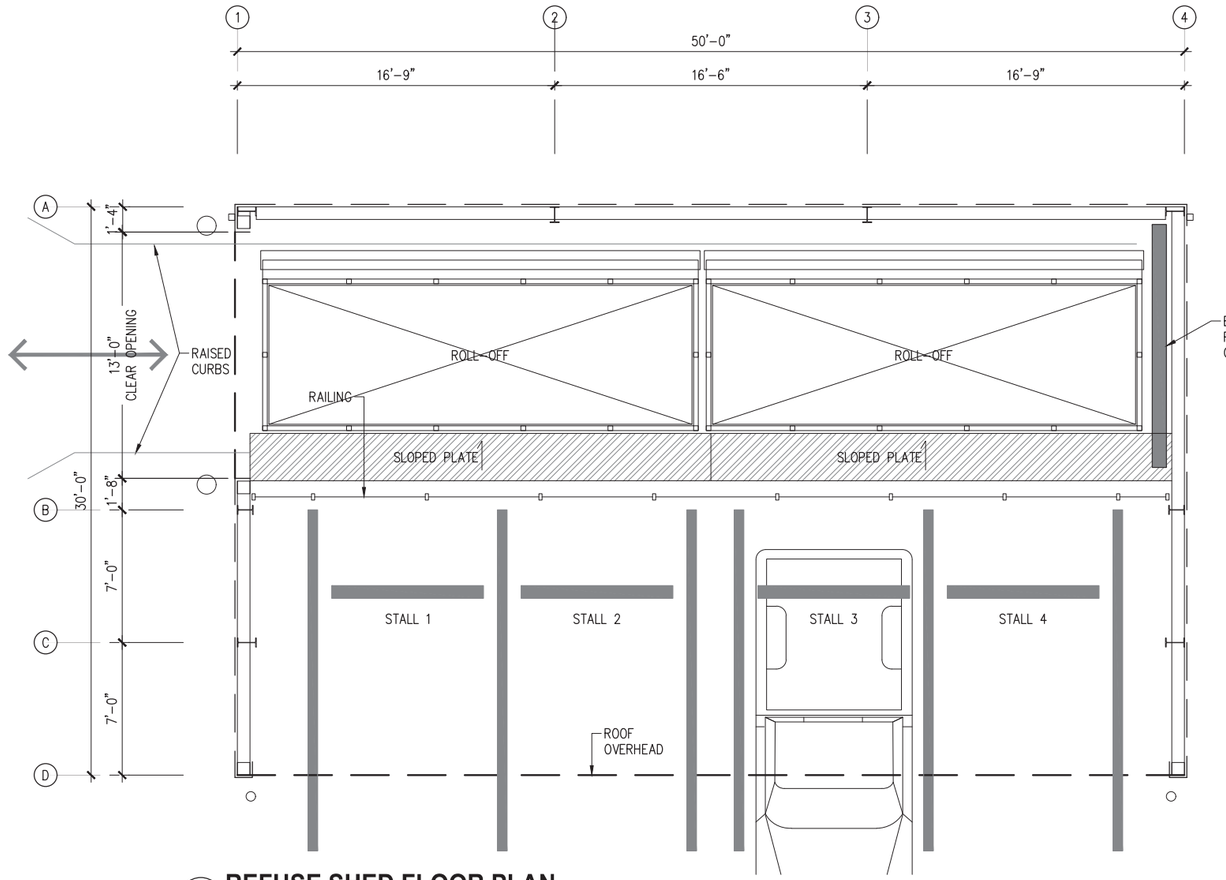
The refuse shed floor plan, section, and elevations are shown in Figures 15 and 16.

Customers exiting the refuse area have the option to continue counterclockwise to the recycle, limited HHW and white goods areas, or to return to the attendant building to exit the site. Haulers exiting the refuse area will continue counterclockwise along the perimeter roadway.

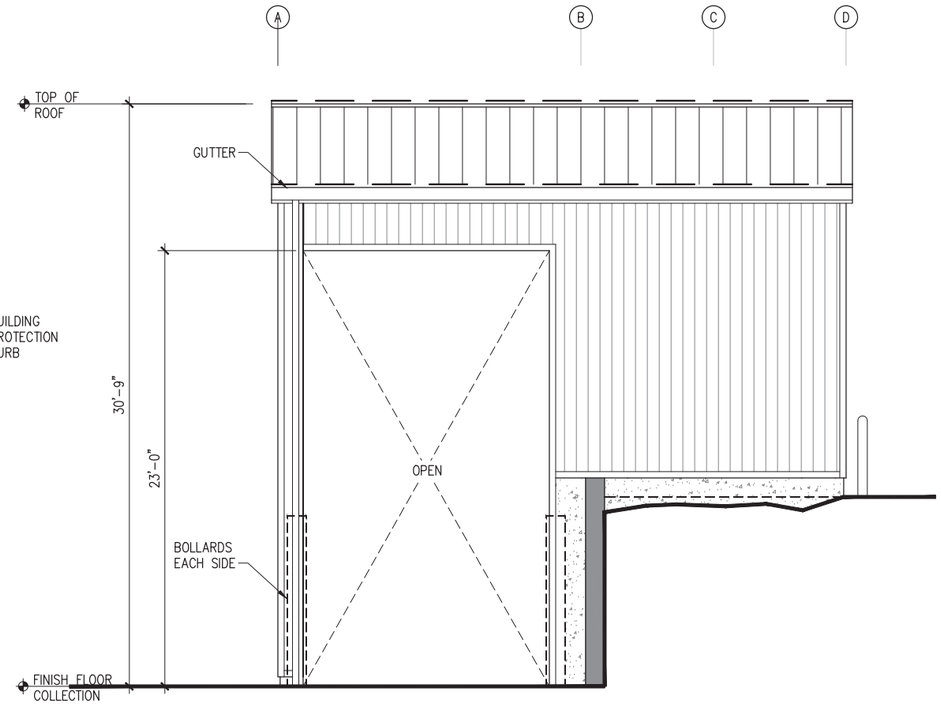
3.2.4 Recycle Area

The recycle area will consist of a vertically separated, paved area, west of the refuse area. The area will be accessed by customers who continue to the area through the counterclockwise traffic circulation from the refuse area, or alternatively, by customers who bypass the refuse area. The recycle area will have the capacity for nine roll-off containers to include:

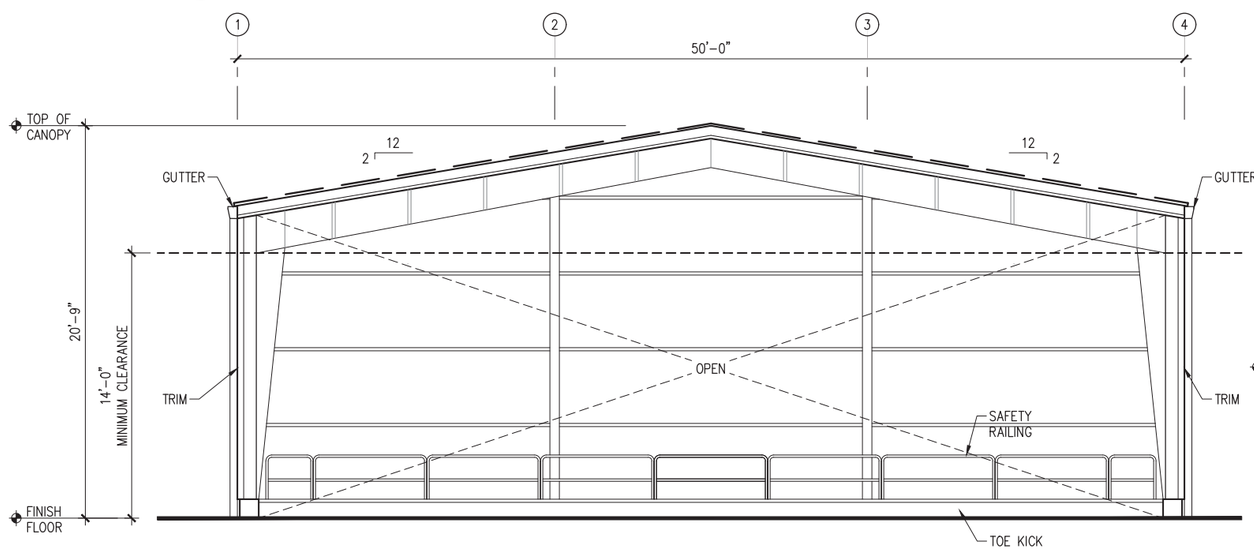
- Four 40-cubic-yard roll-off containers for commingled recyclables
- Two 50-cubic-yard roll-off containers for cardboard
- Two 30-cubic-yard roll-off containers for metals
- One 30-cubic-yard roll-off container for glass



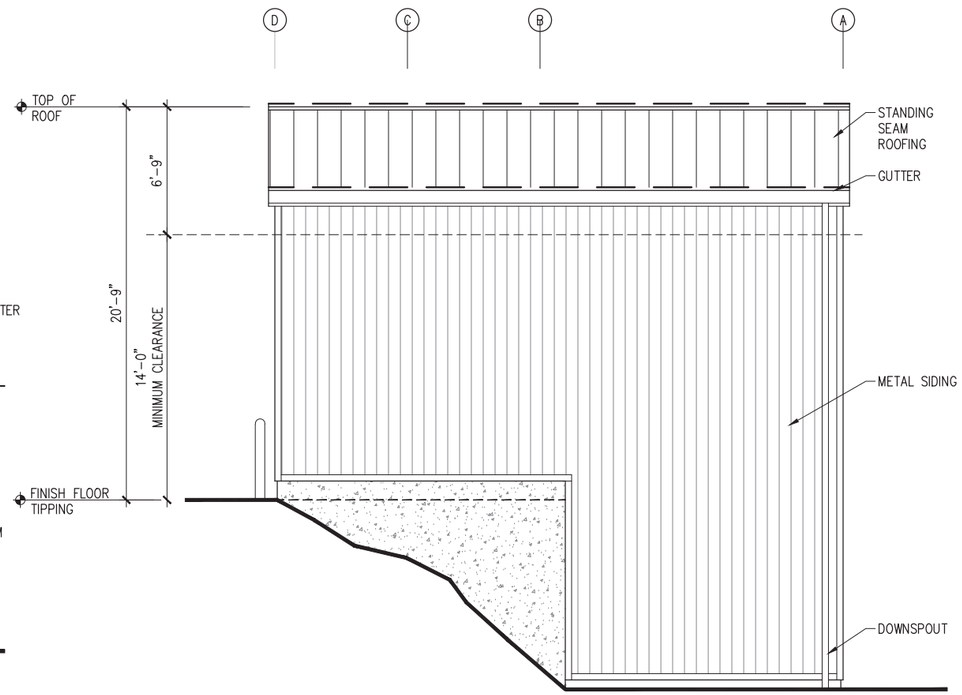
A 1 **REFUSE SHED FLOOR PLAN**
SCALE: 1/4" = 1'-0"



B 1 **REFUSE SHED DOOR ELEVATION**
SCALE: 1/4" = 1'-0"



C 1 **REFUSE SHED ELEVATION, OPEN SIDE**
SCALE: 3/8" = 1'-0"



D 1 **REFUSE SHED END ELEVATION**
SCALE: 1/4" = 1'-0"

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FIGURE 15
REFUSE SHED, SHEET 1 OF 2

SILVERDALE RAGF

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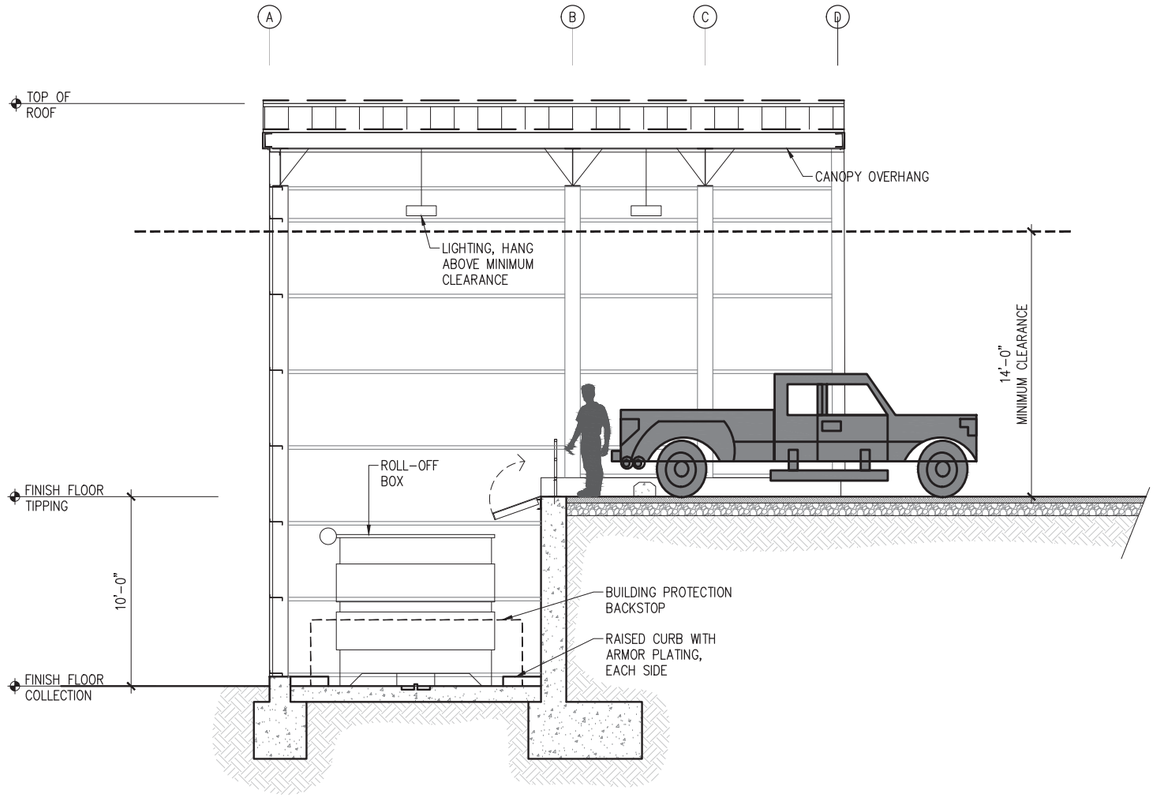

C/1 REFUSE SHED SECTION

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FIGURE 16
REFUSE SHED, SHEET 2 OF 2

SILVERDALE RAGF

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PROJECT MANAGER S. FISCHER DATE

PROJECT ARCHITECT DATE

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Customers will access the recycle area from south of the containers utilizing approximately 13 ten-foot wide parking stalls. Materials will be deposited conveniently in the containers through top loading with access provided along the top of a finger pier wall, or finger wall. Figure 17 shows a similar finger wall and containers configuration at another facility in the County of Hawaii, Hawaii.

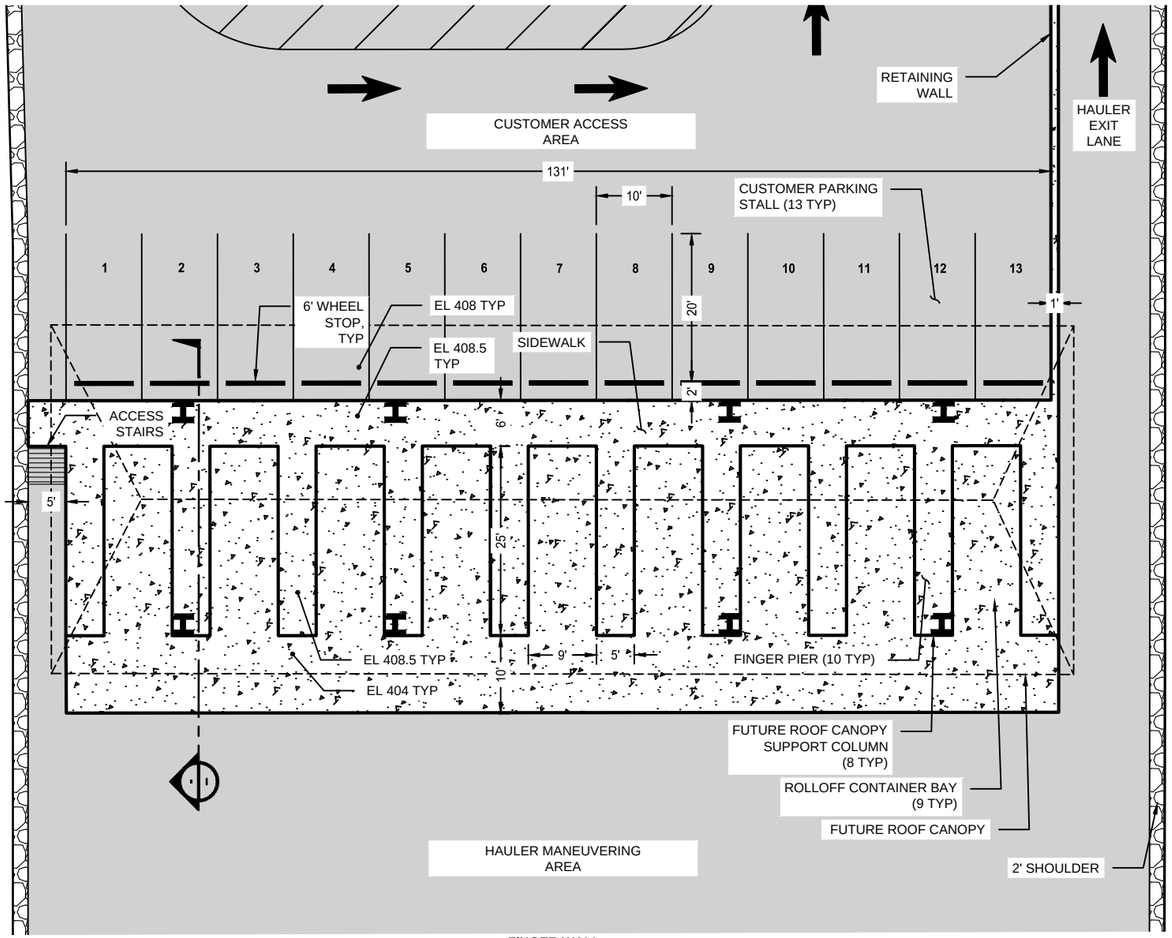
Figure 17. Pahoa Transfer Station Finger Wall Recycle Area

Haulers will access the area from the north, following the perimeter, counterclockwise route. The hauler maneuvering area and container area will be approximately 15,900 square feet, with the area under the roll-off containers and the approach apron to the container area being paved with concrete and the remainder paved with asphalt. The hauler area will be 4 feet, 6 inches lower than the customer area providing safe, separated maneuvering. The finger wall will also have 42-inch tall fall prevention rails as illustrated in Figure 17.

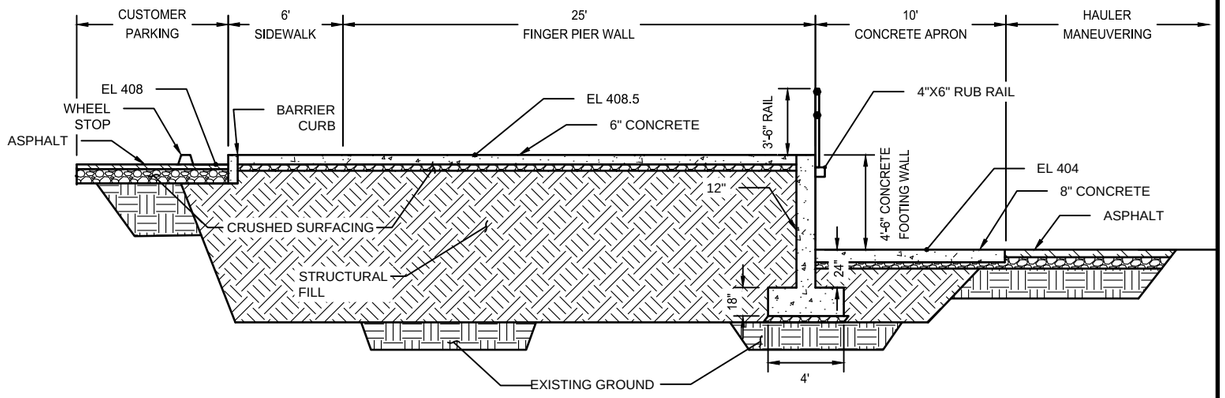
The finger wall will initially be uncovered, without a canopy; however, the walls/piers will be designed to accommodate future canopy installation. The finger wall plan and sections are shown in Figure 18.

Excess paved area will be provided in the central and peripheral areas south of the recycle area. These areas will provide opportunities for expanded recycling service, either of a temporary or permanent nature.

Customers will exit the recycle area and continue counterclockwise past the limited HHW and white goods areas, and then to the attendant building. Haulers exiting the recycle area will continue counterclockwise along the perimeter roadway.



FINGER WALL
PLAN
SCALE IN FEET
0 10 20



FINGER PIER
TYPICAL SECTION
1" = 8 FEET

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FILE: PS1578148-D1

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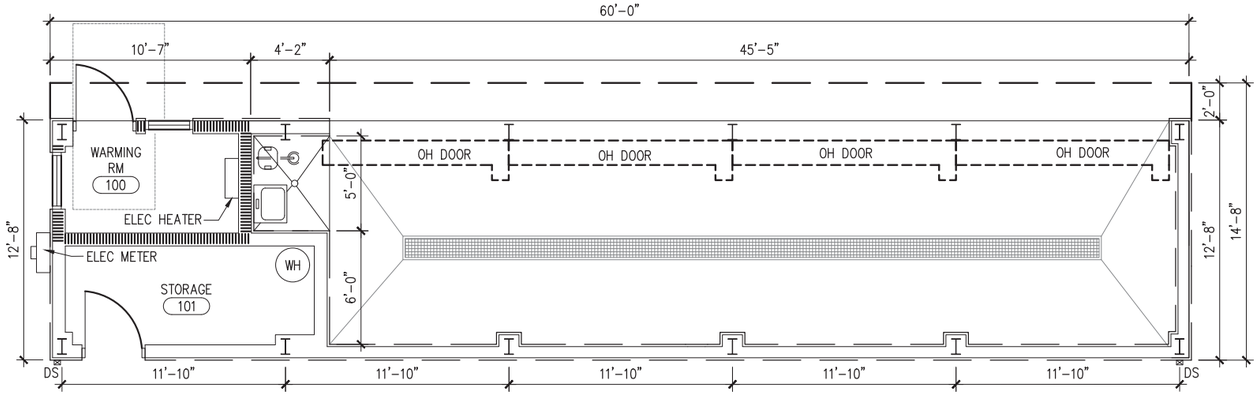
FIGURE 18
FINGER WALL
SILVERDALE RAGF
KITSAP COUNTY

3.2.5 Limited HHW/White Goods Areas

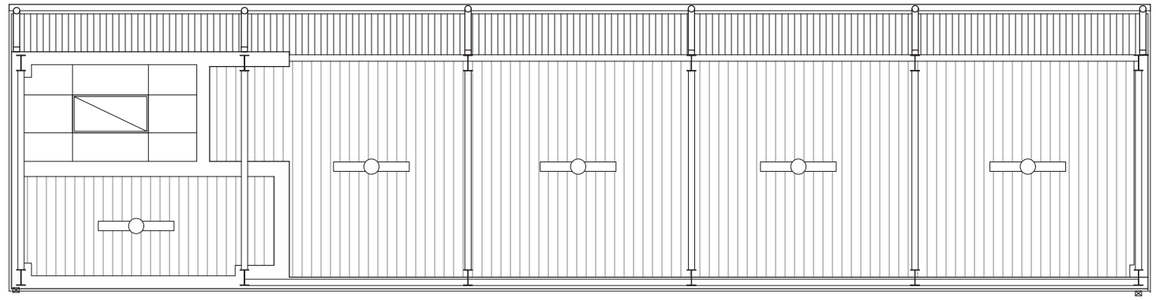
The limited HHW/white goods areas will consist of a flat, paved area south of the recycle area. The area will be accessed by customers that continue to the area through the counterclockwise traffic circulation from the recycle area. The area includes the limited HHW building and a fenced white goods collection area. The limited HHW building will be approximately 13 feet by 60 feet, open-faced with an enclosed, heated attendant room. A similar building configuration to the limited HHW building is shown in Figure 19.

Figure 19. Bow Lake Recycling and Transfer Station Recycle Building

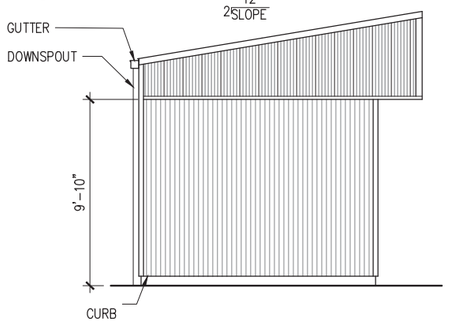
The limited HHW building could be a pre-engineered metal building package, or custom-engineered steel frame construction. The metal roofing, siding, and interior liner panels should include 22-gauge metal siding coated with PVDF, UV resistant factory finishes providing longevity, durability, and ease of maintenance. Glazing units should have aluminum frames with insulated glazing. Doors should be insulated fiberglass faced in aluminum frames, or insulated hollow metal doors and frames. The limited HHW building floor plan and elevations are shown in Figure 20. The adjacent, fenced white goods area will be approximately 600 square feet, more than double the current 260-square-foot area.

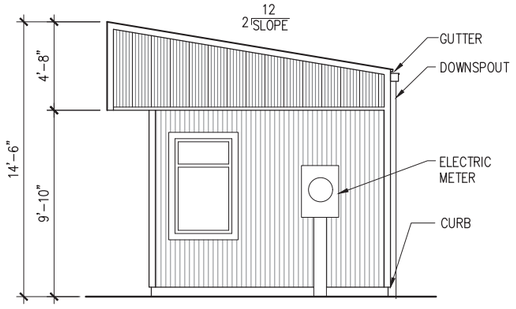


A/1 **FLOOR PLAN**
SCALE:1/4" = 1'-0"

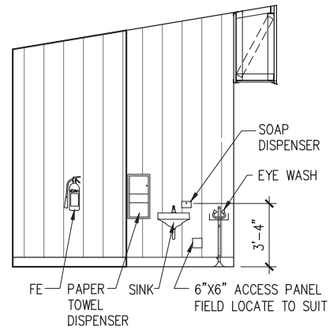


B/1 **REFLECTED CEILING PLAN**
SCALE:1/4" = 1'-0"

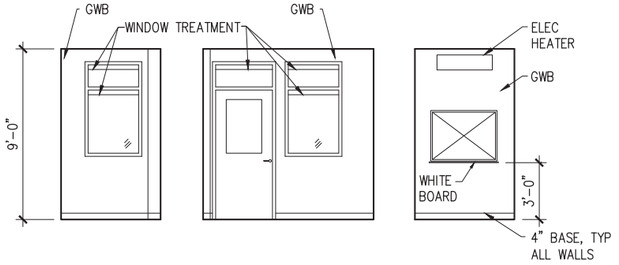




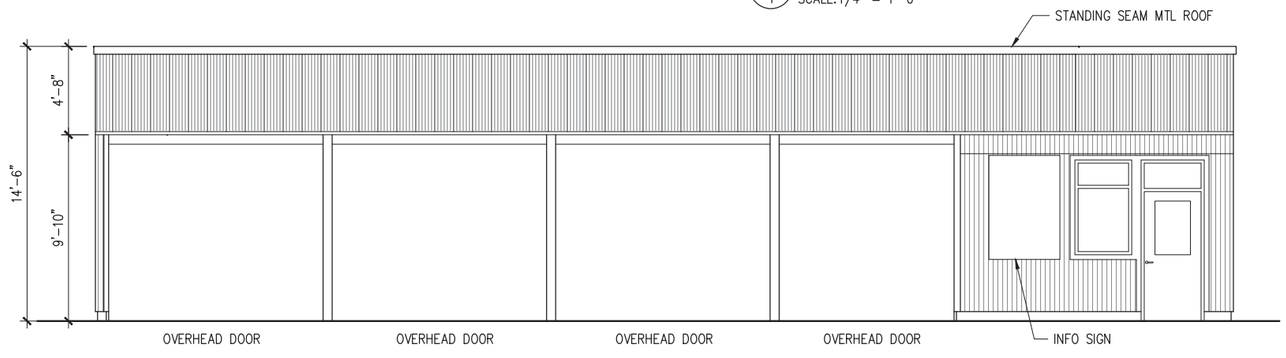
E/1 **EXTERIOR ELEVATIONS**
SCALE:1/4" = 1'-0"



C/1 **SAFETY EQUIPMENT ELEVATION**
SCALE:1/4" = 1'-0"



D/1 **WARMING RM INTERIOR ELEVATIONS**
SCALE:1/4" = 1'-0"



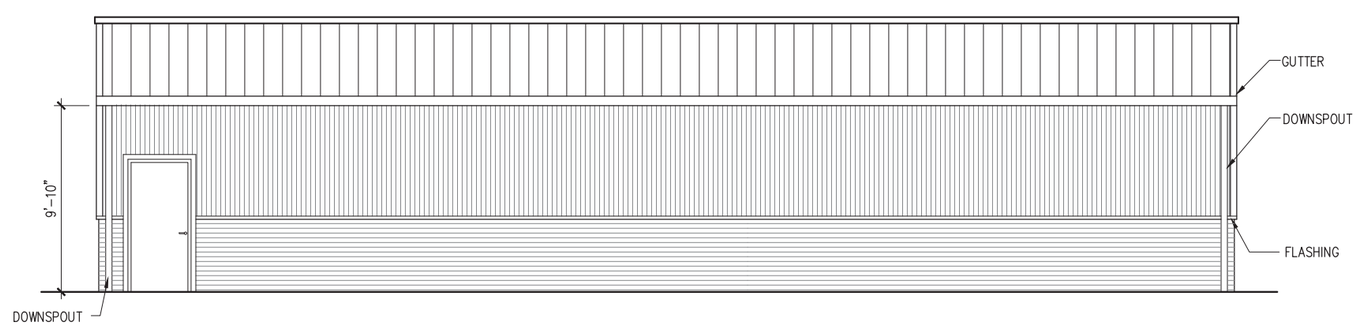


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FIGURE 20
LIMITED HHW BUILDING

SILVERDALE RAGF

REVISIONS

NO.	DATE	BY	APPR.

SCALE: ONE INCH AS DRAWN

Approved By

QA/QC MANAGER	DATE
PROJECT MANAGER S. FISCHER	DATE
PROJECT ARCHITECT	DATE
A_HHW.dwg FILENAME	
DESIGNED BY C. WENTWORTH	DATE
DRAWN BY S. FISCHER	DATE 08/07/2018
CHECKED BY	DATE

SHT _____ OF _____

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The Preferred Site Plan currently shows the limited HHW building on the west side of the area; although the final location will be determined during detailed design. Customers will parallel park in front of the limited HHW building (2-3 stalls) and wait for attendant assistance. Once access is provided by the attendant, customers will be able to dispose of limited HHW items and wash their hands afterward. Customers depositing white goods will be able to back up to the customer gate on the north side of the fenced collection area, unload appliances, and place them within the fenced area. Customers will then continue to progress through the site in a counterclockwise direction and be routed back to the attendant building to exit the site. The limited HHW building will be designed for unattended service should the County decide to operate the facility without an attendant present.

Haulers will access the limited HHW area by traveling counterclockwise along the perimeter road, past the recycle area. Haulers will pass the limited HHW area and then back up to the limited HHW building and white goods area for loading of collected materials. The haulers will likely need to park in front of the limited HHW building to collect materials. The white goods haulers will have a dedicated gate to access the white goods area from the west. The approach will provide for limited interaction between customers and haulers and may allow continued use of the facilities during hauler activities. Haulers will then continue south along the perimeter road and be able to exit the site.

When in the vicinity of the recycle area or limited HHW areas, attendants have the opportunity to access the warming room of the limited HHW building during lulls in activity to take shelter from adverse weather.

3.2.6 Stormwater Management

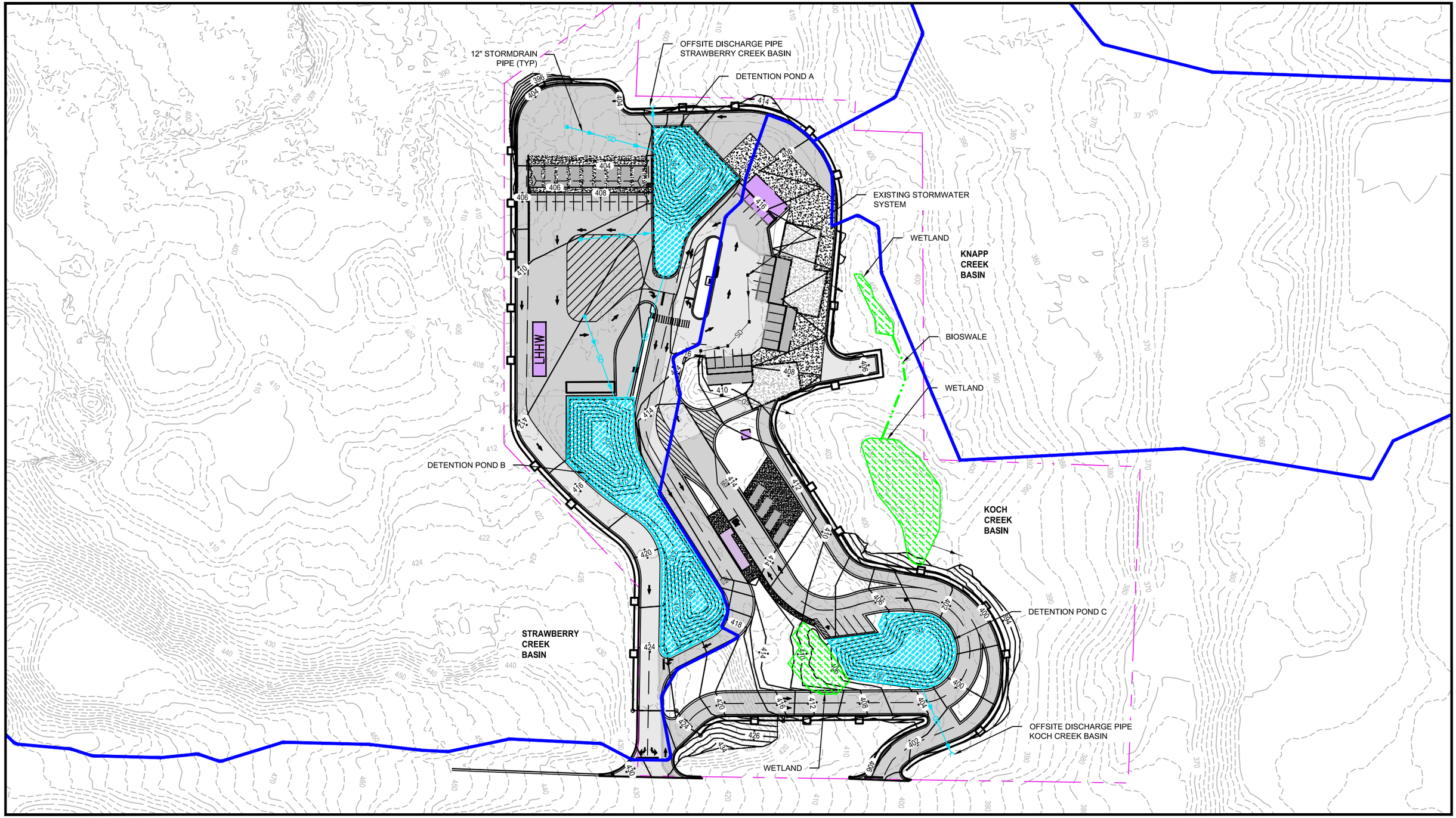
The conceptual stormwater management system layout is shown in Figure 21. The stormwater management for the redeveloped site will focus on maintaining contributing discharges to their current receiving basins (Strawberry Creek and Koch Creek watersheds) and reducing flow volumes to match historical forested conditions. The system will be designed to provide stream-protection flow control by matching targeted forest runoff for 50 percent of the 2-year, 24-hour peak flow up to the 50-year, 24-hour peak flow based on the requirements of the 2016 Kitsap County Stormwater Design Manual.

The onsite stormwater management system will comprise a series of existing and new catch basins, conveyance pipes, ditches, detention ponds, and culverts. Existing wetlands on site are assumed to be protected receiving waters and will require additional flow control considerations.

The recycle and limited HHW areas will drain to central catch basins that will convey the sheet runoff to one of two connected detention ponds to the east that will discharge to the natural outfall location to the north, contributing to the Strawberry Creek basin.

The refuse area will drain to central catch basins that will convey the roof and surface runoff to an existing bioswale and wetlands east of the developed site. If volumes warrant protection of the wetland hydroperiods, portions of the runoff may be diverted to a new south detention pond. The remaining runoff from the southern portion of the site will sheet flow, and then be directed through ditches and culverts to a new south detention pond. The south detention pond may also have wetland considerations that will require some isolation or mitigation. The south pond will outfall to the existing drainage channel just north of Dickey Road NW, contributing to the Koch Creek basin.

Where feasible, the site will utilize low impact development (LID) stormwater management features. Undeveloped portions of the site will maintain their current drainage patterns.



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LEGEND

- EXISTING STORMWATER PIPE
- EXISTING STORMWATER STRUCTURE
- PROPOSED STORMWATER PIPE
- PROPOSED STORMWATER STRUCTURE
- DRAINAGE BASIN BOUNDARY
- DETENTION POND
- WETLAND

FIGURE 21
CONCEPTUAL STORMWATER PLAN
SILVERDALE RAGF
KITSAP COUNTY

The site was modeled using the Washington State Department of Ecology's Western Washington Hydrology Model (WWHM2012). The results indicate detention volumes of 78,000 cubic-feet (1.8 acre-feet) and 32,000 cubic-feet (0.73 acre-feet) for the areas contributing to the Strawberry Creek and Koch Creek watersheds, respectively. Because of the potential variability in soils, infiltration was assumed to be zero. During detailed design, geotechnical investigations are expected to quantify the infiltration capacity of the ponds and wetlands, which will reduce storage requirements. Additionally, for the Koch Creek basin, the stream-protection detention pond was sized for the south subbasin only, assuming the existing discharge from the refuse area to the east bioswale and wetlands would be maintained. For the north and central Koch Creek subbasins, detailed wetland hydroperiod analyses will have to be conducted to determine runoff limitations and associated flow control, or flow re-routing required (if any), to protect the two adjacent wetlands.

The current configuration may not have the capacity required. During detailed design, final pond sizing will be determined. If size requirements exceed current available space, additional options will need consideration, including but not limited to, establishing detention capacity elsewhere on the County's larger parcel, outside the designated RAGF footprint; or reducing the planned pavement to decrease runoff and increase available pond footprints. Additionally, there may be opportunity to seek a forested condition design constraint exemption, and instead design to manage to the current existing conditions; or applying for an exemption for modification of the contributing basin delineation.

Additional conceptual stormwater management information, including model results and figures pertaining to the system sizing, are presented in Appendix I.

3.2.7 Site Utilities Systems

In addition to the stormwater management system, other utility systems will include water, sewer, fire protection, electrical, telephone, security, and data. These systems will generally be installed as underground systems.

The existing water supplied from Dickey Road NW to the south will be expanded to provide sufficient capacity for usage in the attendant building and limited HHW building and hose bibs at each refuse shed and the recycle area. Backflow prevention will be provided to protect the system portions requiring potable water.

Fire protection will be provided through a single fire hydrant centrally located within the site with acceptable proximity to all buildings and storage areas. Sprinklered systems are not anticipated for the buildings.

Sewer volumes will be generated from sanitary facilities within the attendant building and limited HHW building. Other potential sewer volumes may occur as contact water, which is water that has come in contact with deposited refuse or recyclables. Contact water could come from roll-off container drainage from the refuse sheds, refuse container storage area, and the recycle area. Sewer volumes may be disposed of through onsite septic, or through connection to the municipal system within Dickey Road NW that is available east of the site.

Electrical power to the facility will be provided from Dickey Road NW to the south and will include power to the four refuse sheds, attendant building, limited HHW building, and an expanded site lighting system. LED luminaires will be utilized throughout. A permanent standby engine generator with the capacity to power the attendant building and select site systems such as lighting and gates will be located near the attendant building.

Telephone, data, and security will be provided from Dickey Road NW to the south and will include copper and fiber systems. Systems will be routed to the attendant building and from there to other locations on site as needed. Security cameras will be provided throughout the site and monitored at the attendant building. Attendant service buttons with rotating beacon lights will be provided to all service locations and may include intercom service to the attendant building.

3.2.8 Other Facilities

In addition to the attendant building and limited HHW building warming room, a semi-enclosed warming station will be provided in the refuse area, west of the refuse sheds. The station will consist of a roofed structure with transparent windscreen and radiant heater. The station will be available for use by the attendant during lulls in activity to shelter from adverse weather.

Two portable, waterless restrooms will be provided for use by customers. The restrooms will be located on designated pads, one in the refuse area, and one in the limited HHW area.

The storage shed will be a prefabricated building, located along the perimeter roadway with access by site maintenance staff.

3.3 Capacity Considerations and Operating Strategies to Accommodate Growth

The Preferred Site Plan arrangement and layout of the various project elements provide a high level of operational flexibility that will allow the Silverdale RAGF to respond positively as the materials and traffic quantities arriving at the facility grow over the next 30 years, and as programs change. Using the tonnage and customer traffic forecasts provided in Table 1, the following capacity assessments and operating strategies were evaluated for the major traffic pinch points of the facility, which include the attendant building (inbound and outbound) and the three principal customer service area maneuvering yards and parking stalls.

As discussed below, there is expected to be times when available queue capacity is exceeded; however, the extent of these short duration challenges was balanced with sitewide facility optimization and utilization of available space.

3.3.1 Attendant Building

Under current conditions, the peak daily traffic was approximately 515 customers in 2017. Applying an assumption that the peak hourly traffic is 20 percent of the peak daily traffic, results in 103 customers per hour. If the average inbound, visual load assessment and transaction time is about 2 minutes, the attendant building can process approximately 30 customers per hour. The remaining 73 customers would form an inbound queue. Assuming an average customer vehicle length of 21 feet, the resulting queue would be 1,533 feet. The Preferred Site Plan provides for 700 feet of single-lane, inbound queue length and 1,400 feet of alternating double-lane, inbound queue length. Utilizing both lanes during peak flow will not meet current needs, which will require approximately 6 customers to queue on Dickey Road NW, or return at a different time. Note that during alternating double-lane queuing, the bypass lane will not be accessible; however, emergency vehicles will still be able to access the site using the hauler entrance.

If scales are not incorporated and inbound transactions continue for a 10-year planning period, 20 percent of the estimated 584 peak daily customers in 2028 will result in 117 peak hourly customers,

an inbound queue of 87 customers, and a queue length of 1,827 feet. The Preferred Site Plan provides for 1,400 feet of alternating double-lane, inbound queue length, which will require approximately 30 customers to queue on Dickey Road NW, or return at a different time. It is anticipated that some customers encountering a peak hourly queue will elect to return at another time, reducing the actual peak hourly queue. Experience at this facility and other stations shows that customers learn to avoid peak times when backups are likely. Operational approaches can also be implemented to further reduce peak hourly queues, such as extending facility hours, or encouraging off-peak usage through fee incentives. Potential operational approaches can be assessed as the need develops over time. Note that during alternating double-lane queuing, the bypass lane will not be accessible.

When weight-based transactions are implemented at the site, it is assumed that inbound customers will require about a half-minute transaction time. Based on a 30-year planning period, 20 percent of the estimated 704 peak daily customers in 2047 will result in 141 peak hourly customers. The attendant building would process 120 customers an hour, leaving an inbound queue of 21 customers and a queue length of 441 feet, which is less than the available single-lane, inbound queue length provided by the Preferred Site Plan.

Prior to initiating weight-based transactions, outbound traffic will move unimpeded out of the site. When weight-based transactions are implemented, it is assumed that recycle customers will be allowed to exit the site through the bypass lane without an outbound transaction. In 2047, and at a 20 percent conversion rate, the remaining 422 peak daily MSW customers will generate an assumed 84 peak hourly customers. With an assumed 2-minute average outbound transaction time, the attendant building can process 30 customers per hour, resulting in a 54 customer outbound queue and a 1,134-foot queue length. The Preferred Site Plan provides for a 240-foot outbound queue length while maintaining free exit from the recycle and limited HHW areas using the outbound bypass. Based on these assumptions, the exit queue will back up into service areas. Similar to the discussion above, peak hourly traffic is expected to be reduced based on customer recognition of the busy site and the decision to return at a different time. Additionally, operational approaches can be modified to help reduce peak hourly traffic.

3.3.2 Refuse Area

The Preferred Site Plan includes 16 refuse unloading, or tipping, stalls. Assuming an average 12-minute unload time, each stall can accommodate 5 customers per hour for a total of 80 customers per hour. Under current 2017 conditions and with a 20 percent conversion factor, 250 peak daily customers would result in 50 peak hourly customers, which can be accommodated by the capacity of the four refuse sheds.

The 30-year planning period has 422 peak daily customers and 84 peak hourly customers. The 200-foot queue length into the refuse area is able to accommodate the remaining 4 customer vehicles with a queue length of 84 feet. Note that the 200-foot queue length is a shared queue with other service areas on site.

If needed in the future, the parking stalls at each shed could be restriped to accommodate 5 vehicles, for a total capacity of 20 customers using the area at one time.

3.3.3 Recycle and Limited HHW Areas

The Preferred Site Plan includes 13 recycle unloading stalls. Assuming an average 5-minute unload time, each stall can accommodate 12 customers per hour for a total of 156 customers per hour. Under current

2017 conditions and with a 20 percent conversion factor, 464 peak daily customers would result in 93 peak hourly customers that can be accommodated by the capacity of the recycle area.

The 30-year planning period has 634 peak daily customers and 127 peak hourly customers. Under these conditions, the recycle area has adequate capacity. In addition to the 200-foot-shared queue length, the recycle and limited HHW areas have a dedicated 75-foot inbound queue length.

The limited HHW and white goods customer counts are low in comparison to the recycle customer counts and have been included in those quantities. Each of the limited HHW building and white goods areas is able to serve 2 to 3 customers at a time.

3.3.4 Waste Tonnage

The Preferred Site Plan provides for 8 active and 4 reserve 50-cubic-yard, roll-off, refuse containers with a combined volume of 600 cubic yards, or at an average of 4 tons per container, with a combined tonnage of 48 tons of capacity. Under current 2017 and 30-year planning conditions, the peak daily refuse tonnage will be 26 tons and 36 tons, respectively. Provided that the containers are hauled out and replaced promptly and daily, the site provides adequate refuse capacity.

The Preferred Site Plan provides 9 roll-off containers of varying size for recyclables. Container sizes range from 30 cubic yards to 50 cubic yards depending on commodity. Container stalls will be sized to accommodate 50-cubic-yard containers, if the smaller containers require upsizing in the future. Under current 2017 and 30-year planning conditions, the peak daily recycling tonnage will be 6 tons and 12 tons, respectively. The number of containers will be adequate provided the containers are hauled and replaced at the required frequency to maintain service.

3.4 Project Schedule, Construction Phasing, and Maintenance of Facility Operations

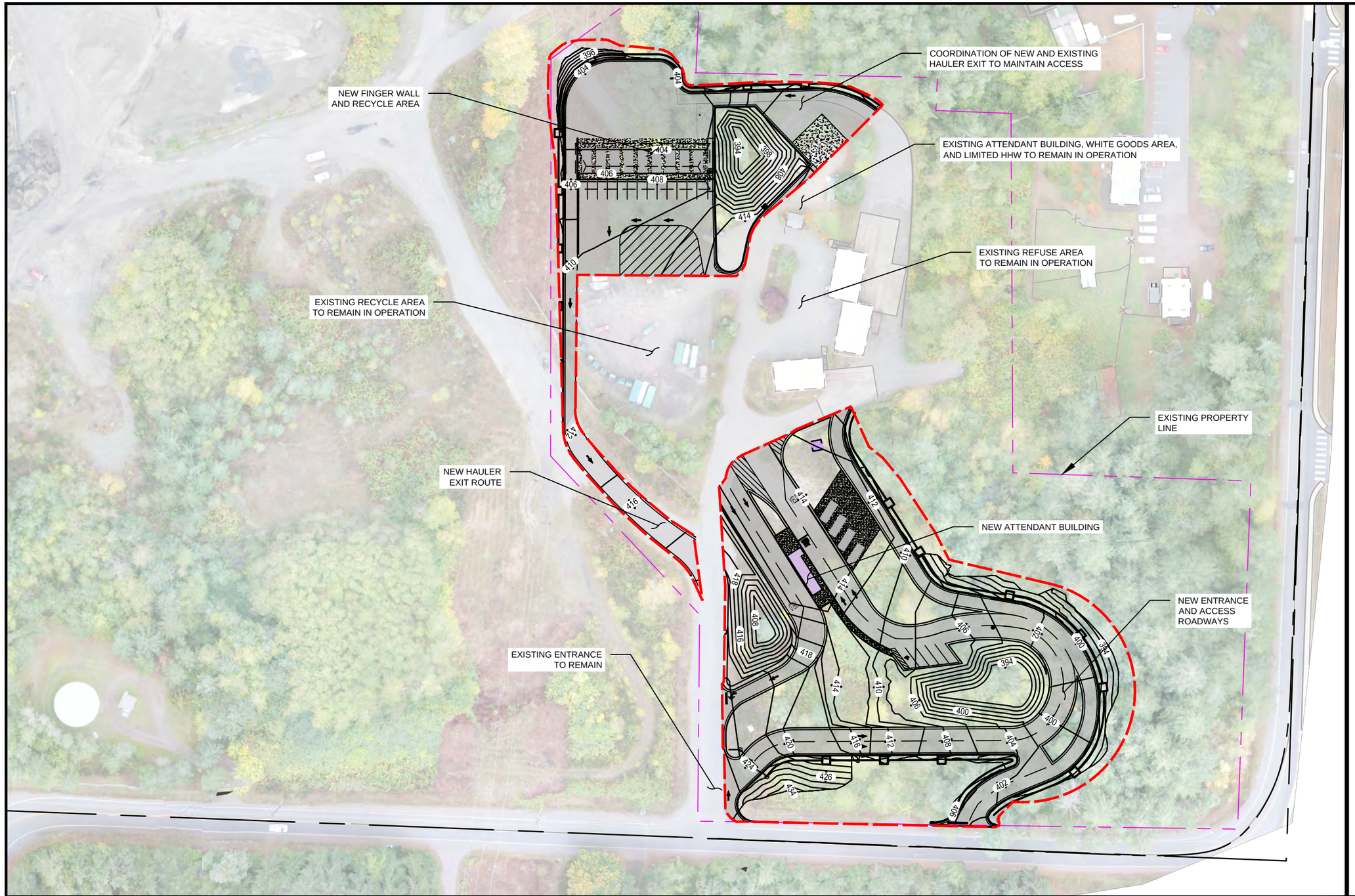
A preliminary project schedule is provided in Appendix B and shows design, permitting, and construction activities beginning with the adoption of the FMP. Schedule durations include some float in order to position the construction period within a favorable construction window as it pertains to weather.

As identified in Section 2, Design Criteria, a primary project objective is continued facility services during construction. A preliminary construction phasing plan has been developed to achieve this objective and is discussed below and illustrated in Figures 22, 23, and 24.

3.4.1 Phase 1

During Phase 1, primary site functionality will be maintained with minimal impacts to current operations. The construction effort will be focused in the south and northwest. In the south, the attendant building will be constructed along with entrance and exit grading and paving. Utilities will be brought into the site, and those utilities that extend farther into the site will be provided with temporary terminations. In the northwest, the northern half of the recycle and limited HHW area will be graded and paved, along with access from the refuse hauler maneuvering area and to the hauler exit along the perimeter roadway. The finger wall will be constructed. Utilities will be installed within this area and provided with temporary terminations.

Phase 1 will also include upfront submittals, mobilization, and establishment of temporary facilities and erosion and sedimentation controls. Phase 1 is estimated to take 5 months to complete.



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KITSAP COUNTY WASHINGTON 1857

PLAN
SCALE IN FEET
0 50 100

N

FIGURE 22
CONSTRUCTION PLAN
PHASE 1
SILVERDALE RAGF
KITSAP COUNTY

MAINTAIN HAULER EXIT ROUTE

NEW REFUSE SHED

NEW RECYCLE AREA IN OPERATION

REMOVE EXISTING ATTENDANT BUILDING, WHITE GOODS AREA, AND LIMITED HHW

TEMPORARY LIMITED HHW AND WHITE GOODS AREA IN OPERATION

EXISTING REFUSE AREA TO REMAIN IN OPERATION

NEW LIMITED HHW BUILDING

NEW WHITE GOODS AREA

EXISTING PROPERTY LINE

NEW ATTENDANT BUILDING IN OPERATION

NEW ENTRANCE AND ACCESS ROADWAYS IN OPERATION

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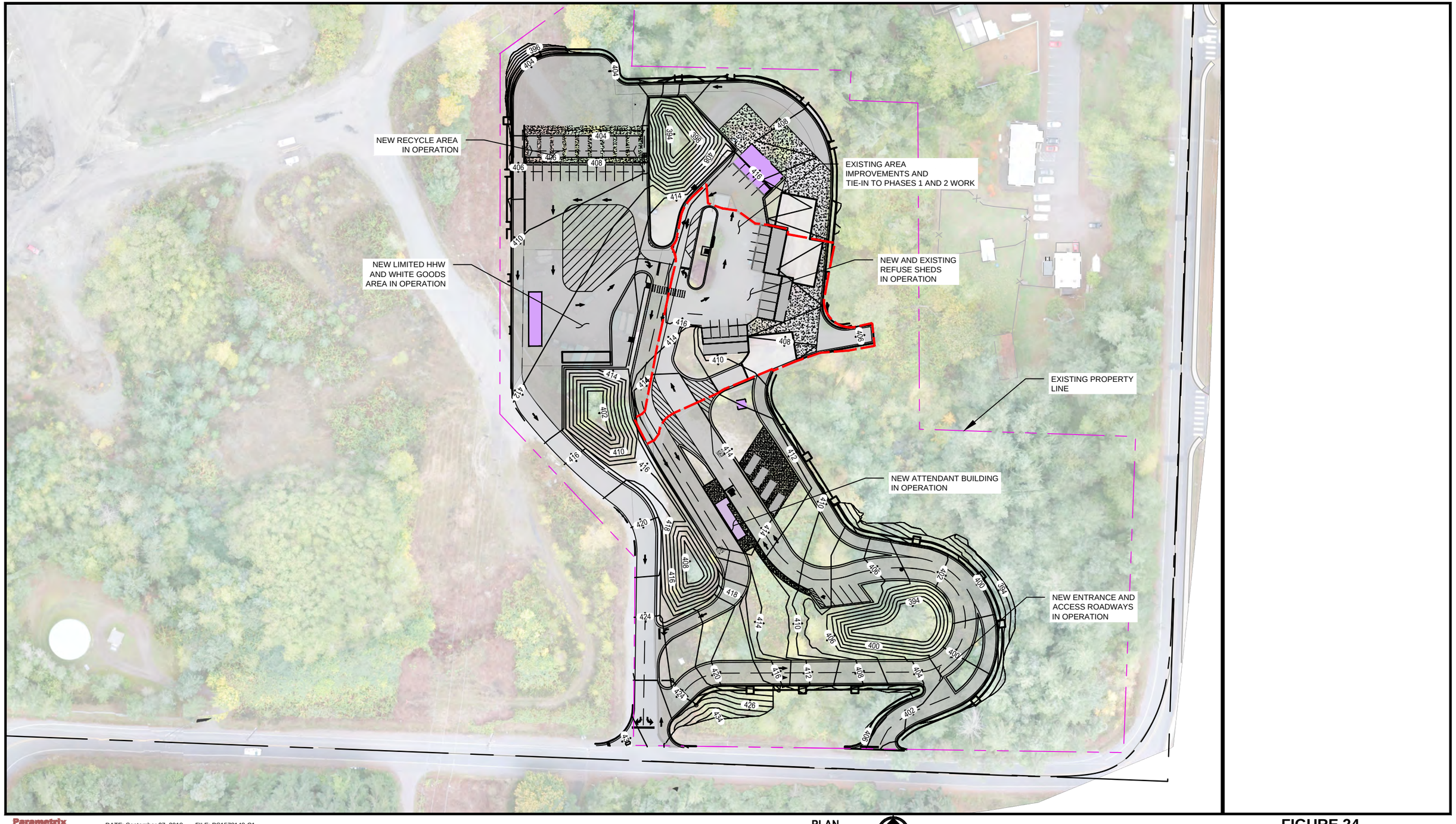
PLAN
SCALE IN FEET
0 50 100

FIGURE 23
CONSTRUCTION PLAN
PHASE 2
SILVERDALE RAGF
KITSAP COUNTY



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PLAN
SCALE IN FEET
0 50 100

FIGURE 24
CONSTRUCTION PLAN
PHASE 3
SILVERDALE RAGF
KITSAP COUNTY

3.4.2 Phase 2

During Phase 2, customers will be routed past the new attendant building, utilizing the new entrance and exit. The existing recycle area will be closed with customers transitioned to the new recycle area in the northwest. The existing limited HHW area will be closed, and a temporary collection area will be established in the vicinity of the new recycle area. The existing refuse area will continue in use with some restrictions near the location of the new refuse shed. Haulers will utilize the perimeter road requiring some coordination with the contractor around the new refuse shed area.

Construction effort will be focused on removal of the existing attendant building, limited HHW area, and recycle area. The existing recycle area will be replaced with the new limited HHW area, limited HHW building, and white goods area. The existing limited HHW area will be replaced by the new refuse shed. Utility systems will be mostly completed during this phase. Phase 2 is estimated to take 3 months to complete.

3.4.3 Phase 3

During Phase 3, the remainder of the work will be completed. This will include work within the refuse area to tie in the work of Phases 1 and 2; replace, repair, and overlay pavement; upgrade the existing refuse sheds and utilities; install the warming station; and provide any remaining pavement striping and signage. The upgrades to the existing sheds will also need to be performed incrementally, to maintain three of the four refuse sheds in service at all times. Note that there may be opportunity to perform some of the shed upgrade work during Phases 1 and 2, which might allow for some compression of the Phase 3 schedule. Phase 3 is estimated to take 2 months to complete.

The total time required to complete the construction is estimated to be 10 months.

3.5 Development Cost Estimate

The estimated total construction cost of the redevelopment, including contingency, sales tax, and design and construction management services, is approximately $4,484,000 (2018 dollars). A detailed OPC is included in Appendix A.

3.6 Permit Requirements

A permit matrix of federal, state, and local permits and approvals that may be required is provided in Appendix D.

Appendix A

Opinion of Probable Cost

Project:	Silverdale RAGF Master Plan	Date:	2-Oct-18
Estimate Basis:	Planning Level, Order of Magnitude for Preliminary Base Case Site Layout	Costs:	2018 Dollars
Location:	Silverdale, Kitsap County Washington	Prepared By:	K. Hufnagel, Parametrix

DETAILED CAPITAL COST ESTIMATE

I. GENERAL

Item	Quantity	Units	Unit Price	Item Cost	Total
General Conditions Allowance	1	LS	LS	$25,000	
Construction Phasing Allowance	1	LS	LS	$10,000	
Work Setout and Survey	1	LS	LS	$10,000	
Mobilization/Demobilization	1	LS	LS	$10,000	
Trench Safety	1	LS	LS	$10,000	
Traffic Control	1	LS	LS	$10,000	
Overhead and Profit 12% of Direct Construction Cost Below	1	LS	LS	$310,000	
Subtotal I					**$385,000**

II. SITEWORK

Item	Quantity	Units	Unit Price	Item Cost	Total
Temporary Erosion and Sediment Control Measures	1	LS	LS	$15,000	
Saw Cut Pavement	500	LF	$4.00	$2,000	
Remove Asphalt Pavement	2700	SY	$6.00	$16,200	
Remove Structures	1	LS	LS	$10,000	
Earthwork					
Clear and Grub	4	Acres	$15,000.00	$60,000	
Strip/Stockpile Topsoil	3200	CY	$4.00	$12,800	
Common Excavation/Fill	18800	CY	$8.00	$150,400	
Common Borrow	0	CY	$25.00	$0	
Finishing Grading	2.6	Acres	$8,000.00	$20,800	
Roadway and Sidewalk Concrete					
8" Reinforced	1400	SY	$100.00	$140,000	
4" Reinforced	90	SY	$45.00	$4,050	
Subgrade Preparation	12700	SY	$2.00	$25,400	
Geotextile Separation Fabric for Pavements	1000	SY	$3.00	$3,000	
Gravel Base (9" thick)	6250	Tons	$30.00	$187,500	
Prime Coat/Tack Coat	1500	GAL	$3.00	$4,500	
Asphalt Pavement, Parking (5" thick new, 2" overlay)	3400	Tons	$90.00	$306,000	
Planing Bituminous Pavement	3000	SY	$6.00	$18,000	
Off Site Utilities					
Water System Allowance	1	LS	LS	$20,000	
Sewer System Allowance	1	LS	LS	$50,000	
Fiber System Allowance	1	LS	LS	$20,000	
Electrical System Allowance	1	LS	LS	$20,000	
Off-Site Roadway Improvements	1	LS	LS	$20,000	
Site Utilities					
Water Supply	1	LS	LS	$80,000	
Sewer System	1	LS	LS	$20,000	
Fiber Allowance	1300	LF	$50.00	$65,000	
Electrical	800	LF	$90.00	$72,000	
Standby Generator	1	LS	LS	$20,000	
Site Drainage					
Collection system	1	LS	LS	$50,000	
Vehicle Guardrail	800	LF	$50.00	$40,000	
Fencing and Gates					
6 Foot chainlink vinyl coated w/ 2 Personnel Gates	2200	LF	$18.00	$39,600	
25 Foot Motor-Operated Gates	3	EA	$7,500.00	$22,500	
Pavement Striping	1	LS	LS	$15,000	
Wheel Stops	29	EA	$75.00	$2,175	
Site Lighting					
Conduit and Cable	1200	LF	$9.50	$11,400	
Concrete Base	11	EA	$380.00	$4,180	
Standard and Luminaire	11	EA	$3,000.00	$33,000	
CCTV System	6	EA	$2,000.00	$12,000	
Site Signage	20	EA	$300.00	$6,000	
Entrance Site Sign	1	LS	LS	$3,000	
Operator Warming Station	1	LS	LS	$10,000	
10x10 prefab shed	1	LS	LS	$2,000	
Landscaping					
Topsoil	1500	CY	$35.00	$52,500	
Planting	1	LS	LS	$8,000	
Seeding/Mulch/Fertilizer	2	Acres	$8,000.00	$16,000	
Subtotal II					**$1,690,005**

III. REFUSE SHEDS

Item	Quantity	Units	Unit Price	Item Cost	Total
New Metal Building	800	SF	$40.00	$32,000	
Repair and Restoration of Existing Sheds	1	LS	LS	$25,000	
Subgrade Preparation	100	SY	$2.00	$200	
Gravel Base 12"	100	CY	$26.00	$2,600	
Backfill	40	CY	$26.00	$1,040	
Concrete Slabwork	50	CY	$450.00	$22,500	
Concrete Building Footings & Foundation Walls	100	CY	$500.00	$50,000	
Miscellaneous Concrete	10	CY	$500.00	$5,000	
Bollards and Miscellaneous Metals	10000	LB	$4.00	$40,000	
Guardrails (Galv)	200	LF	$60.00	$12,000	
Building Signage	1	LS	LS	$5,000	
Electrical					
Electrical Distribution Equipment	1	LS	LS	$5,000	
Lighting	800	SF	$7.50	$6,000	
Grounding System	1	LS	LS	$10,000	
Power Distribution	800	SF	$3.00	$2,400	
Signal, Alarm and Communications	800	SF	$2.00	$1,600	
Existing Shed Upgrades	3	EA	$5,000.00	$15,000	
CCTV System	4	EA	$2,000.00	$8,000	
Subtotal III					**$243,340**

IV. LIMITED HOUSEHOLD HAZARDOUS WASTE SHELTER

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building	840	SF	$40.00	$33,600	
Subgrade Preparation	95	SY	$2.00	$190	
Gravel Base 12"	35	CY	$26.00	$910	
Backfill	20	CY	$26.00	$520	
Concrete Slabwork	21	CY	$450.00	$9,450	
Concrete Footings & Foundation Walls	30	CY	$500.00	$15,000	
Miscellaneous Concrete	10	CY	$500.00	$5,000	
Miscellaneous Metals	500	LB	$5.00	$2,500	
Doors/Grills					
Coiling Overhead Metal Grill	560	SF	$90.00	$50,400	
3' x 7' Personnel w/ Hardware	1	EA	$2,000.00	$2,000	
Interior Finishes - General	840	SF	$10.00	$8,400	
Special Interior Finishes	200	SF	$25.00	$5,000	
Building Signage	1	LS	LS	$4,000	
HHW Area Equipment Allowance	1	LS	LS	$5,000	
Mechanical Allowance	1	LS	LS	$10,000	
Emergency Eyewash & Shower	1	EA	$6,000.00	$6,000	
Electrical					
Electrical Distribution Equipment	1	LS	LS	$5,000	
Lighting	840	SF	$7.50	$6,300	
Signal, Alarm and Communications	840	SF	$2.00	$1,680	
CCTV System	1	EA	$2,000.00	$2,000	
Subtotal IV					**$172,950**

V. ATTENDANT BUILDING

Item	Quantity	Units	Unit Price	Item Cost	Total
Building	650	SF	$130.00	$84,500	
Concrete Slabwork	1	LS	LS	$15,000	
Concrete Footings	1	LS	LS	$15,000	
Interior Finishes and Specialties	1	LS	LS	$28,000	
Interior Furnishings and Equipment	1	LS	LS	$13,000	
Air Quality Monitoring System	1	LS	LS	$5,000	
Mechanical	1	LS	LS	$32,500	
Plumbing	1	LS	LS	$13,000	
Electrical - Building	1	LS	LS	$60,000	
CCTV System	2	EA	$2,000.00	$4,000	
Subtotal V					**$270,000**

VI. Recycle Area Finger Wall

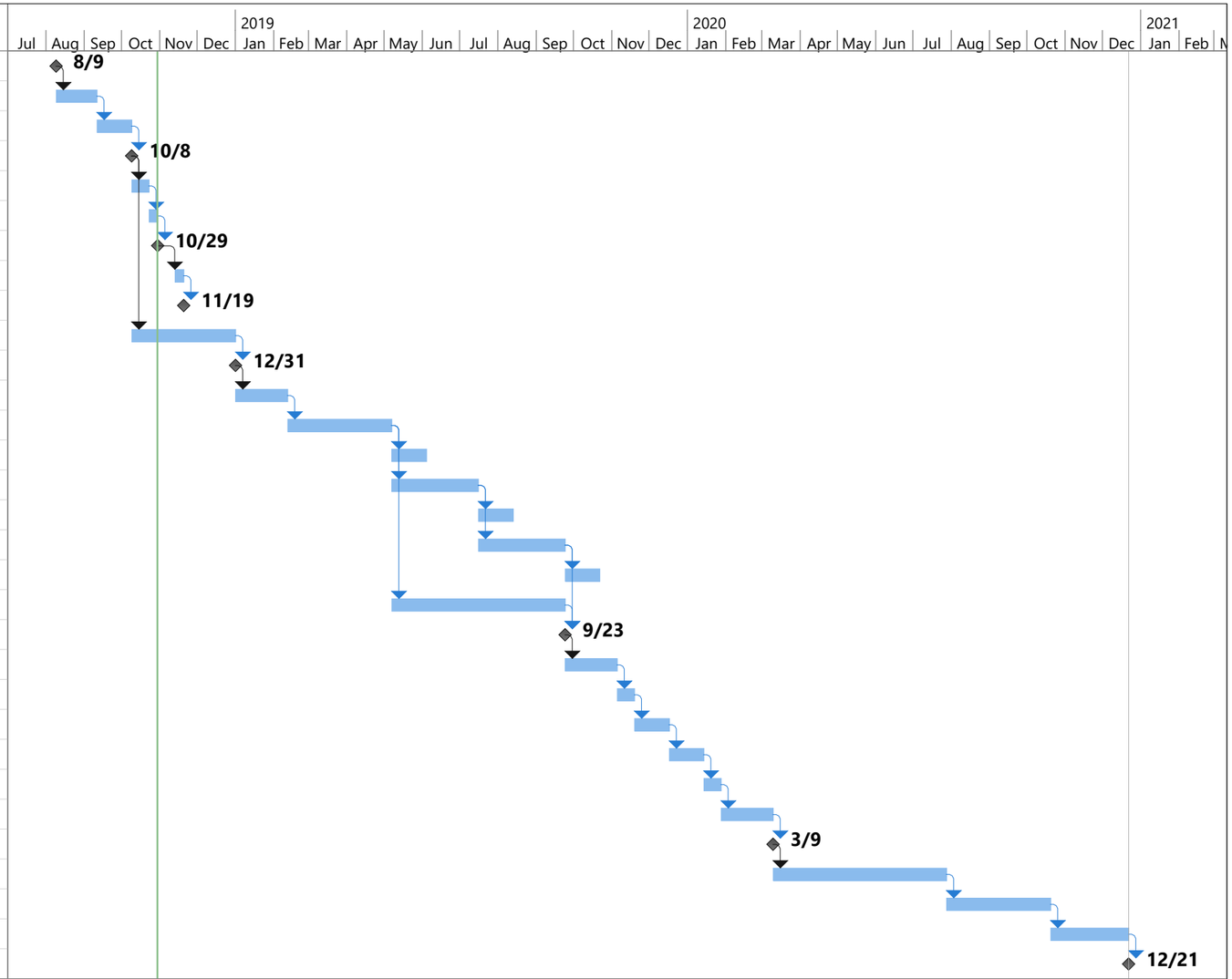
Item	Quantity	Units	Unit Price	Item Cost	Total
Recycle Area Finger Wall Structure					
Concrete Foundation Walls	214	CY	$500.00	$107,000	
6" Reinforced (Finger Pier)	285	SY	$85.00	$24,225	
Rub Rail Pressure Treated 3" x 12"	475	LF	$10.00	$4,750	
Guardrail (42" high) Hot Dip Galv & Painted	475	LF	$65.00	$30,875	
Rub Rail Anchor Bolts	270	EA	$20.00	$5,400	
Column Foundation Concrete	40	CY	$500.00	$20,000	
Hauler Exit Lane Wall	55	CY	$500.00	$27,500	
Subtotal VI					**$219,750**

TOTAL w/o CONTINGENCY	**$2,981,045**
CONTINGENCY (20%)	**$596,209**
TOTAL w/ CONTINGENCY	**$3,577,254**
TAX (9%)	**$321,953**
TOTAL w/ TAX	**$3,899,207**
DESIGN AND CONSTRUCTION MANAGEMENT SERVICES (15%)	**$584,881**
TOTAL	**$4,484,088**

Appendix B

Implementation Schedule

ID	Task Name	Duration	Start	Finish
1	Submit First Draft of the Facility Master Plan	0 days	Thu 8/9/18	Thu 8/9/18
2	County Review and Comments	23 days	Thu 8/9/18	Mon 9/10/18
3	Prepare Second Draft of the Facility Master Plan	20 days	Tue 9/11/18	Mon 10/8/18
4	Submit Second Draft of the Facility Master Plan	0 days	Mon 10/8/18	Mon 10/8/18
5	County Review and Comments	10 days	Tue 10/9/18	Mon 10/22/18
6	Prepare Final Facility Master Plan	5 days	Tue 10/23/18	Mon 10/29/18
7	Submit Final Facility Master Plan	0 days	Mon 10/29/18	Mon 10/29/18
8	Internal County Briefing Preparation	5 days	Tue 11/13/18	Mon 11/19/18
9	Internal County Briefing	0 days	Mon 11/19/18	Mon 11/19/18
10	Design Consultant Procurement	60 days	Tue 10/9/18	Mon 12/31/18
11	Design Consultant Selection	0 days	Mon 12/31/18	Mon 12/31/18
12	Design Consultant Contracting	30 days	Tue 1/1/19	Mon 2/11/19
13	30% Design	60 days	Tue 2/12/19	Mon 5/6/19
14	County Review and Comments	20 days	Tue 5/7/19	Mon 6/3/19
15	60% Design	50 days	Tue 5/7/19	Mon 7/15/19
16	County Review and Comments	20 days	Tue 7/16/19	Mon 8/12/19
17	90% Design	50 days	Tue 7/16/19	Mon 9/23/19
18	County Review and Comments	20 days	Tue 9/24/19	Mon 10/21/19
19	Permit Applications Preparation	100 days	Tue 5/7/19	Mon 9/23/19
20	Permit Submittals	0 days	Mon 9/23/19	Mon 9/23/19
21	Permit Review and Comments	30 days	Tue 9/24/19	Mon 11/4/19
22	100% Design	10 days	Tue 11/5/19	Mon 11/18/19
23	Bid Documents	20 days	Tue 11/19/19	Mon 12/16/19
24	Bid Advertisement	20 days	Tue 12/17/19	Mon 1/13/20
25	Contract Award	10 days	Tue 1/14/20	Mon 1/27/20
26	Construction Contracting	30 days	Tue 1/28/20	Mon 3/9/20
27	Construction Notice To Proceed	0 days	Mon 3/9/20	Mon 3/9/20
28	Phase 1 Construction	100 days	Tue 3/10/20	Mon 7/27/20
29	Phase 2 Construction	60 days	Tue 7/28/20	Mon 10/19/20
30	Phase 3 Construction Completion and Demobilization	45 days	Tue 10/20/20	Mon 12/21/20
31	Silverdale RAGF Redevelopment Completed	0 days	Mon 12/21/20	Mon 12/21/20



Project: Silverdale RAGF
Date: Tue 10/30/18

Task Milestone

Appendix C

Facility Programming/Needs Statement

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

719 2ND AVENUE, SUITE 200 | SEATTLE, WA 98104 | P 206.394.3700

FACILITY PROGRAMMING/NEEDS STATEMENT

DATE: January 9, 2018

TO: Keli McKay-Means

FROM: Ian Sutton

PROJECT NUMBER: 553-1578-148

PROJECT NAME: Silverdale Recycling and Garbage Facility
Facility Master Plan

The following individuals participated in the Silverdale Recycling and Garbage Facility (RAGF) Facility Programming Workshop on December 13, 2017.

Keli McKay-Means, Kitsap County Solid Waste Division
Pat Campbell, Kitsap County Solid Waste Division
Marshon Coppinger, Kitsap County Solid Waste Division
Rick Gilbert, Kitsap County Solid Waste Division
Leslie Haynes, Kitsap County Solid Waste Division
David Tucker, Kitsap County Public Works
David Marquis, Kitsap County Utilities
George Geyer, Kitsap County Information Systems
Joey Pellecchia, Waste Management
Ian Sutton, Parametrix
Karl Hufnagel, Parametrix
Sarah Fischer, KPG

The results of the programming workshop are outlined below, organized by facility element. These results will be applied to the development of facility alternatives. Alternatives evaluation criteria are included in the accompanying Alternatives Evaluation Criteria/Scoring Template.

A. Site
    1. Capacity
        a. 30-year planning horizon.
        b. Utilize a 3,275.3 annual County-wide population increase, consistent with that provided in the Capital Facilities Plan for Kitsap County 2016 Comprehensive Plan Update, June 2016. The annual County-wide population increase will be used to develop a growth factor to be applied to customer counts.
        c. Base starting numbers on actual Silverdale RAGF 2017 tonnages and customer counts.
        d. Customer count data is only available for refuse disposal, including refuse-and-recycling customers and refuse-only customers. Assume customers consist of:
            1. 10% refuse-only
            2. 50% refuse-and-recycling
            3. 40% recycling-only

e. Add 30% of Poulsbo Recycle Center actual 2016 recyclable tonnages with growth factor applied.
f. Proximity of Silverdale RAGF to the Olympic View Transfer Station (OVTS) significantly reduces the benefits of efficiencies gained by onsite refuse compaction. Continue top load operation without compaction.
g. Direct top load into export containers provides no benefit due to the unloading and compaction required at OVTS prior to loading to rail transport.
h. Continue to plan for two 50 cubic yard (CY) roll-off containers at each refuse shed. WB-65 transfer trailer trucks should be considered for service contractor site maneuvering; however, there is no current plan to change from roll-offs.
i. Plan for the following recyclable containers.
    1) Four 40 CY roll-off containers for comingled recyclables.
    2) Two 50 CY roll-off containers for cardboard
    3) Two 30 CY roll-off containers for metals
    4) One 30 CY roll-off container for glass

2. Site circulation and access
    a. Minimize crossing traffic.
    b. Separate hauler traffic from customer traffic.
    c. Separate hauler maneuvering areas from customer traffic.
    d. Site should be fenced. At a minimum, operations area needs to be fenced.
    e. Consider automated gate control with coded keypad or card scanned access, with automated exit.
    f. Provide queue bypass lanes for haulers.
    g. Minimize customer pedestrian traffic.
3. Hauling/maneuvering/parking
    a. Straight drive past and direct backing into refuse sheds is preferred over providing a hammerhead pull in and back up.
    b. Size refuse and recycling maneuvering areas for WB-65 trucks and 50 CY roll-offs, respectively.
    c. Size haul routes for WB-65 trucks.
    d. Provide attendant parking. Initial staffing is expected to be two attendants during the week and three attendants on weekend days, with future staffing up to three full time attendants.
    e. Provide for onsite storage of four empty 50 CY roll-off containers, to allow for onsite change-out of full containers by hauler, if offsite haul and replacement time for individual containers will not be able to maintain operational capacity needed.
    f. Refuse maneuvering and roll-off container storage areas should be concrete-paved.
    g. Recycling Area should be asphalt paved with concrete pads for roll-off containers.
4. Queueing
    a. Current daily peak traffic is approximately 250 customers, though 2017 had a 309 daily peak recorded.
    b. Assume a 3-minute inbound transaction time.
    c. The goal for inbound queue time is an average of 10 minutes.
5. Layout/orientation
    a. Entrance and exit queues should be oriented to accommodate a level area sized for the potential future minimum 50-foot long vehicle scales.
    b. All inbound customer traffic should interact with the attendant.
    c. Inbound queue should accommodate current inbound fee transaction time.
    d. Outbound queue should accommodate potential future outbound transaction time.

e. Locate Recycle Area for customer efficiency based on free recycle; however, flexibility should anticipate potential fee recycling in the future.

6. Utilities
   a. Provide a common underground conduit pathway for telecommunications to a centralized location. Expand from the central location to efficiently incorporate site needs.
   b. Drain underground conduit away from structures.
   c. Provided spare conduits to all locations from the centralized location to allow for future expansion of alarms, cameras, communications, etc.
   d. Existing storm drainage along Dickey Road NW may not have capacity for additional surface water contribution from an enlarged site runoff area. Stormwater should be managed onsite to not increase runoff to drainage systems along Dickey Road NW.
   e. The site drainage contributes to three different drainage basins. The site redevelopment should maintain existing drainage contributions to the maximum extent possible.
   f. Utilize low-impact-development (LID) stormwater management approaches where possible.
   g. Offsite sewer connection is preferred; however, consider costs of new onsite septic and offsite sewer connection options.
   h. Telecommunications will require copper and fiber.
   i. Provide site wide light-emitting diode (LED) lighting and camera system.
   j. Lighting should be photocell controlled with manual activation when needed.
7. Landscaping
   a. Provide consistent, easily recognizable landscape plant types to minimize accidental thinning and removal during maintenance. Facility staff should be able to easily distinguish between plants and weeds.
8. Customer facilities
   a. Provide onsite portable restroom facility locations for customer use (i.e. Sani-cans). Depending on site layout, one location may be sufficient. Limit locations to a maximum of two. Provide ADA accessible facilities and locate near recycling and near refuse collection without pedestrian interaction with traffic.

B. Attendant Booth
1. General configuration should be similar to the Hansville RAGF Attendant Booth with break area, table for breaks accommodating four personnel.
2. General program amenities: half-height lockers, accessible restroom, two attendant workstations, safe, and provide a temperature-controlled, larger communications room than is at Hansville.
3. The attendant door should face incoming traffic, and allow for attendant exit of the booth into a safe, non-traffic area for load inspection.
4. Provide servers and central communications switch in proximity to one another in the conditioned and secure communications room.
5. Provide the communications room door access with electric hinge and lockset through coded keypad or card scanner.
6. Provide wall mounted lockable glass front cabinet for cable termination and router/switch within the communications room. Servers should be floor mounted.
7. Provide uninterruptible power supply (UPS) equipment within the communications room with enough capacity for the servers and network gear, plus 30%.
8. Provide for server data backup within the communications room.
9. Size communications room to allow for 50% system expansion.
10. Provide eight half sized lockers in the hallway.

11. Provide a storage closet for supplies (at least 20 square feet).
12. Cabinetry needs to be provided to full wall height.
13. Provide workstations with adjustable heights.
14. Workstations need a computer, monitor, cash register, and UPS.
15. Provide power-actuated transaction windows at an appropriate height to not over expose attendants.
16. Consider incorporating a ledge for customer use when writing checks.
17. Pressurize the facility interior to prevent incoming vehicle exhaust. Include CO_2 monitors.
18. Windows should be heavy duty glass, but not bulletproof. Provide tinting or reflective laminate glazing.
19. Work area configuration should allow for viewing of inbound and outbound traffic.
20. Provide breakroom approximately apartment size with table, chairs, microwave, sink, and small refrigerator.
21. Provide unisex, ADA compliant restroom.
22. Provide a concealed, safe, bolted to the floor or interior wall.
23. Provide door access with electric hinge and lockset through coded keypad or card scanner.
24. Provide for incorporation of future inbound and outbound vehicle scales (minimum 50 foot long).
25. Provide general heating and overhead workstation spot heating.
26. Provide air conditioning.
27. Provide hookup for portable generator.
28. Provide foundation configured for addition of future scale foundations.
29. Provide block outs for future scale conduits.
30. Assume 50-foot long, above grade scales, with an imbedded foundation, to provide maintenance access around the scales while allowing vehicles to drive on to scale level with the surround grade.

C. Refuse Sheds
    1. Add a fourth refuse shed with performance coatings and LED lighting.
    2. An open-sided lower bay is operationally preferred for the fourth refuse shed.
    3. The fourth refuse shed should provide for lower doorway access for a WB-65 truck.
    4. Provide washdown hoses at each shed.
    5. Provide attendant notification button in Refuse Area with alert and light.
    6. Clean, repair, prepare and recoat/paint surfaces of existing sheds.
    7. Replace existing lighting with new LED lighting.
    8. Consider raised concrete roll-off guides with armor plating, in lieu of current imbedded rail guides.
    9. Provide bollards to protect sheds.
    10. Consider different fall prevention options.
    11. Consider changing out the metal litter prevention flaps with lighter weight HDPE flap product or revised chute configuration.
    12. Provide cameras to allow remote monitoring of customers and roll-off box capacities.
    13. Provide warming shelter/location for attendant.
    14. Consider options to direct sweep material into roll-offs.
    15. Provide safe backing, wheel stops.

D. Recycling Area
    1. Plan for the roll-off containers discussed in Item A.1.h.
    2. No baling needed.
    3. Reserve space for a container to collect textiles. Currently there are NW Center supplied boxes.

4. Plan for all roll-off container collection. No front load collection as is currently being performed.
5. Provide warming shelter/location for attendant
6. Consider finger-wall drop-off configuration.
7. Provide attendant notification button in with alert and light.
8. Provide cameras to monitor customers and roll-off capacities.
9. Provide hose bib.
10. If platforms are needed to access roll-off containers, provide stair access. Ramps are too space constrictive.
11. Consider customer accessibility at the recycling area that can be accommodated with at-grade small collection bins adjacent to an ADA parking stall, or by providing an elevating parking area to access top of roll-off bins.

E. Limited Household Hazardous Waste (LHHW)/White Goods
   1. Provide three-sided, covered enclosure for LHHW with blind sump.
   2. Provide access lockout during period without attendant.
   3. Provide good proximity to Refuse and Recycling Areas to allow for easy attendant access.
   4. Provide spill kit.
   5. Provide handwash sink and heated water.
   6. Provide hose bib.
   7. Provide emergency eyewash, but no shower.
   8. Provide attendant notification button in with alert and light.
   9. Provide cameras to monitor customers.
   10. Provide abundant space for white goods collection.

F. Maintenance Shed
   1. Storage of landscape maintenance equipment, mower, cones, rakes, brooms, spare equipment, portable generator, and supplies (approximately 100 square feet).
   2. The shed does not need to be heated or cooled.
   3. The shed will need electricity for a light.

Appendix D

Permits and Approvals Summary

Silverdale Recycling and Garbage Facility
Facility Master Plan – Matrix of Potential Permits and Approvals

Agency/Potential Permits and Approvals	Regulated Activities	Permit /Approval Acquisition Time	Considerations and Issues
Federal			
US Army Corps of Engineers (USACE) – Section 404 Permit	Potential impacts to jurisdictional wetlands.	Approximately 120 days after submittal to USACE.	• A wetland determination, delineation, and functional assessments per Kitsap County Code are required to determine the final size, jurisdictional status, and rating of the three potential onsite wetlands. • Each wetland appears consistent with a Category III wetland with moderate habitat value. Category III Wetlands with moderate habitat values adjacent to high intensity land uses require 150-foot regulated buffers under current Kitsap Count Critical Areas regulations.
State			
Washington State Department of Ecology (Ecology) - National Pollutant Discharge Elimination System (NPDES)	Construction activities, including clearing, grading, and excavation, that disturb 1 acre or more of land.	Approximately 30 days.	• Stormwater pollution prevention plan. • Public notification.
Regional			
Puget Sound Clean Air Agency (PSCAA) - Notice of Construction (NOC)	Expansion of the existing facility.	Approximately 20 days.	• Submit NOC 2 to 3 months prior to construction.
County			
Kitsap County – State Environmental Policy Act (SEPA) Permit	Determination if project will have significant adverse impacts on the environment.	Approximately 30 days.	• Kitsap County to act as lead agency for the project. • Mitigation may be required.

Agency/Potential Permits and Approvals	Regulated Activities	Permit /Approval Acquisition Time	Considerations and Issues
County			
Kitsap County - Conditional Use Permit (CUP)	Required to ensure that new development is compatible with surrounding properties and achieves the intent of the Comprehensive Plan		• Director determines if applications will be reviewed administratively or by the hearing examiner at a scheduled public hearing.
Kitsap County - Site Development Activity Permit	Land disturbing activity of 1 acre or greater.	Approximately 90 days.	
Kitsap County - Commercial Construction - New, Additional, Replacement	Construction of the refuse shed, attendant building, LHHW building, and any significant retaining walls.	Approximately 30 days.	
Kitsap County - Right-of-Way (ROW) Use Permit	Utility connections within the ROW. Entrance improvements.		
Kitsap County – Timber Harvest Application	Tree clearing activities.		
Kitsap County - Critical Area Buffer Reduction	Construction within the buffer of an identified wetland.		
Kitsap County - Fire Alarm - New System or Major Modification	Fire Marshal requirements for facility alarming.		
Kitsap County - Fire Code - Miscellaneous - Construction	Fire Marshal requirements for the new site layout.		
Kitsap County – Sign Permit	Installation of new entrance signage.		
Kitsap Public Health District - Solid Waste Handling Facility Operating Permit	Operation of a solid waste handling facility.		
Kitsap Public Health District - Building Site Application	Installation of a new septic system.		

Agency/Potential Permits and Approvals	Regulated Activities	Permit /Approval Acquisition Time	Considerations and Issues
County			
Kitsap County - Sewer Connection	Sewer connection to the municipal system within Dickey Road NW.		
Other			
Easement	Access to municipal sewer through the Kitsap Humane Society property.		

Appendix E

Assessment Summary of Findings

Silverdale Recycling and Garbage Facility (RAGF) Site and Facility Assessment Summary of Findings

Prepared for

Kitsap County
Solid Waste Division
614 Division Street MS-27
Port Orchard, WA 98366

Prepared by

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January 2018 | 553-1578-148

CITATION

Parametrix. 2018.
Silverdale Recycling and Garbage Facility (RAGF) Site and Facility Assessment Summary of Findings.
Prepared by Parametrix, Seattle, WA.
January 2018.

TABLE OF CONTENTS

KEY TERMS

County	Kitsap County Solid Waste Division
EMT	electrical metallic tubing
GFCI	ground fault circuit interrupter
HHW	household hazardous waste
HID	High-intensity discharge
HMA	hot mix asphalt
LED	light-emitting diode
LHHW	limited household hazardous waste
NW	northwest
Parametrix	Parametrix, Inc.
PRC	Poulsbo Recycle Center
PTZ	pan tilt zoom
PVC	polyvinyl chloride
PVDF	polyvinylidene difluoride
RAGF	Recycling and Garbage Facility
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SRAGF	Silverdale Recycling and Garbage Facility
UV	ultraviolet

1. INTRODUCTION

Parametrix, Inc. (Parametrix) completed a visual site and facility assessment of the Silverdale Recycling and Garbage Facility (SRAGF) on November 15, 2017, as part of the Kitsap County Solid Waste Division (County) facility master planning for future redevelopment of the site. This assessment reflects the condition of the facility at the time of the observations.

Prior to the assessment, Parametrix reviewed relevant information made available by the County to develop an initial understanding of property layout and condition, environmental characteristics, facility physical construction and operation, and capacity requirements, current and future.

Parametrix visually inventoried and evaluated the following:

- General site
- Structures
- Electrical systems
- Site drainage systems
- Environmental conditions
- Geotechnical conditions

This summary of findings discusses the general assessment results and identifies opportunities and limitations associated with site redevelopment. Appendix A includes the site survey and proposed lot subdivision, identifying available extent for site redevelopment.

2. SUMMARY OF FINDINGS

The SRAGF was assessed on November 15, 2017 during daylight hours. Weather conditions consisted of clouds with light rain. The lack of significant rainfall did not facilitate a thorough "wet weather" review of stormwater drainage conditions. The facility assessment was performed on a Wednesday, which is a closed facility day.

The facility was generally found to be in good overall condition taking into consideration the level of robustness designed and built into the facility, the harsh environment related to the outdoor, heavy industrial handling of solid waste material, and the age of the facility. The existing refuse sheds are in sound condition and will be reusable based on physical condition; though, cleaning, repairs, and some upgrade modifications are recommended.

The available site appears conducive to a redevelopment with an increased operational footprint. The site is feasible for the redevelopment from a geotechnical and critical areas standpoint. Site redevelopment should consider maintaining the existing watershed boundaries, as discussed in Section 3.4.1.

Section 3 discusses the assessment results.

3. ASSESSMENT RESULTS

Assessment results are discussed below with a focus on observations made and recommendations relative to intended redevelopment of the site. Particular detail has been provided for the three, essentially identical refuse sheds due to the intention to preserve the sheds as part of the future site redevelopment.

3.1 General Site

The site is generally in good condition and appears well maintained. The site layout is shown in Appendix A. The majority of the developed site area consists of asphalt and/or gravel surfaced vehicle driving areas with several small, minor landscaped areas. Some specific observations are discussed below, followed by recommendations in the context of future redevelopment of the site.

3.1.1 Access

Access to the site main gate from Dickey Road NW is paved with asphalt and is in good condition. The shoulders of the roadway are gravel.

Gated access to the site from the roadway north of the Kitsap Humane Society is not currently used for SRAGF operations. This roadway north of the Kitsap Humane Society is occasionally used for access to adjacent quarry operations by that property owner. The gated access to SRAGF is in poor condition between the gate below the transmission lines and the active portion of the site due to tree root growth, lack of maintenance, and a gap in paving at the gate location. This access route is not currently considered a future access option.

3.1.2 Refuse Area

The refuse area consists of the entrance queue/exit roadway, attendant booth, refuse sheds, and container maneuvering area and haul route. The area is generally in good condition.

The attendant booth is not discussed with the understanding that it is no longer functionally adequate and will be replaced as part of the site redevelopment. The refuse sheds are discussed in detail in Section 3.2.

The asphalt paved roadway is in good condition with the exception of the container maneuvering area east of refuse sheds, and the haul route around the limited household hazardous waste (LHHW) area, as shown in Appendix B, Figures 1 and 2. The area east of refuse sheds is heavily worn by the maneuvering of haul vehicles and as a result of temporary roll-off container storage on non-concrete surfaces. The haul route around the LHHW area has damage outside the paved area due to the inadequate radius and width of the roadway to accommodate the size of haul vehicles being utilized. The result has been rutting and erosion on the interior of the turn and damage to the exterior curb as vehicle tires track off the roadway.

Other roadway concerns are: the queue lane west of Refuse Shed C which is adjacent to a steep slope and presents a potential safety hazard; some local depressed areas that are not able to drain to the site drainage system; and surface water run-on into the top load bay of Refuse Shed C. Representative photographs are shown in Appendix B, Figures 3, 4, 5, and 6.

Except as noted above, the developed site generally drains well, though there is a notable amount of sediment that is tracked around the site which accumulates where surface flows consolidate.

3.1.3 Recycle Area

The recycle area consists of a shared, large container maneuvering and customer drop off area, numerous roll-off and front load recycling containers, a portable restroom facility (i.e., Sani-can), and the attendant booth from the former Poulsbo Recycle Center (PRC). The PRC attendant booth is not discussed as it is not in use and will not be part of the site redevelopment; however, it could potentially be used as a temporary transaction booth during construction activities. The area is generally in good condition.

The area is unpaved and consists of a gravel surfacing. The area drains reasonably well; however, potholes, rills, and rutting is present throughout. A representative photograph is shown in Appendix B, Figure 7. There is also some gravel and dirt track out onto the paved queue and exit roadway.

3.1.4 Limited Household Hazardous Waste (LHHW) Area

The LHHW area consists of a concrete pad for white goods drop off, a walk-in roll-off container for automobile batteries, and motor oil and antifreeze collection stations. Although not a household hazardous waste (HHW), used cooking oil also collected here. The area is surfaced with gravel and is well drained. A representative photograph is shown in Appendix B, Figure 8.

The area is generally in good condition. The concrete pad for white goods drop off is the only permanent structure. The pad is fenced and has some worn yellow warning paint along the perimeter and access stairs.

3.1.5 Topography and Grades

Topography and grades for the site and surrounding area are shown in Appendix A. Other than a localized mound to the east of the entrance from Dickey Road NW, at Elevation 436 feet, access into the site from Dickey Road NW is the highest elevation on the site at approximately 428 feet. The access elevation generally, gradually decreases along the entrance queue/exit roadway, leveling out at approximately 416 feet at the customer drop off locations in the refuse and LHHW areas. The access road, refuse area, and LHHW area generally form a ridge line from which all other site areas slope away.

There is an approximate 8-foot vertical drop in elevation at the refuse sheds to allow for top loading of roll-off containers. The recycle area and area immediately south of the refuse area are relatively flat at approximate elevations of 410 to 416 feet. Beyond these operational areas, slopes generally fall away at approximately 20 to 25% with some dispersed flatter areas.

The recycle area is also bordered on the south by the existing access roadway into the adjacent quarry to the west. The roadway is initially higher in elevation than the recycle area and gradually drops below as it trends in a northwest direction to the quarry.

3.1.6 Utilities

The site water supply is serviced by Silverdale Water District 16. Service enters the site along Dickey Road NW to a meter vault at the attendant booth. The size and capacity of the service is currently unknown. Water service is provided to the attendant booth restroom and to hose bibs and coiled wash-

down hoses located at the northwest corner of Refuse Sheds A and B. A similar hose bib installation exists at the northwest corner of Refuse Shed C, but has been decommissioned because of leaks in the underground pipe.

There is currently no sanitary sewer connection at the site. The attendant booth restroom drains to a septic system and drainage field located east of and adjacent to the attendant booth. No surface features, such as manholes and cleanouts, of the septic system are visible, and are assumed to have been buried. Sanitary sewer connection is available at Dickey Road NW, adjacent to the Kitsap Humane Society.

The site electrical system is addressed in Section 3.3. In addition to the site electrical, Puget Sound Energy has a 250-foot easement and power lines that traverse the west side of the property from north to south. The existing recycle area is within the easement. The existing refuse area and LHHW area are outside the easement.

The site drainage system is addressed in Section 3.4.

3.1.7 Security

Site security consists of a gated and padlocked entrance across the entrance queue/exit roadway from Dickey Road NW. Chain link fence extends from the gate to the east and west approximately 160 feet and 280 feet, respectively. The chain link fence has been breached and repaired in the past.

There is also a bar gate across the access to the site from the roadway north of the Kitsap Humane Society.

The site has limited security cameras, which are discussed with the electrical system in Section 3.3.

Otherwise site security is primarily dependent on the setbacks, buffers, and screening provided by the surrounding wooded areas and the Kitsap Humane Society.

3.1.8 Vegetated and Undeveloped Areas

Undeveloped areas of the site are primarily wooded. The northeast area is primarily undisturbed. The east and southeast portion of the undeveloped site shows indications of being disturbed previously with irregular grading and an overgrown gravel access roadway; however, the area has since returned to a somewhat natural state since it is not part of the current operational area. Detailed discussion of these areas is included in Section 3.5.

3.1.9 Recommendations

3.1.9.1 Grading and Pavement

The redeveloped site configuration should emphasize utilization of natural grades to maximum extent possible to meet the development needs, such as flat areas for the future scales and vehicle maneuvering, and areas with significant grade changes to accommodate difference in elevation for top loading of refuse and recyclables. A fourth refuse shed should be coordinated with the location of the existing three sheds, and the future attendant booth should be situated to provide good line of site to the majority of the redeveloped operational area.

The paved areas adjacent to refuse shed roll-off container doorways should be regraded as required to prevent run-on of surface water into the refuse sheds. Concrete paving should be installed in the entire non-customer refuse maneuvering areas to reduce surface wear caused by the temporary storage of roll-off containers. The recycling area should be asphalt paved with concrete pads for roll-off containers.

Haul roadways should be expanded to accommodate current and anticipated haul vehicle sizes and turning radii to prevent vehicles straying off the pavement and rutting and eroding adjacent non-paved areas. Perimeter curbs and storm drainage infrastructure should be reestablished or added to effectively manage stormwater.

Roadways adjacent to significant slope drop offs should consider vehicle guardrail safety measures, such as the deep depression west of Refuse Shed C.

3.1.9.2 Utilities

The water system should be evaluated for current capacity and redevelopment needs to ensure adequate water is supplied to the site that can accommodate use at multiple, simultaneous locations around the new, larger development. Washdown water access should be re-established at existing refuse sheds. The new development needs to confirm, or provide, back flow prevention for the system and potentially at each hose location. An assessment of fire protection requirements for the facility redevelopment should be completed as this could influence the redeveloped water supply system.

If the redeveloped site will only collect wastewater from the new attendant booth restroom, a new septic system may be preferable to offsite connect to sanitary sewer across the Kitsap Humane Society property and within Dickey Road NW. However, offsite connection may be preferable to allow for additional wastewater flows if wastewater collection is added for the refuse sheds, recycle container pads, or other areas. With offsite sewer, an approach to metering will need to be determined.

Additional recommendations for site electrical and drainage systems are included in Section 3.3 and Section 3.4, respectively.

3.1.9.3 Other

A covered collection area for LHHW should be provided. The LHHW should have a blind sump for general spill containment. A canopy or three-sided shelter will keep rainwater out of the sump and also provide a better work environment. The white goods/appliances drop off should have level access. The current irregular ground surface and access steps can create safety concerns when handling heavy, bulky items.

The operations area should be fully fenced. This will not prevent future breaches of the chain link fence; however, it will help protect the County from a liability perspective. Provide a clear setback for shrubs and trees from the fence to expose the fence area and help deter trespasser breaches on the fence.

Along with full fencing, a robust camera system and warning signs identifying the surveillance should be added to dissuade trespassers and capture unwanted site activities.

3.2 Structures

Refuse Sheds A, B, and C were reviewed for general interior and exterior conditions. The existing facility attendant booth, recycling attendant booth, and smaller ancillary structures present on the site were not included in the assessment.

The refuse sheds have been well-maintained and remain serviceable for their intended function. Recommendations for remedial actions may all be characterized as ordinary recurrent maintenance and repair actions. Implementing these recommendations will extend the life of the buildings for many years to come and their components indefinitely at relatively low cost. It is anticipated that all of these recommendations may be implemented without the need for building permits or other approvals from the building or planning departments.

3.2.1 Refuse Sheds

The refuse sheds are steel-framed open-fronted shed structures arranged around a central customer vehicle maneuvering and unloading area, as shown in Appendix A. Refuse Shed A is the northern most shed, with Refuse Sheds B and C progressing clockwise. Each refuse shed houses two open-topped 20-foot long roll-off containers, in series. The refuse sheds were installed in 1981 and 1982, establishing their age at 35 to 36 years.

The buildings consist of stepped concrete foundations that provide a 9-foot grade separation between the tipping level and the roll-off container parking level. The concrete foundation and retaining walls are in generally good condition with no signs of cracking, spalling, reinforcing bar corrosion or other distress due to settlement or weathering. Exterior exposed concrete surfaces exhibit signs of light weathering and localized growth of moss and algae.

The building superstructures consist of pre-engineered metal buildings with metal skins and metal low-slope gable roofs, as shown in Appendix C, Figures 1 and 2. Neither the roof nor the walls are fitted with blanket insulation. The roof rakes are fitted with gutters; water is conducted to the ground in rectangular downspouts that discharge to grade.

The siding and roofing panels are in generally good condition. The original factory coating, likely polyvinylidene difluoride (PVDF), is intact, although exterior surfaces show some light chalking from exposure to ultraviolet (UV) light. No signs of significant corrosion or perforation were noted. The interior wall surfaces exhibit significant algal growth and buildup of dirt, which may eventually compromise the integrity of the coating. Some minor damage to the roof panels and rake trim is evident on Refuse Shed B.

The rake-mounted gutter system is generally in serviceable, water-tight condition. Leaks were noted at a few of the building corners. The rectangular downspouts are generally secure and functional, although some have been damaged or crushed at the ground level, presumably by vehicles or equipment. There is significant leakage in the valley between Refuse Sheds A and B that results in water running down the interior wall of Refuse Shed A at the southeast corner, as shown in Appendix C, Figure 3.

The structural systems consist of a clear-span building frame inset from the front (open) face of the building and a second building frame in the rear wall of the building, which is supported by wide-flange wind columns, as shown in Appendix C, Figures 4 and 5. Lateral stability is provided by steel rod bracing in the walls and roof. The steel building frames, wind columns and bracing rods are coated with red shop primer.

Roof and walls are framed with hot-dip galvanized 8-inch Z-girts. The wall girts are oriented with their inner (exposed) flanges facing upward. The exposed edges of the walls and roof at the open face of the refuse sheds are finished with fabricated sheet metal trim pieces.

The building framing system is in generally good condition. The main building frames and wind columns exhibit widespread surface corrosion due to the failure of the shop primer coating, as shown in Appendix C, Figure 6. The hot-dip galvanizing on the wall girts and roof purlins is generally intact. These components show little sign of corrosion; however, the wall purlins have collected a significant layer of dirt and moss, which is trapping moisture on their upper surfaces, as shown in Appendix C, Figure 7. This situation is aggravated by the fact that the girts were originally installed with the inside flanges facing up rather than down.

The original rod-type lateral bracing is largely intact, although a few of the braces have been removed and most of the rods and fittings exhibit surface corrosion due to the failure of the shop primer coating. Some of the braces are sagging or bent.

The tipping level is paved with asphalt. Recycled plastic wheel stops have been installed about six feet from the edge of the tipping area in each of the four tipping stalls (per refuse shed). The edge of the tipping area has a 9-inch by 9-inch concrete curb on which a two-rail demountable railing system has been installed, as shown in Appendix C, Figure 8. The railing was fabricated from galvanized steel pipe and pipe fittings. Hinged sheet steel bridge plates are fitted to the outer edge of the curb to close the gap between the tipping wall and the roll-off containers, as shown in Appendix C, Figure 9.

The demountable safety railings at the edge of the tipping area are in generally good condition, although the yellow paint coating has largely failed. The segmented bridge plates at the edges of the tipping areas are generally in serviceable condition, although a few segments show signs of wear and damage as shown in Appendix C, Figure 10. All of the plates exhibit surface corrosion due to failure of the shop primer coating.

The lower level is paved with concrete; the floor does not appear to have positive drainage slope. Refuse Sheds A and B have shallow steel C-channels cast into the concrete floor to act as guides for the roll-off container wheels. Refuse Shed C has surface-mounted C-channels on steel bridging plates, which have been installed to replace the original cast-in channels, as shown in Appendix C, Figure 11.

The roll-off container guide rails in Refuse Sheds A and B show signs of significant wear and corrosion. The trial replacement rail system in Refuse Shed C exhibits signs of surface corrosion because it was fabricated from uncoated steel components. This corrosion is aggravated by water that pools on the relatively flat floor of the container parking level, as shown in Appendix C, Figure 12.

Concrete pavement extends outside the lower-level roll-off container parking areas; the steel guide channels extend approximately 40 feet outside the building line as well. There are concrete stairs fitted with pipe-rail handrails at the east side of Refuse Shed C and the north side of Refuse Shed A, as shown in Appendix C, Figure 13.

3.2.2 Recommendations

3.2.2.1 Building Framing

The surface corrosion does not currently appear to have advanced to the level of structural deterioration, but it will do so if it is not arrested. The best practice for preventing further corrosion is to remove rust and the remaining shop primer, prepare the steel surface by grit blasting to SSPC-SP6 standards and applying an epoxy primer followed by a urethane, UV-resistant top coating. Removal of selected exterior wall panels will be required to reach the back of the main frame columns and wind columns.

The upper faces of the wall girts should be cleaned with a low-pressure wash using a mild detergent cleaning solution to remove accumulated dirt and plant growth.

3.2.2.2 Building Lateral System

Missing braces should be replaced. Braces that are sagging or bent should be straightened and re-tensioned. The surface corrosion on the rods does not currently appear to have compromised their structural integrity, but it will do so if it is not arrested. The best practice for preventing further corrosion is to remove rust and the remaining shop primer, prepare the steel surface by grit blasting to SSPC-SP6 standards and applying an epoxy primer followed by a urethane, UV-resistant top coating.

3.2.2.3 Siding and Roofing Panels

Interior wall surfaces should be cleaned with a low-pressure wash using a mild detergent cleaning solution that is compatible with PVDF coatings in order to prevent premature coating failure.

The cosmetic damage to the roof rakes on Refuse Shed B may be corrected by replacing the trim with new component fabricated by a sheet metal shop.

3.2.2.4 Safety Railings and Bridge Plates

The safety rail yellow paint should be renewed because it serves a warning function. Recoating the railings with a good quality urethane or acrylic gloss industrial enamel will yield a longer-lasting finish if the galvanized surface of the pipes is prepared by brush blasting to SSPC-SP7 standards and solvent cleaned in accordance with SSPC-SP1. The most durable finish will be achieved by sending the railing segments to a finishing shop for powder coating with an exterior-grade polyester material.

Bridge plates that have been damaged should be repaired or replaced. Consideration should be given to having replacement plates hot-dipped galvanized after fabrication to reduce corrosion.

3.2.2.5 Roll-Off Container Guide Rails.

Consideration should be given to having replacement rail components hot-dipped galvanized after fabrication to reduce corrosion. Consideration should also be given to adding a topping layer of concrete to the floor of the container parking level to improve drainage of water, particularly if experience has shown that the pooled water presents a slipping hazard during periods of freezing weather.

3.2.2.6 Gutters and Downspouts

Leaks in the eave-mounted gutters and in the between Refuse Sheds A and B should be corrected by a qualified sheet metal specialist in accordance with recommendations in the Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).

Damaged downspout segments should be replaced in-kind, and rerouted to a safe location or protected with bollards or Jersey barrier terminal segments pinned to the pavement.

3.3 Electrical Systems

3.3.1 Attendant Booth

The site is served by single phase, 120/240V utility power which is fed to the attendant booth from a pole mounted transformer located along Dickey Road NW through underground conduit. The electrical service meter, as shown in Appendix D, Figure 1, is located on the exterior of the attendant booth with a 100A distribution panel located inside the attendant booth, as shown in Appendix D, Figure 2. This service is adequate for the minimal loads associated with the existing facility.

The attendant booth will be replaced as part of the site redevelopment. Evaluation comments for the attendant booth are only to document existing electrical service conditions and design elements to be included in the construction of a new structure.

Security at the attendant booth consists of a single pan tilt zoom (PTZ) camera mounted on a pole, one fixed camera on the building exterior, and one fixed camera on the building interior. The PTZ camera is on a pre-programmed pattern set to survey the refuse sheds and recycle area. The exterior fixed camera is set to record vehicles as they check in at the attendant booth. The interior fixed camera is set to record the cash register and the attendant window. Currently, there is no outside communications connected to the camera system. Information is recorded to an onsite hard-drive. The only recorded video data archived is from the camera covering the cash register.

3.3.2 Site

General site lighting consists of three high-intensity discharge (HID) luminaires mounted on arms and one halogen light directly mounted to the side of Refuse Shed C. The arm mounted HID luminaires are controlled by independent photocells integral to the luminaire. The halogen light is controlled by a common photocell located in Refuse Shed A as part of the interior lighting controls for all three sheds, as shown in Appendix D, Figure 3. One HID luminaire is mounted to the pole outside the attendant booth to illuminate the customer driveway. Two arm-mounted HID luminaires are located on the ends of Refuse Shed B to illuminate the container maneuvering area. Refuse Shed C has one halogen luminaire aimed at the main driveway entering the facility.

3.3.3 Refuse Sheds

Each of the three refuse sheds contain a single center hung HID high bay luminaire, as shown in Appendix D, Figure 4. The lighting is controlled by a single photocell located at the entrance of Refuse Shed A. The existing lighting is adequate. Increasing the number of luminaires would improve the lighting by providing more even lighting. Refuse shed lighting should be of a vapor tight design with an enclosure rating of IP65, allowing use of water to clean the inside of the sheds.

Power distribution is routed underground in polyvinyl chloride (PVC) conduit and transitions to electrical metallic tubing (EMT) on the interior of the sheds. The existing EMT fittings are of the set-screw type only allowed in dry areas.

Only two electrical receptacles were found. One located on a railing outside Refuse Shed B and one located inside Refuse Shed C. It is unclear if the receptacle in Refuse Shed C is protected with a ground fault circuit interrupter (GFCI).

3.3.4 Recommendations

3.3.4.1 Lighting

Lighting should be upgraded to light-emitting diode (LED) luminaires, reducing maintenance and electrical costs while improving the overall quality of lighting. Replacement of lighting will provide better coverage of the existing areas. Additional site lighting should be added to illuminate the Refuse Shed A maneuvering area, recycle area, and customer traffic areas. The facility is typically only open during daylight; however, additional lighting to fill in low light situations would improve public safety. Facility attendants are also often onsite in low light conditions prior to the opening and closing of the facility. Additional lighting would improve worker conditions and safety. Improved lighting can also be coordinated with new security cameras for improved coverage. New lighting control can be divided to allow partial unoccupied nighttime lighting, and full lighting when the facility is in operation. Bypass control can be integrated to turn on lights for maintenance purposes or in the event of a photocell failure.

3.3.4.2 Conduit

The EMT within the refuse sheds should be replaced with galvanized rigid conduit. Rigid conduit has the strength to resist most physical damage that would be present at the facility and can be made watertight allowing for use of water to clean the inside of the refuse sheds.

3.3.4.3 Receptacles

Existing refuse shed receptacles should be removed and replaced. New GFCI receptacles should be located in each of the three refuse shed top load areas. Receptacles should also be added at the lower rear of each refuse shed at the container doorways.

3.4 Site Drainage Systems

3.4.1 Basins

The site is uniquely located at headwaters of three separate basins: Koch Creek Basin to the east and south, Strawberry Creek Basin to the west and north, and Knapp Creek Basin to the east. Figure 1 in Appendix E shows a general delineation of the three basins. Based on actual site conditions, observed grades and stormwater management system, a more representative delineation of the three basins was developed and is shown in Figure 2 in Appendix E. Development of the site will require existing watershed boundaries to be maintained, or additional regulatory approvals to modify the basin boundaries.

3.4.2 Drainage System

The site was reviewed for drainage infrastructure, features, and patterns, including along the site property line. Drainage basins along site property line were verified. Figure 2 in Appendix E identifies site observations and indicates the locations of photographs shown in Appendix E, Figures 3 through 8.

The developed site drains through sheet flow and a limited system of catch basins and conveyance pipes and culverts to adjacent undeveloped areas. The majority of the paved area drains to an infiltration

area southeast of refuse area. No drainage issues were observed, with the exception that the swale downstream of the container maneuvering area catch basin appears to be ponding water. No water quality facilities were identified in the document review or observed on site.

3.4.3 Recommendations

Site redevelopment should consider maintaining the existing watershed boundaries, and provide for stormwater management of the developed operations area that will not adversely impact downstream storm drain system.

3.5 Environmental Conditions

The environmental review was focused on the approximate 9-acre area designated for County use as shown in Appendix A. The remainder of the larger County-owned property that also currently includes a quarry operation and the Kitsap Humane Society was not included.

3.5.1 Undeveloped Areas

There are three predominately undeveloped areas on the portion of the parcel that includes the current SRAGF.

There is a stand of mature, predominantly coniferous, second growth forest located in the northwest corner of the site. This area occupies about 1/2 of an acre to the north and east of the gated access road to the site from the roadway north of the Kitsap Humane Society.

There is approximately 1 acre of mixed deciduous/coniferous second growth forest/shrub area located directly east of the developed portion of the facility, between the SRAGF and the Kitsap Humane Society. This area appears to have had a high level of historical disturbance, and is bisected by old road beds and modified topsoil throughout. There are also large areas of invasive plants including English ivy and Himalayan blackberry in this part of the site.

The majority of the southern and eastern approximate 4 acres of the site is also dominated by mixed deciduous/coniferous forest. The westernmost 2 acres is predominately deciduous dominated forest with more evidence of disturbance, particularly adjacent to the developed site areas. The remainder is less disturbed and dominated by mature second growth coniferous forest with a well-developed understory and forest topsoil. Invasive species are found along roadways but are generally absent from the interior of this part of the site.

3.5.2 Critical Areas

The site investigation conducted to support this initial phase of work did not include a formal wetland determination, functional assessment, or formal ratings. The investigation included review of current critical areas inventory mapping and a walkthrough of the site to identify characteristics commonly associated with critical areas, specifically wetlands, and included noting observable surface water and the presence of hydrophytic plants.

No regulated streams are mapped within the site boundary, although runoff from the site is anticipated to contribute flow to two surface water drainages that contain streams. The majority of the site is mapped as a geologic hazard area; however, the redevelopment will include a geotechnical evaluation to avoid adverse impacts to the area. Initial geotechnical review of the site is discussed in Section 3.6.

The entire site is currently mapped by Kitsap County as being within a critical aquifer recharge area. No frequently flooded areas are mapped within the project site boundaries.

Three potential wetlands were identified on the site. Each area is a relatively small depression with standing surface water and hydrophytic plants. One potential wetland was identified directly to the east of the existing facility. Surface water in this appears to be from stormwater runoff from the developed site collecting on an old roadbed which is identified as a swale. The two other areas occur in the eastern portion of the southern approximately 4-acre undeveloped area adjacent to Dickey Road NW.

Wetland determination, delineation, and functional assessments per Kitsap County Code are required to determine the final size, jurisdictional status, and rating of the three potential onsite wetlands, but each wetland appears consistent with a Category III wetland with moderate habitat value. Category III wetlands with moderate habitat values adjacent to high intensity land uses require 150-foot regulated buffers under current Kitsap County Critical Areas regulations.

3.5.3 Recommendations

Wetland determination, delineation, and functional assessments will need to be conducted during the detail design phase of the redevelopment. The results will identify wetland extents and determine setback requirements which will need to be designed around or mitigated, either onsite or offsite.

3.6 Geotechnical Conditions

A geotechnical reconnaissance-level investigation was performed by Aspect Consulting for the site. No engineering analyses or subsurface explorations were conducted. A summary of observations and recommendation follows, with the report included in Appendix F. The detailed design phase of the project will require a subsurface investigation and geotechnical engineering report.

3.6.1 Observations

The site is underlain by modified land, described as locally derived sand, pebbles, cobbles, boulders, silt, clay, and diamicton excavated and redistributed to modify topography. The modified land is surrounded by Vashon ice-contact deposits, described as cobble and pebble gravel, sand, ablation till, flow till, lodgement till, lacustrine mud, and rare boulders.

At the site, exposed soil was present at the north end of the LHHW area. The exposed soil consisted of very dense, silty sand with fine to coarse gravel, which is consistent with Vashon ice-contact deposits.

There are no indications of landslides, or other instabilities around the site. The site has a low erosion potential and a very low to low susceptibility to liquefaction. The potential for surficial ground rupture at the site is also considered low during the expected life of the facility.

3.6.2 Recommendations

The site is feasible for the redevelopment from a geotechnical standpoint utilizing conventional spread footing and conventional site development procedures and earthwork equipment. Key geotechnical considerations for the project will include moisture sensitive soils, earthwork, structure foundation design and subgrade preparation, and pavement design.

3.6.2.1 Moisture Sensitive Soils

The native soils are expected to be moisture sensitive due to relatively high fines (silt and clay) content. These soils will be sensitive to any water encountered, both groundwater and rain water. For planning purposes, it should be assumed that the native site soils will generally be suitable for use as structural backfill only if site earthwork is completed during the dry season (summer through early fall). If site earthwork is completed outside of the dry season, use of imported clean granular structural fill should be anticipated.

3.6.2.2 Stormwater Management

In general, the density and gradation of the ice contact deposits are such that these native soils have low permeability. Stormwater management using widespread dispersion, rather than concentrated infiltration, is advised. Dispersion of stormwater onto sloping ground should be carefully evaluated to assure slope stability.

3.6.2.3 Buildings and Pavements

In general, the native ice-contact soils will provide good bearing support for new buildings and pavements. Conventional spread footings and slabs-on-grade can be anticipated for lightly loaded structures. For new driveways and parking areas to be paved using conventional hot mix asphalt (HMA), the Kitsap County standard pavement sections should be adequate.

4. LIMITATIONS

This document was prepared solely for the County in accordance with professional standards at the time the services were performed and in accordance with Contract No. KC-263-17 between the County and Parametrix dated September 11, 2017. This document is governed by the specific scope of work authorized by the County; it is not intended to be relied upon by any other party.

Appendix A

Site Survey and Proposed Lot Subdivision

MATCH LINE SEE SHEET 2

PMX CONTROL TABLE				
Point #	Northing	Easting	Elevation	Raw Description
1000	240802.79	1174817.18	409.54	XHT
1001	240677.54	1175160.83	407.55	FPK
1002	240295.41	1174719.10	456.02	XHT
1003	240271.36	1174257.80	495.82	XHT
1004	241189.65	1174531.37	393.29	XHT
1005	241793.02	1173994.12	393.40	XHT
1006	240908.81	1174150.44	414.69	XNL
1007	241462.23	1175583.71	360.88	XHT
1008	240789.59	1175563.10	366.26	XHT
1009	240246.39	1175567.06	375.39	XHT

PMX #1000 SET HUB & TACK
PMX #1001 SET PK NAIL
PMX #1002 SET HUB & TACK
PMX #1003 SET HUB & TACK
PMX #1008 SET HUB & TACK
PMX #1009 SET HUB & TACK

SIGN "SILVERDALE DROP BOX FACILITY"
OFFICE
STL. TRACKS
GRAVEL
PLANTER
SHED
ASPH
SD
CB RIM=416.57' IE 12" CMP (S)=414.22'
CB RIM=416.66' IE 12" CMP (S/N)=413.16'
CB RIM=416.53' IE 12" CMP (W)=412.33' IE 12" CMP (N)=412.28
CB RIM=416.41' IE 12" CMP (S/E)=411.91'
IE 12" CMP=409.57'
IE 12" CMP=405.53'
CB RIM=406.30' IE 12" CMP (E)=403.40'
IE 12" CMP=400.55'
IE 12" CMP=401.74'
CHAINLINK FENCE
BONNEVILLE POWER LINE EASEMENT
STOP SIGN
GATE
SIGN "EMPLOYEES ONLY DEAD END"
STOP "SILVERDALE RECYCLING & GARBAGE FACILITY OPEN 7 DAYS A WEEK 9 "O 5"
250.00'
62.50'
187.50'
SEASONAL WET AREA
IRON WIRE FENCE
BUILDING
WC RAMP w/ RAILING
TRAINING CENTER
CB RIM=369.15' IE 12" CMP (N/S)=365.25'
IE 18" CCP (E)=365.00±
CB W/ OIL-WATER SEPARATOR RIM=367.00± IE 12" CMP (N)=363.50'±
TREES
STREET SIGN "CAUTION CURVE 15 MPH"
DICKEY RD NW
CROSSWALK
STOP BAR
IE 12" CMP=394.70'
IE 12" CMP=392.96'
IE 18" RCP (E)=361.85
SIGN "CAUTION TRUCK CROSSING"
STREET SIGN "DICKEY PLACE"
CTR E-W LINE SEC 19, T25N, R1E WM
EAST LINE SW ¼ NE ¼ SEC 19, T25N, R1E WM
DATUM
ASSUMED EL. 375.00' SET IRON PIPE CONTROL PT 194
19

N
SCALE IN FEET
0 40 80

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P 253.604.6600
WWW.PARAMETRIX.COM

DESIGNED	SNS
DRAWN	SNS
CHECKED	
APPROVED	

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME	553-1578-148 SV BASE
JOB No.	553-1578-148
DATE	DECEMBER 2017

TOPOGRAPHIC MAP OF SILVERDALE RECYCLING & GARBAGE FACILITY KITSAP COUNTY

DRAWING NO. 1 OF 2

FILE: 553-1578-148 SV BASE LAYOUT: SHEET 1
DATE: Dec 11, 2017 - 10:12am PLOTTED BY: sharpsie
IMAGES: 1578148RAGF_transparent_mosaic_group1
XREFS: topofill

N

SCALE IN FEET
0 40 80

FILE: 553-1578-148 SV BASE LAYOUT: SHEET 2
DATE: Dec 11, 2017 - 10:13am PLOTTED BY: sharpste
IMAGES: 1578148RAGF_transparent_mosaic_group1 |
XREFS: topoINI

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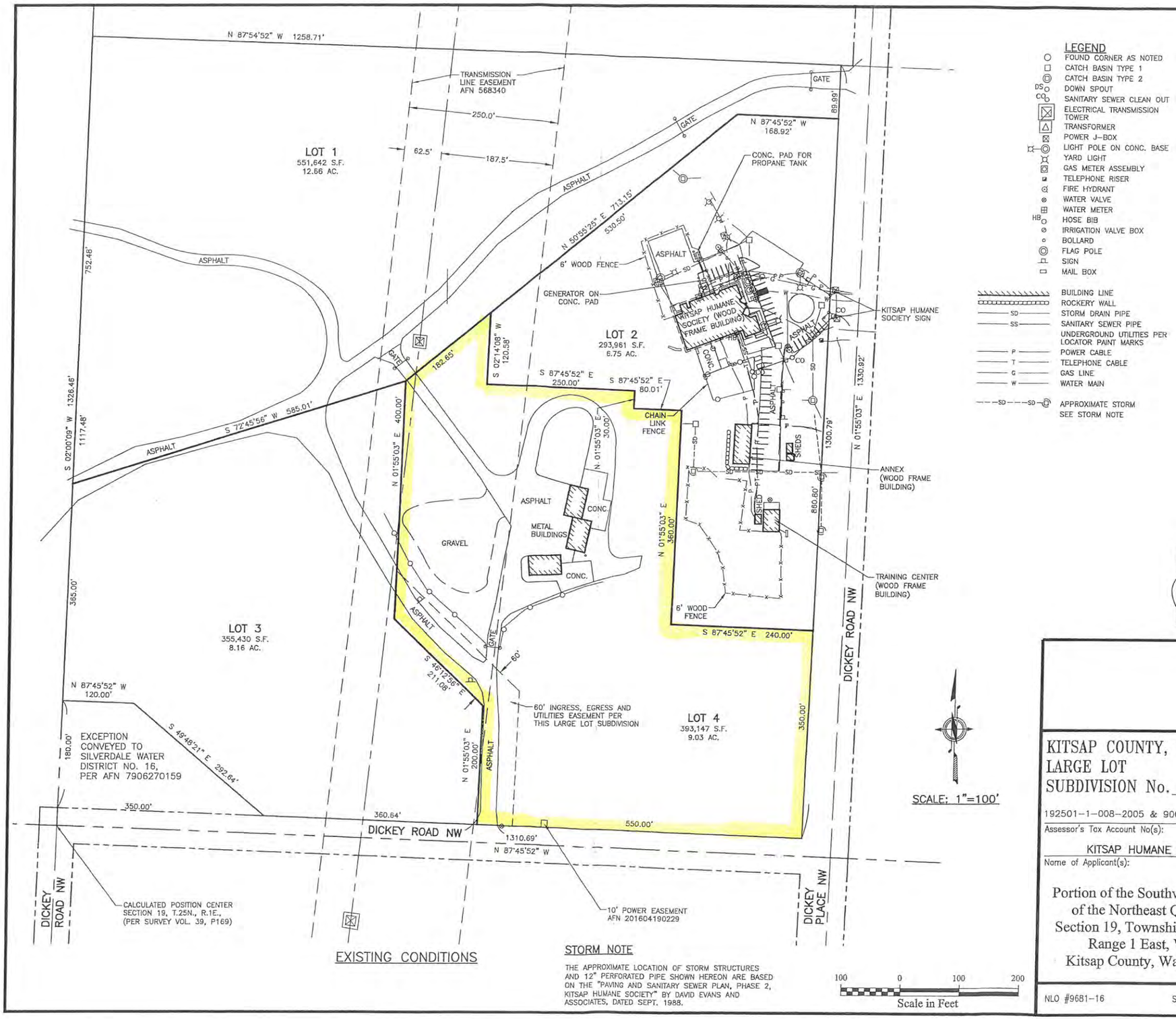
CHECKED	
APPROVED	

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME	553-1578-148 SV BASE
JOB No.	553-1578-148
DATE	DECEMBER 2017

TOPOGRAPHIC MAP OF SILVERDALE RECYCLING & GARBAGE FACILITY KITSAP COUNTY

DRAWING NO.
2 OF 2



KITSAP COUNTY, WASHINGTON
LARGE LOT
SUBDIVISION No. _____

192501-1-008-2005 & 9000-010-193-2007
Assessor's Tax Account No(s):

KITSAP HUMANE SOCIETY
Name of Applicant(s):

Portion of the Southwest Quarter of the Northeast Quarter of Section 19, Township 25 North, Range 1 East, W.M., Kitsap County, Washington.

NLO #9681-16

SHEET 3 OF 3 SHEETS

DRAFT
PROPOSED

Appendix B

General Site Figures

Figure 1: Pavement Deterioration East to Refuse Shed B

Figure 2: Rutting and Erosion on the Interior of the Haul Roadway

Figure 3: Entrance Queue Lane Roadway Drop-off

Figure 4: Ponding West of Refuse Shed C

Figure 5: Ponding along the Entrance Queue Roadway

Figure 6: Run-on into Refuse Shed C

Figure 7: Recycling Area

Figure 8: LHHW Area

Appendix C

Structures Figures

Figure 1: Refuse Shed C Unloading Area

Figure 2: Refuse Shed C Exterior

Figure 3: Leakage in the Valley between Refuse Sheds A and B

Figure 4: Clear-span Building Frame

Figure 5: Wide-flange Wind Columns

Figure 6: Shop Primer Coating Failure

Figure 7: Wall Purlin Dirt and Moss

Figure 8: Two-rail Demountable Railing System

Figure 9: Hinged Sheet Steel Bridge Plates

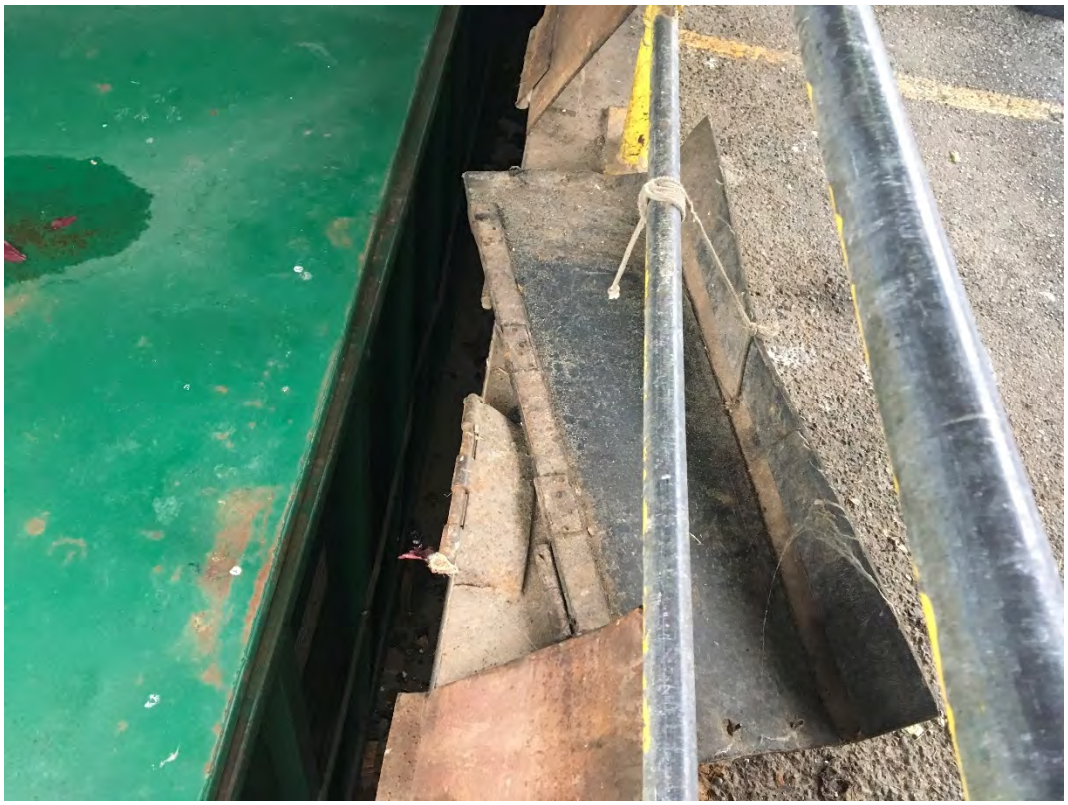


Figure 10: Damaged Hinged Sheet Steel Bridge Plate

Figure 11: Surface-mounted C-channels on Steel Bridging Plates

Figure 12: Pooling within Roll-Off Container Guide Rails

Figure 13: Concrete Stairs Fitted with Pipe-rail Handrails

Appendix D

Electrical Figures

Figure 1: Electrical Service Meter

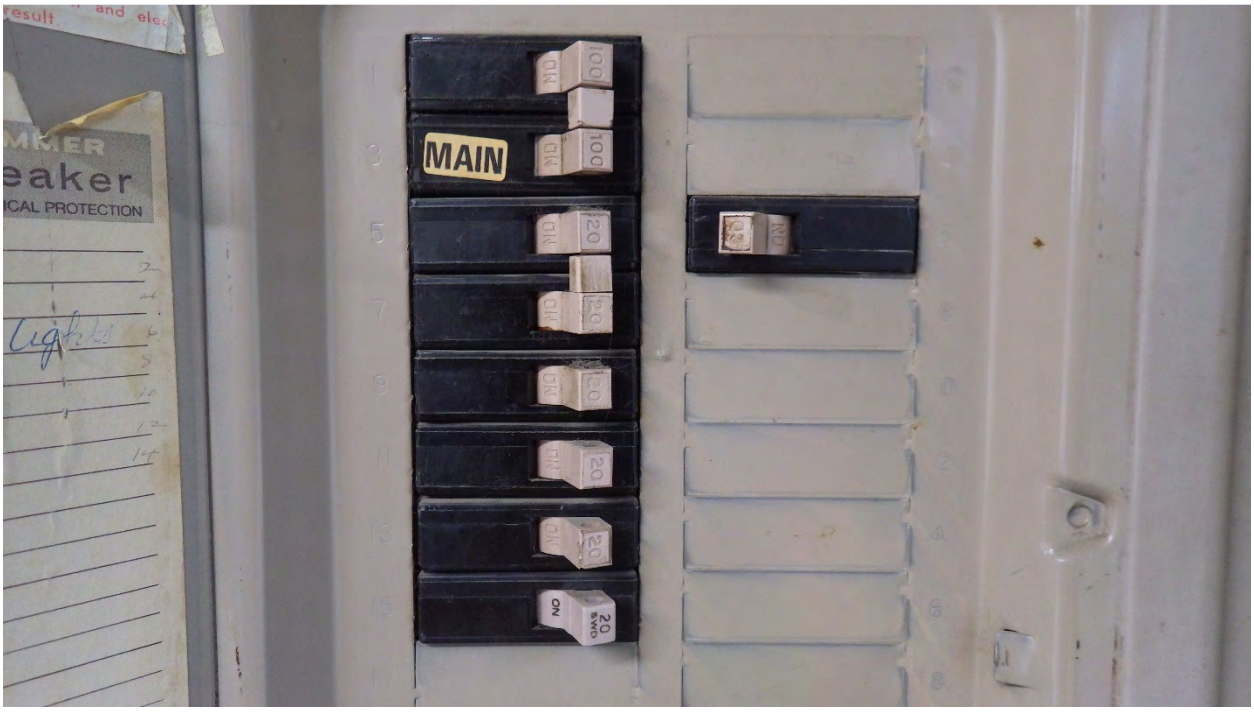


Figure 2: Distribution Panel

Figure 3: Photocell

Figure 4: Center Hung HID High Bay Luminaire

Appendix E

Site Drainage System Figures

Figure 1 - Drainage Basins

Silverdale Recycling and Garbage Facility (RAGF)

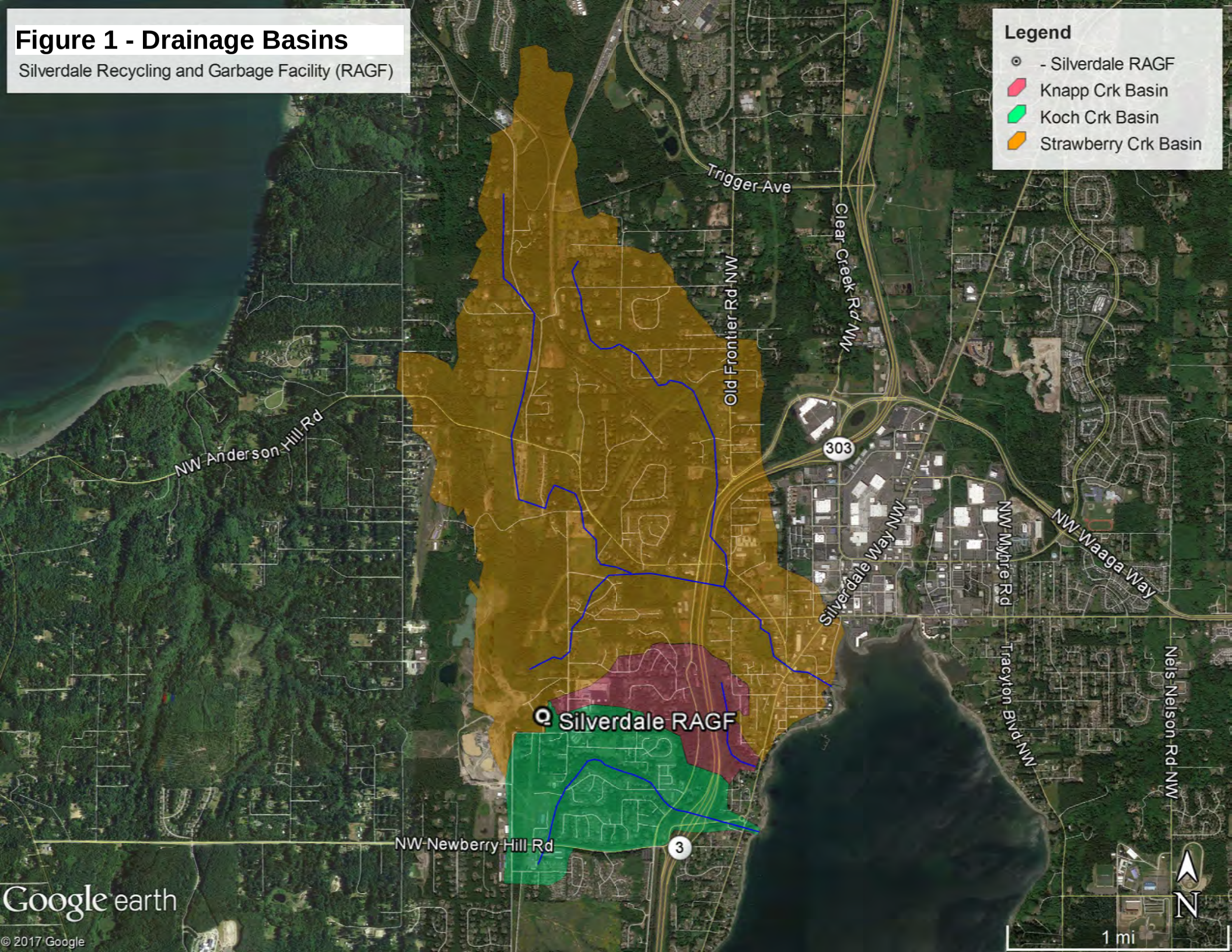


FIGURE 2 - Surface Water Site Visit
Silverdale RAGF
553-1578-148 | 11/15/2017

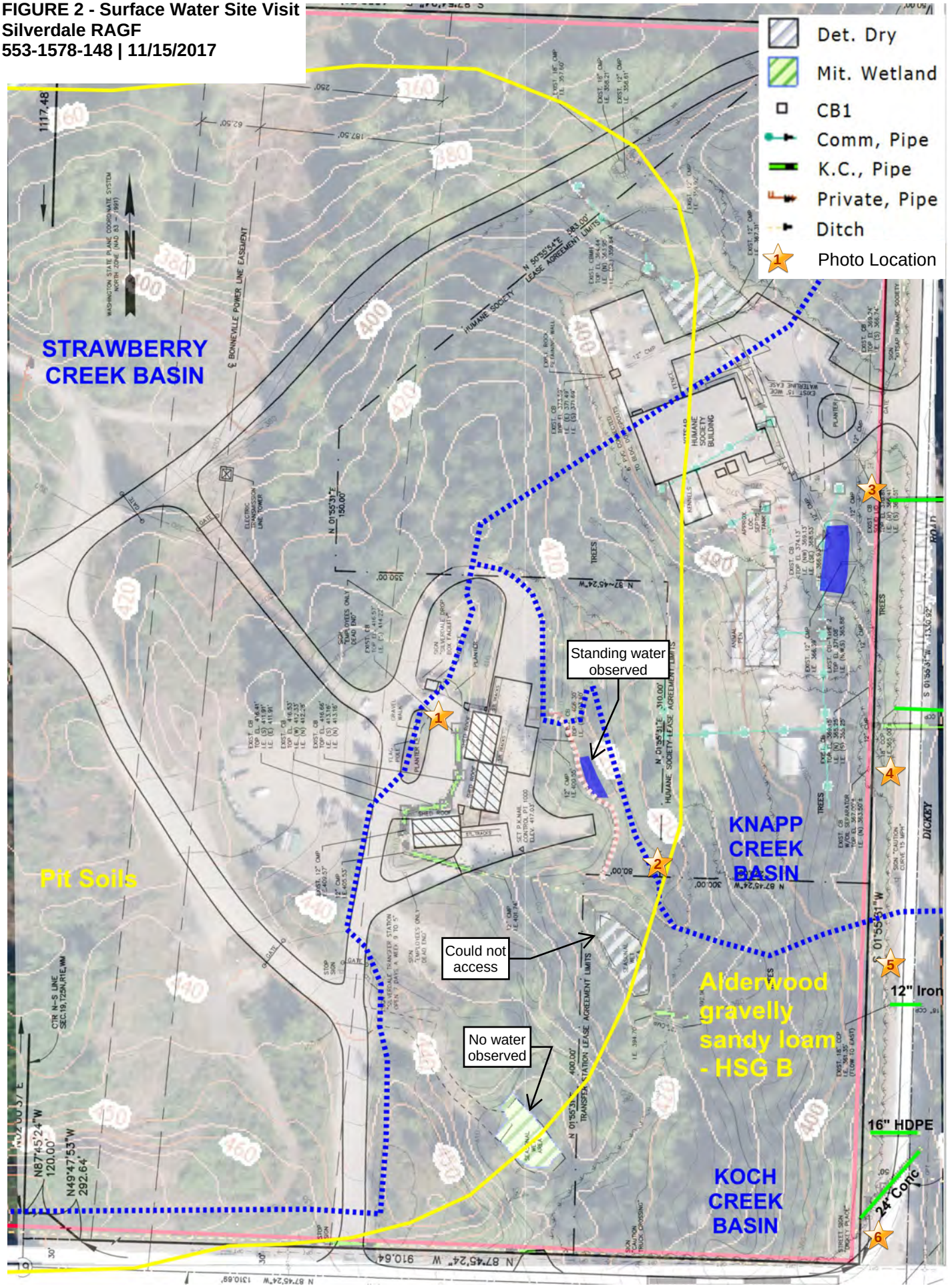


Figure 3: Photo Location 1 – Viewing South

Figure 4: Photo Location 2 – Viewing North

Figure 5: Photo Location 3 – Viewing East

Figure 6: Photo Location 4 – Viewing North

Figure 7: Photo Location 5 – Viewing South

Figure 8: Photo Location 6 – Viewing North

Appendix F

Geotechnical Reconnaissance

Aspect CONSULTING

January 24, 2018

Parametrix
Ian Sutton
719 2nd Avenue, Suite 200
Seattle, Washington 98104

Re: Revised: Geotechnical Reconnaissance
Kitsap County Public Works Department, Solid Waste Division
Silverdale RAGF
8843 Dickey Road NW
Silverdale, Washington 98383
Kitsap County Parcel No. 192501-1-008-2005
Aspect Project No. 170361

Dear Mr. Sutton:

This letter report summarizes Aspect Consulting, LLC's (Aspect) review of readily available public data and observations made during a geotechnical reconnaissance of the existing drop box facility, Silverdale Recycling and Garbage Facility (RAGF), located at 8843 Dickey Road NW in Silverdale, Washington located on Kitsap County Parcel Number 192501-1-008-2005. We performed the Site reconnaissance on November 15, 2017.

The purpose of our work was to document the current conditions, with a specific focus on the upcoming subdivision of the parcel and a planned expansion of the facility. The observations and recommendations contained herein are preliminary and based on the current plans for expansion. This letter report is the result of a reconnaissance-level investigation only and no engineering analyses or subsurface explorations were conducted.

Project Understanding

The RAGF is located on a 36.6-acre parcel owned by Kitsap County (Main Parcel). The RAGF provides opportunities for residents and small businesses to self-haul municipal solid waste (MSW), recyclable materials, and limited household hazardous waste (HHW) for proper disposal. The Silverdale RAGF accepts commingled recyclables, glass, corrugated carboard, scrap metal, and appliances.

Kitsap County (County) plans to subdivide the 36.6-acre Main Parcel and the resulting central, 9.3-acre parcel (Site) will continue to be used for RAGF operations. The current Project will expand and modify the RAGF operations within the Site. Based on discussions with you, the Project includes demolition and replacement of the service booth at a new location, a gravity-fed septic system, upgrading utilities (cameras, lights), a possible 4th shed, structural upgrades to the existing sheds, and new roadways with entrances/exits from the south side of the Site off of Dickey Road NW, and an area for possible scales in the future. Cuts and fills on the order of 5 to 10 feet are planned to accommodate the new Site features.

Observations

Site Conditions and Topography

The Site address is 8843 Dickey Road NW located in unincorporated Kitsap County, just west of Silverdale, Washington. The Main Parcel is roughly rectangular in shape, about 1,320 feet north-to-south and 1,250 feet east-to-west. The Main Parcel is bordered by two parcels to the west, one parcel to the north, and Dickey Road NW to the south and east. The northeast corner of the Main Parcel is developed and occupied by Kitsap Humane Society as an animal shelter. The shelter is developed with an approximately 10,000 square-foot building and a few other smaller outbuildings, barns, sheds, and small pasture areas. The two parcels to the west are owned by the same entity and used for surface mining and related activities. The parcel to the north is undeveloped and zoned for industrial use.

The high, central area of the Main Parcel is the 9.3-acre Site within which the RAGF operates. The Site is currently utilized as a drop box area and is developed with three sheds, a service booth, and associated drive lanes with level areas for different items for disposal. From this high part of the Site, the area slopes down in all directions with slopes up to 6 degrees (11 percent) and limited areas that may be slightly steeper. The approximate Elevation of the central portion of the Site is 435 feet (NAVD 88) (Kitsap County, 2017).

Drainage

During our Site reconnaissance on November 15, 2017, we observed that the roof-gutter downspouts from the sheds discharged onto the ground surface adjacent to the sheds. Roadside ditches along the south and east sides of the Site drained towards the southeast corner of the Site and into a culvert that crossed under Dickey Road NW traveling to the southeast. We observed stormwater sheet flowing across the asphalt and concrete surfaces and into the adjacent vegetated areas. Surface drainage conditions will vary with fluctuations in precipitation, Site usage (such as irrigation), and off-Site land use.

Vegetation

The northern and southeastern portions of the Site are vegetated with mature evergreens, some deciduous trees, ferns, and forest undergrowth. The western and southern portions of the Site are vegetated with low brush, young deciduous trees, and grass.

Geology

The geologic map (Polenz et al., 2013) of the Site area indicates that the Site is underlain by modified land (ml), described as locally derived sand, pebbles, cobbles, boulders, silt, clay, and diamicton excavated and redistributed to modify topography. The modified land is surrounded by Vashon ice-contact deposits (Qgic), described as cobble and pebble gravel, sand, ablation till, flow till, lodgement till, lacustrine mud, and rare boulders.

Aspect recently performed a geotechnical engineering evaluation and subsurface explorations in support of the Central Kitsap School District's Consolidated Transportation Food Service and Warehouse Project at a site located directly east of the Main Parcel (Aspect, 2016). For that study, we advanced sixteen test pit excavations, which confirmed the geologic mapped designations as generally correct.

At the subject Site, exposed soil was present on the inside (south) side of the drive lane around the north side. The exposed soil consisted of very dense, silty sand with fine to coarse gravel, which is consistent with Vashon ice-contact deposits.

Landslides

Review of the Recent Light Detection and Ranging (LiDAR) images does not show features indicating landslides or other signs of instability around the general area of the Main Parcel or Site (PSLC, 2000 and McKenna et al., 2008). The images do show that grading of the surface has occurred.

Aerial images of the Main Parcel, Site and surrounding area were reviewed for the years 1951, 1969, 1994, 2001, 2005, 2007, 2009, 2012, 2015, 2000, and 2006 (NETR, 2017 and Kitsap County, 2017). The photographs indicated that the surface mining of the area began between 1951 and 1969 and is ongoing.

Erosion Hazard

The soils expected to be encountered on the Site have a low erosion potential due to the relatively flat to gently sloping topography of the Site. Areas outside of the proposed construction area with dense groundcover also have low erosion potential. Care should be taken during construction to prevent any erosion on temporary slopes.

Liquefaction

Liquefaction occurs when loose, saturated, and relatively cohesionless soil deposits temporarily lose strength as a result of earthquake shaking. The primary factors controlling the onset of liquefaction include intensity and duration of strong ground motion, characteristics of subsurface soil, in-situ stress conditions, and the depth to groundwater. Liquefaction maps for the area (Palmer et al., 2004), and our experience, indicates that the Site has a very low to low susceptibility to liquefaction. Therefore, liquefaction hazard is not a design consideration for the proposed development.

Surficial Ground Rupture

The nearest known active fault trace is a geologic thrust fault structure associated within the Seattle fault zone. This trace is mapped as an east-to-west trending structure approximately 2.5 miles south of the Site (USGS, 2010). Recent LiDAR did not indicate the potential for a fault on the Site (PSLC, 2000). Accounting for the suspected long recurrence interval (greater than 15,000 years) and the offset of the Site from the known preferred rupture surface, the potential for surficial ground rupture at the Site is considered low during the expected life of the structures.

Conclusions and Recommendations

Based on our review of publicly available sources, it is our opinion the Site is feasible for the current Project plans from a geotechnical standpoint utilizing conventional spread footing and conventional site development procedures and earthwork equipment. Key geotechnical considerations for the Project will include moisture sensitive soils, earthwork, structure foundation design and subgrade preparation, and pavement design.

Moisture Sensitive Soils

The native soils expected to be encountered on the Site are moisture sensitive due to relatively high fines (silt and clay) content. These soils will be sensitive to any water encountered, both groundwater and rain water. For planning purposes, it should be assumed that the native site soils will generally be suitable for use as structural backfill only if site earthwork is completed during the dry season (summer through early fall). If Site earthwork is completed outside of the dry season, use of imported clean granular structural fill should be anticipated.

Earthwork

Excavating, subgrade preparation, and construction of temporary slopes will require careful site preparation, surface drainage control, soil handling procedures, dust control, and sequencing on the part of the earthworks contractor. The grading contractors should channel all surface drainage into approved surface water collection systems. Surface water drainage from the site must be controlled during and after construction to avoid erosion and uncontrolled runoff onto adjoining streets and properties.

Stormwater Management

In general, the density and gradation of the ice contact deposits are such that these native soils have low permeability. Stormwater management using widespread dispersion, rather than concentrated infiltration, is advised. Dispersion of stormwater onto sloping ground should be carefully evaluated to assure slope stability.

Buildings and Pavements

In general, the native ice contact soils will provide good bearing support for new buildings and pavements. Conventional spread footings and slabs-on-grade can be anticipated for lightly loaded structures. For new driveways and parking areas to be paved using conventional hot mix asphalt (HMA), the County's standard pavement sections should be adequate.

Additional Services

At the time of this report, site plans, site grading, structural plans, and construction methods have not been finalized, and the recommendations presented herein are based on preliminary Project information. We are available to provide geotechnical engineering and monitoring services as the Project plans continue to be developed. We recommend that after a preliminary Site development plan is prepared, the next step would be a subsurface investigation and preliminary geotechnical engineering report.

We are also able to provide monitoring services during construction. The integrity of the foundation depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent.

References

Aspect Consulting, LLC (Aspect), 2016, Geotechnical Engineering Report – CKSD Consolidated Transportation Food Service & Warehouse Project, prepared for: Central Kitsap School District (CKSD), Project No. 150395-01, February 22, 2016 (revised February 25, 2016), Final.

Kitsap County, 2017, Parcel Map and Historical Aerial Photographs for 1994, 2001, 2005, 2007, 2009, 2012, 2015, 2000, and 2006, accessed November 13, 2017, https://psearch.kitsapgov.com/webappa/index.html.

McKenna, J.P., D.J. Lidke, and J.A. Coe, 2008, Landslides mapped from LiDAR imagery, Kitsap County, Washington: U.S. Geological Survey Open-File Report 2007–1292, 81 p.

Nationwide Environmental Title Research, LLC (NETR), 2017, Historical Aerials for 1951 and 1969, accessed November 13, 2017, https://www.historicaerials.com/.

Polenz, M., G.T. Petro, T.A. Contreras, K.A. Stone, G. Legorreta Paulin, and R. Cakir, 2013, Geologic Map of the Seabeck and Poulsbo 7.5-minute Quadrangles, Kitsap and Jefferson Counties, Washington: Washington State Department of Natural Resources, Washington Division of Geology and Earth Resources, Map Series 2013-02, scale 1:24,000, October 2013.

Puget Sound Lidar Consortium (PSLC), 2000, Data Download, accessed November 13, 2017, http://pugetsoundlidar.ess.washington.edu/lidardata/restricted/.

Palmer, S.P., S.L. Magsino, E.L. Bilderback, J.L. Poelstra, D.S. Folger, and R.A. Niggemann, 2004, Liquefaction Susceptibility Map of Kitsap County, Washington: Washington Division of Geology and Earth Resources Open-File Report 2004-20.

U.S. Geological Survey (USGS), 2010, Quaternary fault and fold database for the United States, accessed November 10, 2010, from USGS web site: http://earthquake.usgs.gov/hazards/qfaults/.

Limitations

Work for this project was performed for Parametrix (Client), and this report was prepared consistent with recognized standards of professionals in the same locality and involving similar conditions, at the time the work was performed. No other warranty, expressed or implied, is made by Aspect Consulting, LLC (Aspect).

Recommendations presented herein are based on our interpretation of site conditions, geotechnical engineering calculations, and judgment in accordance with our mutually agreed-upon scope of work. Our recommendations are unique and specific to the project, site, and Client. Application of this report for any purpose other than the project should be done only after consultation with Aspect.

Variations may exist between the soil and groundwater conditions reported and those actually underlying the site. The nature and extent of such soil variations may change over time and may not be evident before construction begins. If any soil conditions are encountered at the site that are different from those described in this report, Aspect should be notified immediately to review the applicability of our recommendations.

It is the Client's responsibility to see that all parties to this project, including the designer, contractor, subcontractors, and agents, are made aware of this report in its entirety. At the time of this report, design plans and construction methods have not been finalized, and the recommendations presented herein are based on preliminary project information. If project developments result in changes from the preliminary project information, Aspect should be contacted to determine if our recommendations contained in this report should be revised and/or expanded upon.

The scope of work does not include services related to construction safety precautions. Site safety is typically the responsibility of the contractor, and our recommendations are not intended to direct the contractor's site safety methods, techniques, sequences, or procedures. The scope of our work also does not include the assessment of environmental characteristics, particularly those involving potentially hazardous substances in soil or groundwater.

All reports prepared by Aspect for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect. Aspect's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

Please refer to Appendix A titled "Report Limitations and Guidelines for Use" for additional information governing the use of this report.

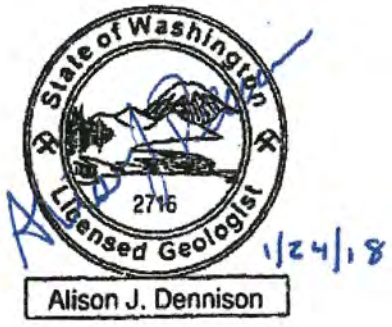
Closure

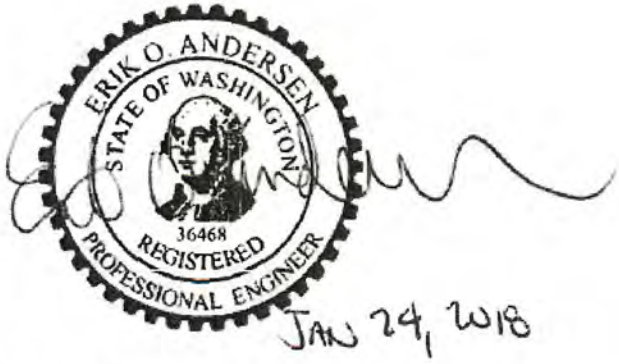
We are available to offer further assistance with this project, if desired. Please contact us to coordinate these activities.

It has been a pleasure to provide these services to you. If you have any questions, please do not hesitate to call.

Sincerely,

Aspect consulting, LLC





Alison J. Dennison, LG
Senior Project Geologist
adennison@aspectconsulting.com

Erik O. Andersen, PE
Senior Associate Geotechnical Engineer
eandersen@aspectconsulting.com

Attachment: Appendix A – Report Limitations and Guidelines for Use

V:\170361 Silverdale Recycling and Garbage Facility\Deliverables\Revised_Geotechnical Recon_Silverdale RAGF_8843 Dickey Rd NW.docx

APPENDIX A

Report Limitations and Guidelines for Use

REPORT LIMITATIONS AND GUIDELINES FOR USE

Geoscience is Not Exact

The geoscience practices (geotechnical engineering, geology, and environmental science) are far less exact than other engineering and natural science disciplines. It is important to recognize this limitation in evaluating the content of the report. If you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or property, you should contact Aspect Consulting, LLC (Aspect).

This Report and Project-Specific Factors

Aspect's services are designed to meet the specific needs of our clients. Aspect has performed the services in general accordance with our agreement (the Agreement) with the Client (defined under the Limitations section of this project's work product). This report has been prepared for the exclusive use of the Client. This report should not be applied for any purpose or project except the purpose described in the Agreement.

Aspect considered many unique, project-specific factors when establishing the Scope of Work for this project and report. You should not rely on this report if it was:

- Not prepared for you;
- Not prepared for the specific purpose identified in the Agreement;
- Not prepared for the specific subject property assessed; or
- Completed before important changes occurred concerning the subject property, project, or governmental regulatory actions.

If changes are made to the project or subject property after the date of this report, Aspect should be retained to assess the impact of the changes with respect to the conclusions contained in the report.

Reliance Conditions for Third Parties

This report was prepared for the exclusive use of the Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against liability claims by third parties with whom there would otherwise be no contractual limitations. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with our Agreement with the Client and recognized geoscience practices in the same locality and involving similar conditions at the time this report was prepared

Property Conditions Change Over Time

This report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope instability, or groundwater fluctuations. If any of the described events may have occurred following the issuance

of the report, you should contact Aspect so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical, Geologic, and Environmental Reports Are Not Interchangeable

The equipment, techniques, and personnel used to perform a geotechnical or geologic study differ significantly from those used to perform an environmental study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually address any environmental findings, conclusions, or recommendations (e.g., about the likelihood of encountering underground storage tanks or regulated contaminants). Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding the subject property.

We appreciate the opportunity to perform these services. If you have any questions please contact the Aspect Project Manager for this project.

Appendix F

Alternatives Evaluation Criteria-Scoring Template

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

719 2ND AVENUE, SUITE 200 | SEATTLE, WA 98104 | P 206.394.3700

ALTERNATIVES EVALUATION CRITERIA/SCORING TEMPLATE

DATE: January 9, 2018

TO: Keli McKay-Means

FROM: Ian Sutton

PROJECT NUMBER: 553-1578-148

PROJECT NAME: Silverdale Recycling and Garbage Facility
Facility Master Plan

The following individuals participated in the Silverdale Recycling and Garbage Facility (RAGF) Facility Programming Workshop on December 13, 2017.

Keli McKay-Means, Kitsap County Solid Waste Division
Pat Campbell, Kitsap County Solid Waste Division
Marshon Coppinger, Kitsap County Solid Waste Division
Rick Gilbert, Kitsap County Solid Waste Division
Leslie Haynes, Kitsap County Solid Waste Division
David Tucker, Kitsap County Public Works
David Marquis, Kitsap County Utilities
George Geyer, Kitsap County Information Systems
Joey Pellecchia, Waste Management
Ian Sutton, Parametrix
Karl Hufnagel, Parametrix
Sarah Fischer, KPG

As part of the workshop, the following weighted evaluation criteria, with a High, Medium or Low level of importance, were selected by consensus for use in evaluating the strengths and weaknesses of the site alternatives that will be developed in the next phase of the project:

HIGH - Operator and customer health and safety

HIGH - Operational capacity

HIGH - Operational efficiency (including possible use of weigh scales for future operations)

MEDIUM - Capital and operations and maintenance (O&M) costs

MEDIUM - Customer convenience

MEDIUM - Operational flexibility and ability to expand

MEDIUM - Environmental considerations (including sewer hook-up)

MEDIUM - Accommodation of continued operations during construction

MEDIUM - Regulatory compliance and permitting complexity

MEDIUM - Ability to accommodate surge capacity that may result from a disaster or the shutdown of a facility elsewhere in the system

LOW - Impacts to adjacent properties

Appendix G

Alternatives Identification Memorandum

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

719 2ND AVENUE, SUITE 200 | SEATTLE, WA 98104 | P 206.394.3700

ALTERNATIVES IDENTIFICATION

DATE: April 30, 2018

TO: Keli McKay-Means

FROM: Ian Sutton

PROJECT NUMBER: 553-1578-148

PROJECT NAME: Silverdale Recycling and Garbage Facility
Facility Master Plan

Conceptual alternative site layouts have been developed for the Silverdale Recycling and Garbage Facility (RAGF) incorporating the requirements provided in the Facility Programming/Needs Statement developed under Task 2 of the scope of work. The existing site is shown in Attachment A. The following four drawings are attached (Attachments B-1 through B-4) for redevelopment consideration and are discussed below.

B-1. Concept A – Full site conceptual layout addressing the long-term facility program needs.
B-2. Cross Sections – General cross sections illustrating changes in grade required to accommodate the Concept A site plan.
B-3. Concept A Alternatives – Illustrates four alternatives that could be incorporated individually, or in combination, to Concept A in the final preferred site layout.
B-4. Concept A Initial Build Out – Illustrates the full site conceptual layout, without the future scales.

A planning-level opinion of probable cost (OPC) is included as Attachment C and was developed for Concept A Initial Build Out, along with costs associated with the alternatives with cost impacts. Other attachments include a queuing assessment (Attachment D) and a conceptual layout of the attendant building (Attachment E).

Concept A

Concept A was developed based on the primary constraints associated with:

1. Revised property subdivision
2. Continued use of the existing three refuse sheds
3. Level of service required (operational capacity and efficiency)
4. Hauler and customer separation for safety
5. Queuing requirements
6. The County's overall budget constraints

Concept A is a complete, long-term build out of the RAGF with space and grading to accommodate future scales and other future facilities in the recycling area. Concept A and its associated benefits include the following.

1. Inbound and outbound scales and bi-directional queue capacity are provided. Queue capacity is required on the inbound direction during initial (pre-scale) operations since all customer transactions will be inbound to the site. Once scales are installed, weight-based transactions will occur in the outbound direction, requiring a need for outbound queue capacity. A queuing assessment was developed, and is

attached (Attachment D). The assessment indicates that queue capacity should be maximized to the extent possible given site constraints.

2. Entrance and exit roadways include two lanes, each direction, which allows for bypass of queues by authorized personnel. Once the number of customer trips exceeds the single lane queue length, the lane striping and signage can be modified to double queue capacity utilizing both lanes with alternating access to the attendant booth. When both queue lanes are in use by customers, bypass by authorized vehicles and service vehicles will be impacted.
3. The existing refuse sheds are retained, rehabilitated and incorporated into the redeveloped site.
4. Capacity is provided for:
    a. Four refuse sheds with a total of eight roll off containers
    b. Four reserve refuse roll off containers
    c. Nine recycling roll off containers
    d. A limited household hazardous waste (LHHW) building
    e. A fenced white goods/appliance area
5. Available space has been provided within the recycling and LHHW areas to allow for future flexibility and expanded regular or periodic services, such as quarterly staging for recycling, or disposal, of non-typical materials.
6. There is a generously sized attendant building with space preserved for future 50-foot long inbound and outbound vehicle scales. A conceptual layout of the attendant building has been included as Attachment E.
7. All customer traffic is required to pass the attendant building prior to entering or exiting the site.
8. Customer traffic circulation is counter clockwise, creating a loop configuration with increased safety and reduced crossing and interactions.
9. Customers are able to bypass the refuse, recycling, and LHHW areas depending on desired services.
10. There is complete separation of haulers and customers.
11. Active site areas are paved and robust concrete surfacing has been included in roll off container handling areas.
12. The primary wetland to the east has been preserved, and surface water detention capacity is available onsite for stormwater management with discharge to existing drainage. Large, paved areas could drain to central catch basins that outlet to oil-water separators, or other treatment, prior to discharge to the detention basins.
13. The layout lends itself to a phased construction which will allow for continued facility operation during construction, with a limited amount of interference. Essentially, the existing refuse sheds could remain accessible during the construction, and there could be a reduced-in-size, temporary recycling area established. Then all but the new refuse shed could be constructed during temporary facility operations. Once this phase of construction is complete, the existing attendant booth can be removed and the new refuse shed can be constructed.
14. Utilities will include:
    a. Water service to all areas
    b. Fire service with a central fire hydrant located between the refuse and recycling areas
    c. Electrical power and fiberoptic service to all areas, including approximately 12 mounted closed-circuit television (CCTV) security cameras
    d. Standby electrical power to the attendant building and site lighting with a dedicated generator
    e. Sanitary sewer connection to the attendant building with an upsized mainline for future capacity
15. Site lighting of access and operations areas has been provided.
16. Two portable restroom for customers have been provided.
17. An operator warming station has been included in a centralized location of the refuse area.
18. A dedicated maintenance shed had been provided.
19. The operations area is fully fenced with motorized, remotely controlled entrance and exit gates.

20. Entrance and exit gates have been moved further from the operations area which is an additional deterrent to trespassers.

Some considerations pertaining to the Concept A layout include:

1. Refuse haulers utilizing the container storage area will be required to make a full site loop for multiple container access.
2. There is significant distance between service areas for one staff person to manage.
3. The attendant building does not have full direct view of all operations; however, the use of surveillance cameras throughout the site will provide convenient monitoring of all areas by the attendant with intercom connection to the principal areas.
4. The recycle area does not include a canopy or grade-separated "finger" wall. A finger wall would consist of level access platforms from the customer parking area. The platforms would be approximately 5 feet above the container floor elevation creating separation between customer and hauler activities and increased safety. The platforms would be concrete with vertical walls forming a stall for each recycling container. The finger wall would replace the metal, stair access platforms. Figure 1, below, shows an example finger wall where customers would access from the left and containers would be backed in from the right. The planning-level cost for these elements was estimated as an alternative in Attachment C, and is discussed below.

Figure 1: Example Finger Wall with Canopy

5. There may be impact to one potential wetland and wetland buffers requiring mitigation.

Concept A Alternatives

Five alternative components were identified for the Concept A layout, as shown in Attachment B-3, and are discussed below.

1. The attendant building could be located further northwest (approximately 50 feet to the northwest). This would provide closer viewing of the recycling and LHHW areas; however, the existing refuse sheds would continue to limit visibility into the refuse area. The primary drawback to this alternative is the reduced exit queue capacity. Though the exit queue capacity is not expected to be needed until scales are incorporated into the facility, the lost queue length would be difficult to recapture. Additionally, the attendant building has a limited distance it can be moved to the northwest due to the straight alignments required to approach the attendant building/scales. With the addition of site-wide cameras, the value of a direct view from the attendant building is further reduced.
2. The LHHW area could be expanded to the south to provide additional operating area and future flexibility. This has some cost considerations for additional grading and paving; however, the expansion could be constructed in the future, if desired. One constraint to the future expansion will be the initial, permanent location of the initial LHHW building.
3. The LHHW building could be located on the east side of the LHHW area. The location would provide for easier access by staff, who are typically located in the refuse area. The limitation at this location would be the limited staff view of the open face of the LHHW building which would be facing west and blocked from view by most areas within the site.
4. A separate site entrance could be installed for hauler access. This has some cost considerations for additional grading and paving, and another gate with monitoring requirements. The double entrance lanes should initially allow for adequate queue bypass by haulers under most queuing conditions; thus, eliminating the need for a separate hauler access until deemed necessary in the future. Though not shown on Attachment B-3, a queue exit lane could be added adjacent to the exclusive hauler entrance road. The exit would be for inbound customers who have entered the queue, and then decided to not continue to the attendant booth.
5. The recycle area concrete slab and access platforms could be replaced with a finger wall with grade separation, providing easier customer access and adding additional separation between haulers and customers. Additionally, a canopy could be constructed to help keep customers and materials dry. This alternative has cost considerations for the additional concrete walls and canopy structure.

Cost Considerations

A planning-level OPC has been developed, and is included as Attachment C. The OPC provides Concept A Initial Build Out and alternatives costs for planning purposes. The initial build out of Concept A is estimated at $4,088,000, not including scales, scale foundations, and associate scale equipment. The estimate includes 20% construction contingency, 9% sales tax on construction, and engineering and construction management costs (combined 15% of fully burdened construction cost). As a planning-level OPC, the expected range of accuracy is between -20% to +30%.

Depending on construction budget constraints, there may be opportunities to reduce the initial construction cost. Some options to reduce costs include, but are not limited to:

1. Reduce the size of the recycling and LHHW area.
2. Increase the steepness of road profiles to reduce fill quantities.
3. Postpone initial installation of double entrance and exit lanes.
4. Postpone expansion of concrete paving within the hauler maneuvering area of the refuse sheds.

Potential reductions may have operational implications, and may be costlier to implement in the future. Potential reductions should be considered during detailed design, as materials and quantities will be better understood and more accurately estimated, providing a more realistic budget expectation.

The cost implications of the five alternative components are discussed below.

1. The attendant building could be located further northwest. This is expected to have minimal cost impact.
2. The LHHW area could be expanded to the south to provide additional operating area and future flexibility. Additional earthwork and paving are estimated to increase the OPC by $108,000.
3. The LHHW building could be located on the east side of the LHHW area. This is expected to have minimal cost impact.
4. A separate site entrance could be installed for hauler access. Additional earthwork and paving, along with the gate access and monitoring, are estimated to increase the OPC by $150,000. The addition of an exit lane for the inbound customers is assumed to add an additional $50,000 to this alternative component, primarily based on expanded fill and paving requirements.
5. A finger wall and canopy could be added to the recycling area. The additional structures are estimated to increase the OPC by $422,000. The majority of this cost is associated with the canopy. If the canopy were eliminated, the finger wall cost, after considering offsets, is estimated to increase the OPC by $55,000.

The expanded RAGF site will have higher operating and maintenance costs compared to the existing facility. This will include higher utility usage and cost, particularly electrical power and wastewater costs. More extensive pavement, signage, pavement striping, fencing, and buildings will require increased maintenance expenditures. Initial staffing is not expected to increase for the expanded facility. The cost of contracted services for refuse and recyclable material removal will likely increase as the volume of material increases over time, regardless of site improvements.

ATTACHMENT A

MATCH LINE SEE SHEET 2

PMX CONTROL TABLE				
Point #	Northing	Easting	Elevation	Raw Description
1000	260802.79	1174817.18	409.54	XHT
1001	260677.54	1175160.83	407.55	FPK
1002	260295.41	1174719.10	456.02	XHT
1003	260271.36	1174257.80	495.82	XHT
1004	261189.65	1174531.37	393.29	XHT
1005	261793.02	1173994.12	393.40	XHT
1006	260908.81	1174150.44	414.69	XNL
1007	261462.23	1175583.71	360.88	XHT
1008	260789.59	1175563.10	366.26	XHT
1009	260246.39	1175567.06	375.39	XHT

N

SCALE IN FEET
0 40 80

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DESIGNED	SNS
DRAWN	SNS
CHECKED	
APPROVED	

ONE INCH AT FULL SCALE
IF NOT, SCALE ACCORDINGLY

FILE NAME	553-1578-148 SV BASE
JOB No.	553-1578-148
DATE	DECEMBER 2017

TOPOGRAPHIC MAP OF SILVERDALE RECYCLING & GARBAGE FACILITY KITSAP COUNTY

DRAWING NO. 1 OF 2

FILE: 553-1578-148 SV BASE LAYOUT: SHEET 1
DATE: Dec 11, 2017 - 10:12am PLOTTED BY: shorpste
IMAGES: 1578148RAGF_transparent_mosaic_group1 |
XREFS: topofnl

ATTACHMENT A

MATCH LINE SEE SHEET 1

N

SCALE IN FEET
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DESIGNED	SNS
DRAWN	SNS
CHECKED	
APPROVED	

ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

FILE NAME	553-1578-148 SV BASE
JOB No.	553-1578-148
DATE	DECEMBER 2017

TOPOGRAPHIC MAP OF
SILVERDALE RECYCLING & GARBAGE FACILITY
KITSAP COUNTY

DRAWING NO.
2 OF 2

FILE: 553-1578-148 SV BASE LAYOUT: SHEET 2 IMAGES: 157814RAGF_transparent_mosaic_group1 |
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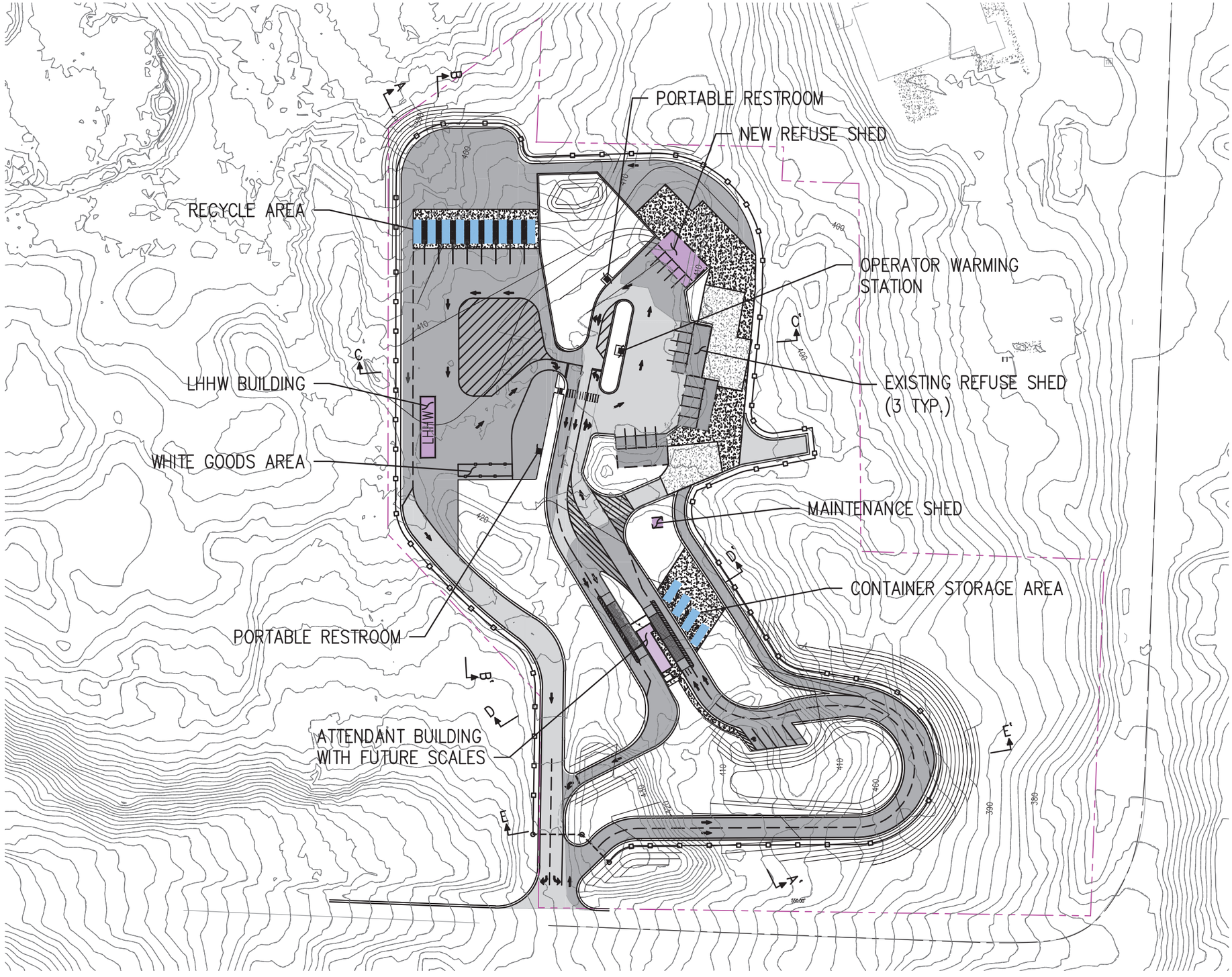

KEY
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CONC
LANDSCAPE
EX BLDG, TO REMAIN
NEW BLDG
CANOPY OVHD
STRIPED ASPHALT
PAVING SHOULDER
TRAFFIC DIRECTION
NEW PAVING
EXISTING PAVING
FENCE

1"

ATTACHMENT B-1

SITE PLAN CONCEPT A

1:100

0 25 50 100 150

SCALE IN FEET

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PROJECT
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DRAWING TITLE
SITE PLAN CONCEPT A

DATE	PROJECT No.
3/30/18	
SCALE 1:100	DRAWING No.
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CHECKED	

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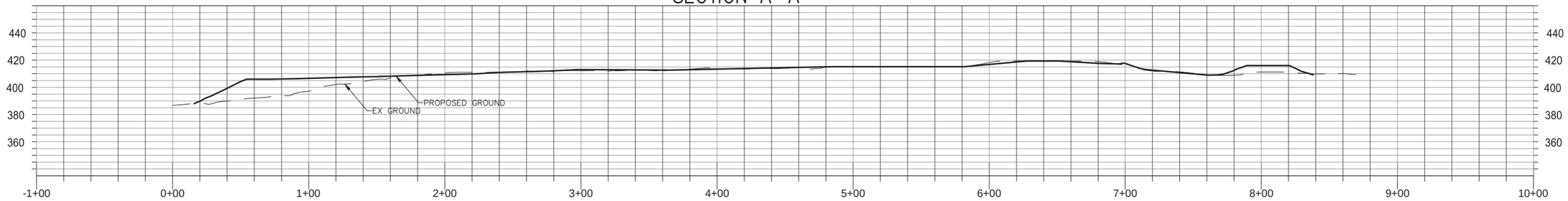

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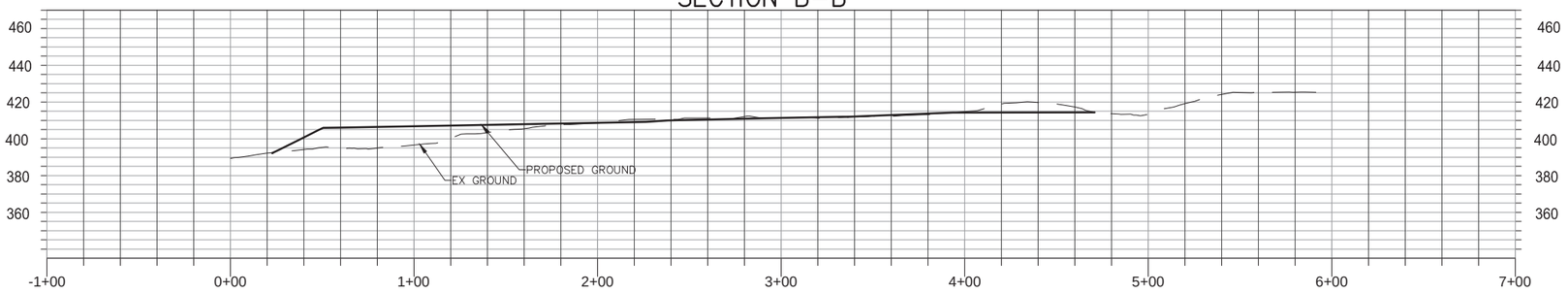

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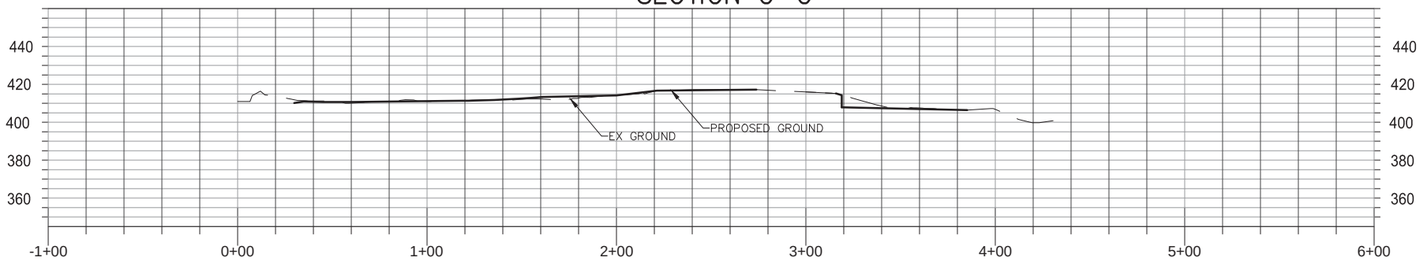

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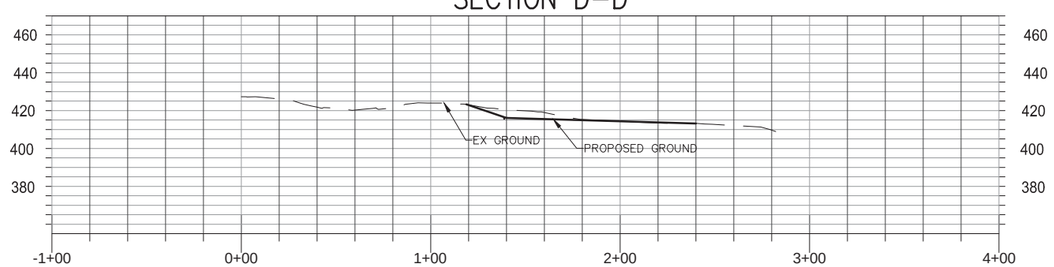

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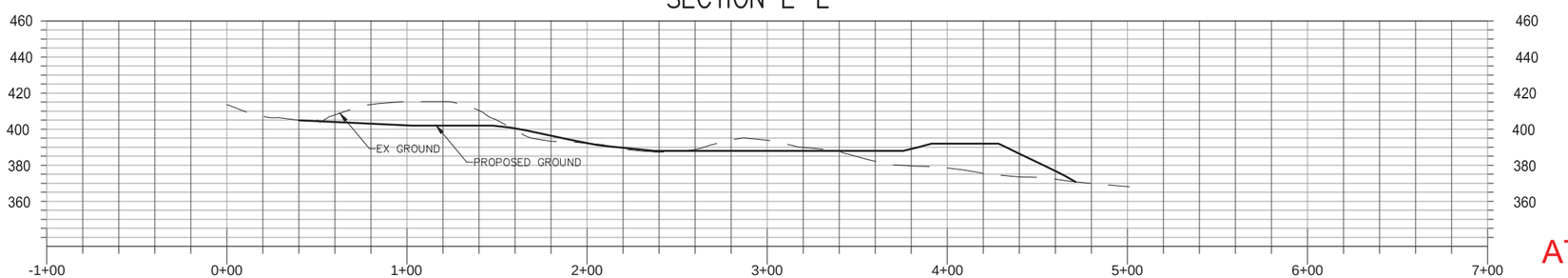

ATTACHMENT B-2

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DRAWING TITLE
CROSS SECTIONS

DATE 3/6/18	PROJECT No.
SCALE 1:80	DRAWING No.
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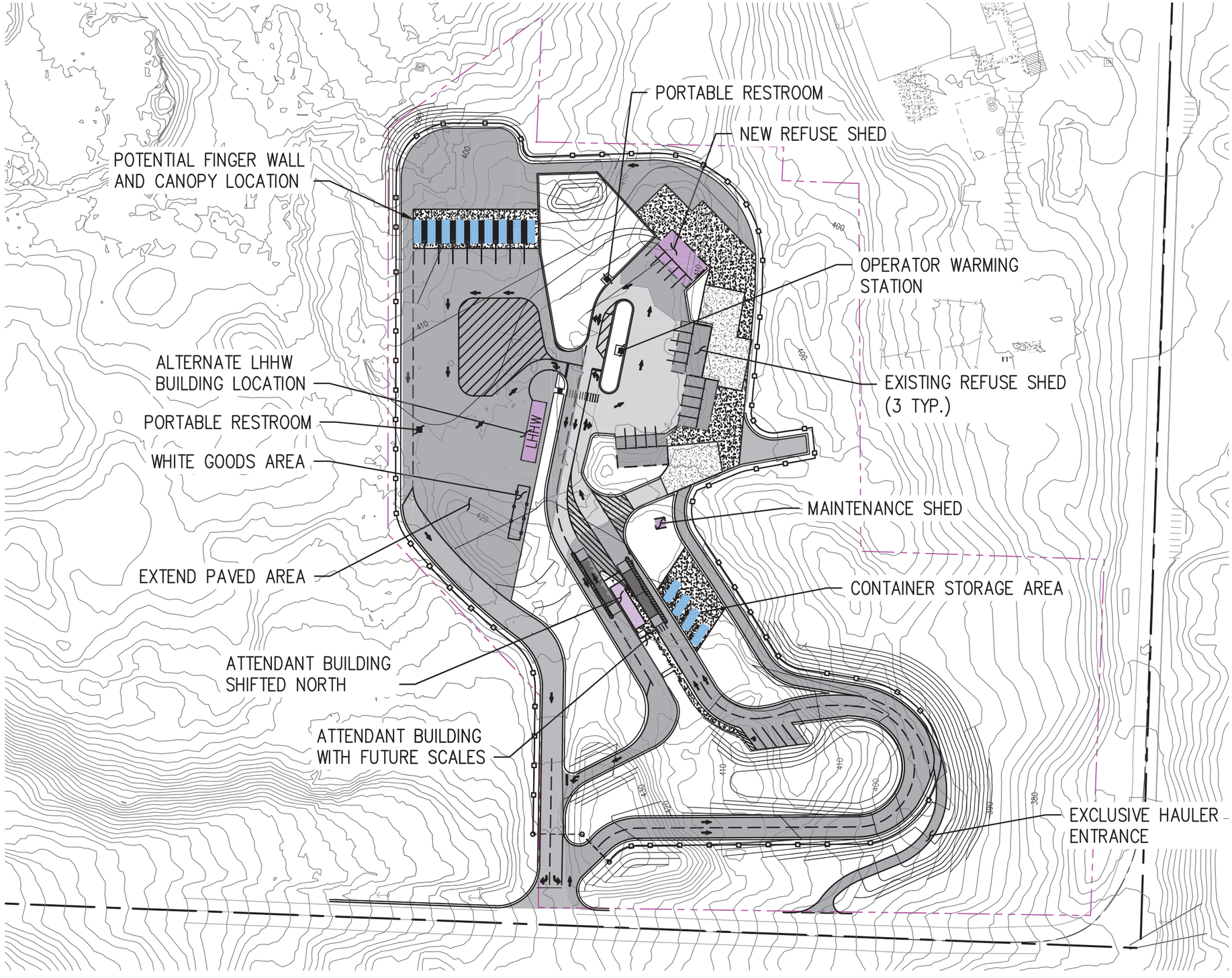
CHECKED	



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LANDSCAPE
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NEW BLDG
CANOPY OVHD
STRIPED ASPHALT
PAVING SHOULDER
TRAFFIC DIRECTION
NEW PAVING
EXISTING PAVING
FENCE

1"

ATTACHMENT B-3

SITE PLAN CONCEPT A ALTERNATIVES

1:100

0 25 50 100 150

SCALE IN FEET

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DRAWING TITLE
SITE PLAN CONCEPT A ALTERNATIVES

DATE 3/30/18	PROJECT No.
SCALE 1:100	DRAWING No.
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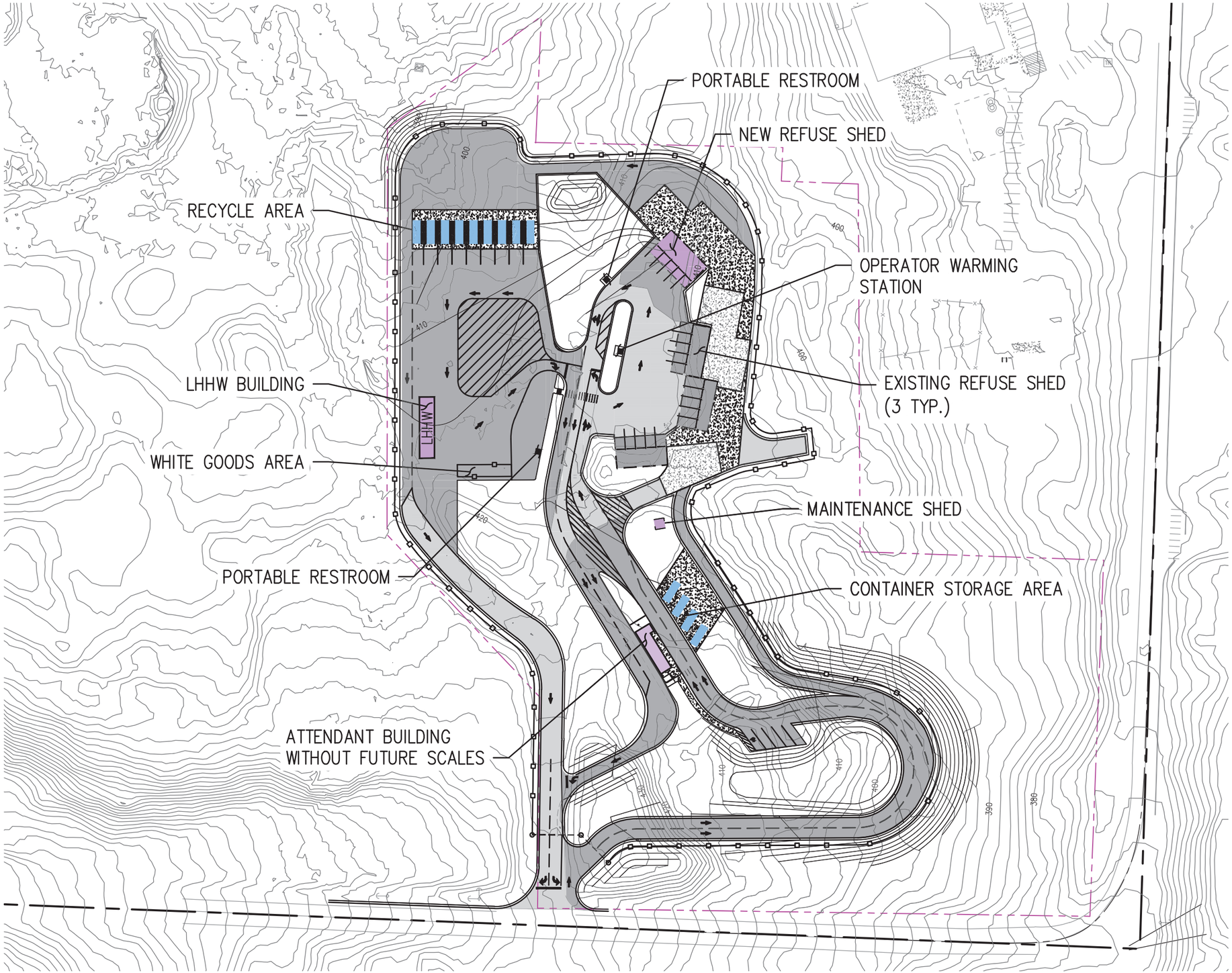

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LANDSCAPE
EX BLDG, TO REMAIN
NEW BLDG
CANOPY OVHD
STRIPED ASPHALT
PAVING SHOULDER
TRAFFIC DIRECTION
NEW PAVING
EXISTING PAVING
FENCE

1"

ATTACHMENT B-4

SITE PLAN CONCEPT A INITIAL BUILD OUT

1:100

0 25 50 100 150

SCALE IN FEET

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PROJECT
Silverdale Recycling and Garbage Facility

DRAWING TITLE
SITE PLAN CONCEPT A INITIAL BUILD OUT

DATE 3/30/18	PROJECT No.
SCALE 1:100	DRAWING No.
DRAWN BY	
CHECKED	

ATTACHMENT C

Project:	Silverdale RAGF Master Plan	Date:	29-Mar-18
Estimate Basis:	Planning Level, Order of Magnitude for Preliminary Base Case Site Layout	Costs:	2018 Dollars
Location:	Silverdale, Kitsap County Washington	Prepared By:	K. Hufnagel, Parametrix

DETAILED CAPITAL COST ESTIMATE

I. GENERAL

Item	Quantity	Units	Unit Price	Item Cost	Total
General Conditions Allowance	1	LS	LS	$25,000	
Construction Phasing Allowance	1	LS	LS	$10,000	
Work Setout and Survey	1	LS	LS	$10,000	
Mobilization/Demobilization	1	LS	LS	$10,000	
Trench Safety	1	LS	LS	$10,000	
Traffic Control	1	LS	LS	$10,000	
Overhead and Profit 12% of Direct Construction Cost Below	1	LS	LS	$280,000	
Subtotal I					**$355,000**

II. SITEWORK

Item	Quantity	Units	Unit Price	Item Cost	Total
Temporary Erosion and Sediment Control Measures	1	LS	LS	$15,000	
Saw Cut Pavement	300	LF	$4.00	$1,200	
Remove Asphalt Pavement	1800	SY	$6.00	$10,800	
Remove Structures	1	LS	LS	$10,000	
Earthwork					
Clear and Grub	4	Acres	$15,000.00	$60,000	
Strip/Stockpile Topsoil	500	CY	$4.00	$2,000	
Common Excavation/Fill	6000	CY	$8.00	$48,000	
Common Borrow	10000	CY	$25.00	$250,000	
Finishing Grading	2	Acres	$8,000.00	$16,000	
Roadway and Sidewalk Concrete					
8" Reinforced	1900	SY	$100.00	$190,000	
4" Reinforced	60	SY	$45.00	$2,700	
Recycle Area Container Receiving Structure					
Concrete	56	CY	$500.00	$28,000	
Armor Plate w/ Anchor Studs	3000	LB	$4.50	$13,500	
Steel Channels w/ Anchor Studs	3500	LB	$4.50	$15,750	
Subgrade Preparation	11000	SY	$2.00	$22,000	
Geotextile Separation Fabric for Pavements	1000	SY	$3.00	$3,000	
Gravel Base (9" thick)	800	Tons	$35.00	$28,000	
Prime Coat/Tack Coat	1500	GAL	$3.00	$4,500	
Asphalt Pavement, Parking (5" thick new, 2" overlay)	2900	Tons	$90.00	$261,000	
Planing Bituminous Pavement	3000	SY	$6.00	$18,000	
Off Site Utilities					
Water System Allowance	1	LS	LS	$20,000	
Sewer System Allowance	1	LS	LS	$50,000	
Fiber System Allowance	1	LS	LS	$20,000	
Electrical System Allowance	1	LS	LS	$20,000	
Off-Site Roadway Improvements	1	LS	LS	$20,000	
Site Utilities					
Water Supply	1	LS	LS	$80,000	
Sewer System	1	LS	LS	$20,000	
Fiber Allowance	1000	LF	$50.00	$50,000	
Electrical	600	LF	$90.00	$54,000	
Standby Generator	1	LS	LS	$20,000	
Site Drainage					
Collection system	1	LS	LS	$50,000	
Vehicle Guardrail	500	LF	$50.00	$25,000	
Fencing and Gates					
6 Foot chainlink vinyl coated w/ 2 Personnel Gates	2400	LF	$18.00	$43,200	
25 Foot Motor-Operated Gates	4	EA	$7,500.00	$30,000	
Pavement Striping	1	LS	LS	$15,000	
Wheel Stops	33	EA	$75.00	$2,475	
Site Lighting					
Conduit and Cable	1000	LF	$9.50	$9,500	
Concrete Base	10	EA	$380.00	$3,800	
Standard and Luminaire	10	EA	$3,000.00	$30,000	
CCTV System	5	EA	$2,000.00	$10,000	
Site Signage	20	EA	$300.00	$6,000	
Entrance Site Sign	1	LS	LS	$3,000	
Recycling Access Platform	8	EA	$7,500.00	$60,000	
Operator Warming Station	1	LS	LS	$10,000	
10x10 prefab shed	1	LS	LS	$2,000	
Landscaping					
Topsoil	200	CY	$35.00	$7,000	
Planting	1	LS	LS	$8,000	
Seeding/Mulch/Fertilizer	1	Acres	$8,000.00	$8,000	
Subtotal II					**$1,676,425**

III. REFUSE SHEDS

Item	Quantity	Units	Unit Price	Item Cost	Total
New Metal Building	800	SF	$40.00	$32,000	
Repair and Restoration of Existing Sheds	1	LS	LS	$25,000	
Subgrade Preparation	100	SY	$2.00	$200	
Gravel Base 12"	100	CY	$26.00	$2,600	
Backfill	40	CY	$26.00	$1,040	
Concrete Slabwork	50	CY	$450.00	$22,500	
Concrete Building Footings & Foundation Walls	100	CY	$500.00	$50,000	
Miscellaneous Concrete	10	CY	$500.00	$5,000	
Bollards and Miscellaneous Metals	10000	LB	$4.00	$40,000	
Guardrails (Galv)	200	LF	$60.00	$12,000	
Building Signage	1	LS	LS	$5,000	
Electrical					
Electrical Distribution Equipment	1	LS	LS	$5,000	
Lighting	800	SF	$7.50	$6,000	
Grounding System	1	LS	LS	$10,000	
Power Distribution	800	SF	$3.00	$2,400	
Signal, Alarm and Communications	800	SF	$2.00	$1,600	
Existing Shed Upgrades	3	EA	$5,000.00	$15,000	
CCTV System	4	EA	$2,000.00	$8,000	
Subtotal III					**$243,340**

IV. LIMITED HOUSEHOLD HAZARDOUS WASTE SHELTER

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building	840	SF	$40.00	$33,600	
Subgrade Preparation	95	SY	$2.00	$190	
Gravel Base 12"	35	CY	$26.00	$910	
Backfill	20	CY	$26.00	$520	
Concrete Slabwork	21	CY	$450.00	$9,450	
Concrete Footings & Foundation Walls	30	CY	$500.00	$15,000	
Miscellaneous Concrete	10	CY	$500.00	$5,000	
Miscellaneous Metals	500	LB	$5.00	$2,500	
Doors/Grills					
Coiling Overhead Metal Grill	560	SF	$90.00	$50,400	
3' x 7' Personnel w/ Hardware	1	EA	$2,000.00	$2,000	
Interior Finishes - General	840	SF	$10.00	$8,400	
Special Interior Finishes	200	SF	$25.00	$5,000	
Building Signage	1	LS	LS	$4,000	
HHW Area Equipment Allowance	1	LS	LS	$5,000	
Mechanical Allowance	1	LS	LS	$10,000	
Emergency Eyewash & Shower	1	EA	$6,000.00	$6,000	
Electrical					
Electrical Distribution Equipment	1	LS	LS	$5,000	
Lighting	840	SF	$7.50	$6,300	
Signal, Alarm and Communications	840	SF	$2.00	$1,680	
CCTV System	1	EA	$2,000.00	$2,000	
Subtotal IV					**$172,950**

V. ATTENDANT BUILDING

Item	Quantity	Units	Unit Price	Item Cost	Total
Building	650	SF	$130.00	$84,500	
Concrete Slabwork	1	LS	LS	$15,000	
Concrete Footings	1	LS	LS	$15,000	
Interior Finishes and Specialties	1	LS	LS	$28,000	
Interior Furnishings and Equipment	1	LS	LS	$13,000	
Air Quality Monitoring System	1	LS	LS	$5,000	
Mechanical	1	LS	LS	$32,500	
Plumbing	1	LS	LS	$13,000	
Electrical - Building	1	LS	LS	$60,000	
CCTV System	2	EA	$2,000.00	$4,000	
Subtotal V					**$270,000**

TOTAL w/o CONTINGENCY	**$2,717,715**
CONTINGENCY (20%)	**$543,543**
TOTAL w/ CONTINGENCY	**$3,261,258**
TAX (9%)	**$293,513**
TOTAL w/ TAX	**$3,554,771**
DESIGN AND CONSTRUCTION MANAGEMENT SERVICES (15%)	**$533,216**
TOTAL	**$4,087,987**

Project:	Silverdale RAGF Master Plan	Date:	29-Mar-18
Estimate Basis:	Planning Level, Order of Magnitude for Preliminary Alternatives	Costs:	2018 Dollars
Location:	Silverdale, Kitsap County Washington	Prepared By:	K. Hufnagel, Parametrix

DETAILED CAPITAL COST ESTIMATE

I. Expand LHHW Area

Item	Quantity	Units	Unit Price	Item Cost	Total
Overhead and Profit 12% of Direct Construction Cost Below	1	LS	LS	$7,700	
Earthwork					
Common Excavation/Fill	1300	CY	$8.00	$10,400	
Finishing Grading	0.25	Acres	$8,000.00	$2,000	
Subgrade Preparation	1000	SY	$2.00	$2,000	
Gravel Base (9" thick)	500	Tons	$35.00	$17,500	
Prime Coat/Tack Coat	150	GAL	$3.00	$450	
Asphalt Pavement, Parking (5" thick new, 2" overlay)	300	Tons	$90.00	$27,000	
Site Drainage					
Collection system	1	LS	LS	$5,000	
Total w/o Contingency					$72,050
Contingency (20%)					$14,410
Total w/ Contingency					$86,460
Tax (9%)					$7,781
Total w/ Tax					$94,241
Design and CM Services (15%)					$14,136
TOTAL					**$108,378**

II. Separate Hauler Entrance

Item	Quantity	Units	Unit Price	Item Cost	Total
Overhead and Profit 12% of Direct Construction Cost Below	1	LS	LS	$4,500	
Earthwork					
Common Excavation/Fill	2900	CY	$8.00	$23,200	
Finishing Grading	0.1	Acres	$8,000.00	$800	
Subgrade Preparation	300	SY	$2.00	$600	
Gravel Base (9" thick)	100	Tons	$35.00	$3,500	
Prime Coat/Tack Coat	50	GAL	$3.00	$150	
Asphalt Pavement, Parking (5" thick new, 2" overlay)	100	Tons	$90.00	$9,000	
Vehicle Guardrail	200	LF	$50.00	$10,000	
Fencing and Gates					
25 Foot Motor-Operated Gates	1	EA	$7,500.00	$7,500	
CCTV System	1	EA	$2,000.00	$2,000	
Electrical	200	LF	$90.00	$18,000	
Fiber Allowance	300	LF	$50.00	$15,000	
Site Lighting					
Conduit and Cable	200	LF	$9.50	$1,900	
Concrete Base	1	EA	$380.00	$380	
Standard and Luminaire	1	EA	$3,000.00	$3,000	
Total w/o Contingency					$99,530
Contingency (20%)					$19,906
Total w/ Contingency					$119,436
Tax (9%)					$10,749
Total w/ Tax					$130,185
Design and CM Services (15%)					$19,528
TOTAL					**$149,713**

III. Recycle Area Finger Wall and Canopy

Item	Quantity	Units	Unit Price	Item Cost	Total
Overhead and Profit 12% of Direct Construction Cost Below	1	LS	LS	$30,100	
Roadway and Sidewalk Concrete					
8" Reinforced	-225	SY	$100.00	-$22,500	
Recycle Area Finger Wall Structure					
Concrete Foundation Walls	214	CY	$500.00	$107,000	
6" Reinforced (Finger Pier)	285	SY	$85.00	$24,225	
Rub Rail Pressure Treated 3" x 12"	475	LF	$10.00	$4,750	
Guardrail (42" high) Hot Dip Galv & Painted	475	LF	$65.00	$30,875	
Rub Rail Anchor Bolts	270	EA	$20.00	$5,400	
Optional Recycle Area Canopy					
Column Foundation Concrete	40	CY	$500.00	$20,000	
Wide Flange Columns	20	EA	$2,000.00	$40,000	
Roof Structure (Framing, Prefin Metal Covering, Gutters/DS, Skylights)	3600	SF	$35.00	$126,000	
Electrical Power Supply Allowance	1	LS	LS	$15,000	
Light Fixtures with Manual and Photoelectric Controls	17	EA	$1,000.00	$17,000	
Recycling Access Platform	-8	EA	$7,500.00	-$60,000	
Recycle Area Container Receiving Structure					
Concrete	-56	CY	$500.00	-$28,000	
Armor Plate w/ Anchor Studs	-3000	LB	$4.50	-$13,500	
Steel Channels w/ Anchor Studs	-3500	LB	$4.50	-$15,750	
Total w/o Contingency					$280,600
Contingency (20%)					$56,120
Total w/ Contingency					$336,720
Tax (9%)					$30,305
Total w/ Tax					$367,025
Design and CM Services (15%)					$55,054
TOTAL					**$422,079**

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SILVERDALE RAGF MASTERPLAN
PRELIMINARY QUEUING ASSESSMENT
JANUARY 2018

Introduction:

The objective of this preliminary queuing assessment is to estimate reasonable inbound and outbound customer traffic queuing lengths required at the proposed new attendant facility that can then be used in establishing alternative site layouts. This queuing assessment is not a detailed, data-driven algorithmic queuing analysis, but rather is based on: a) anecdotal information gathered from Kitsap County (County) staff regarding current queuing conditions at the Silverdale Recycling and Garbage Facility (RAGF) site given the current site layout; and b) reasonable assumptions and approximations of likely traffic conditions during the 30 year planning horizon, including at some future time the implementation of weight based garbage fees. Given various physical site constraints, and capital budget constraints, it seems likely that it will be difficult to develop the desired inbound and outbound queuing lengths.

Current Conditions:

Based on discussions with County staff, it is understood that with the current site layout and operational practices, inbound customer traffic rarely, if ever, backs up beyond the site entrance off of Dickey Road NW. Furthermore, currently, inbound recycle and garbage customers share a common single queuing lane up to the point (bifurcation point) where recycle customers are able to turn left into the recycle area (i.e. there is no recycle customer bypass). The common queue distance is approximately 550 feet. Beyond the bifurcation point there is approximately a 50-foot queue lane length for garbage customers to the stop at the current attendant's building. Load assessment and payment are made at this stopping point.

Based on anecdotal observations, County staff estimate that garbage-only customers account for around 10% of the total customer count, 40% are recycle-only customers, and the remaining 50% have both recycle and garbage material. Therefore, it is estimated that 60% of the total customers have been accounted for in past transaction data and 40% have not been accounted for in that data. This 60/40 split is used to generate peak hour, queue length forecasts.

Future Conditions:

When the new attendant facility is completed, and for the foreseeable future, all inbound customers will stop at the attendant facility thus requiring a transaction time for all customers. Garbage-only and garbage-plus-recycling customers will have their loads assessed and will make payment at this point. Recycle-only customers will be directed on to the recycle area. For estimating purposes, it is assumed that the average transaction time for inbound garbage customers will be 3 minutes (per Programming Workshop), and for recycle-only customers (no payment transaction) will be 30 seconds. For estimating purposes, it is assumed that current

distribution of customer count between garbage-only, recycle-only and garbage-plus-recycling will continue similar to the current distribution (10%/40%/50% respectively). Until weight based fee assessment is instituted, all outbound customers will be able to pass the attendant facility without interacting with the attendant (i.e. no outbound queuing).

When and if scales and weight based garbage transaction fees are implemented, the payment transaction will shift to the outbound direction which will result in a shortening of the inbound transaction time for customers, other than for the recycle-only customers. It is assumed that the shorted inbound transaction time will reduce to 30 seconds, and that the outbound transaction time for weight based customers will average 2 minutes. Recycle-only customers will continue to be able to bypass the attendant facility outbound. Overall the implementation of weight based fees should reduce inbound queuing distance needs and create the need for outbound queuing distance. Note that inbound and outbound weight based transaction durations may require two attendees; otherwise, transaction times will be impacted by alternating transactions occurring for the opposite traffic flow.

Attachment A is a forecast of garbage and recycling tonnage and customer count based on the assumption of a 3,275.3-person annual growth. The growth is then used to generate an annual growth factor which is applied to tonnage and customer counts.

For planning purposes, it is assumed that weight based fee assessment will be implemented for garbage customers only during the planning horizon and that this will be implemented beginning 2029. Given the previously stated assumptions, the following table summarizes forecasted peak daily traffic conditions without and with weight based garbage transactions:

Table 1 – Forecasted Peak Daily Traffic by Customer Type
(T = Total Forecasted Peak Daily Customers)

	a	b	c			
Peak Year	**Forecasted Inbound Recycle & Garbage Customers (Attachment A)**	**Total Customers, T (a/0.6)**	**Inbound Recycle Only Customers (b x 0.4)**	**Inbound Garbage Only Customers (b x 0.1)**	**Outbound Bypass Customers**	**Outbound Rescale Customers**
Current Pre-Weight Based Fee Assessment (no scales)						
2016	250	417	167	42	417	NA
Future Pre-Weight Based Fee Assessment (no scales)						
2028	351	584	234	58	584	NA
Future Post-Weight Based Fee Assessment (with scales)						
2047	422	704	282	70	282	422

Queuing Assessment:

Assume average vehicle queue length is 21 feet (18-foot vehicle length plus 1.5 feet bumper spacing front and rear). Assume peak hour traffic occurs on peak day and is approximately 20% of total peak day traffic count.

Current Pre-Weight Based Fee Assessment

Peak hour, inbound traffic count = 20% X 250 = 50

Average transaction time is around 2.0 minutes

Peak hour vehicles in queue = vehicles inbound – vehicles processed = 50 – 60/2.0 = 50 – 30 = 20 vehicles in queue

Peak hour, queue length = 20 vehicles X 21 feet/vehicle = **420 feet**

The 420-foot queue almost backs up inbound customer traffic to the entrance at Dickey Road NW, which is similar to conditions observed by County staff.

Future Pre-Weight Based Fee Assessment Period:

Peak hour, inbound traffic count = 20% X 584 = 117

If 40% of inbound vehicles require a 0.5-minute transaction, and 60% require a 3-minute transaction, the average transaction time is around 2.0 minutes

Peak hour vehicles in queue = vehicles inbound – vehicles processed = 117 – 60/2.0 = 117 – 30 = 87 vehicles in queue, and

Peak hour, queue length = 87 vehicles X 21 feet/vehicle = **1,827 feet**

Future Post-Weight Based Fee Assessment Period:

Peak hour, inbound traffic count = 20% X 704 = 141

Peak hour, outbound traffic count = 20% X 422 = 84

100% of inbound vehicles require an assumed 0.5-minute inbound transaction

Peak hour inbound vehicles in queue = vehicles inbound – vehicles processed = 141 – 60/0.5 = 141 – 120 = 21 vehicles in queue, and

Peak hour inbound queue length = 21 vehicles X 21 feet/vehicle = **441 feet**

100% of outbound vehicles require an assumed 2-minute outbound transaction

Peak hour, outbound vehicles in queue = rescale vehicles outbound – vehicles processed = 84 – 60/2 = 84 – 30 = 54 vehicles in queue, and

Peak hour, outbound queue length = 54 vehicles X 21 feet/vehicle = **1,134 feet**

Conclusion:

This very simplistic assessment is based on many assumptions and approximations and does not attempt to redistribute customer arrival times outside of future busy traffic periods. Such a redistribution is likely to occur as repeat customers learn from experience how to avoid congested times. It seems likely that the queue lengths forecasted are highly conservative.

Regardless, as stated in the introduction, physical site constraints and budget constraints limit the amount of inbound and outbound queuing length that can practically be developed. The objective of the alternative site arrangements should be to develop as much inbound and outbound queue length as is practical and affordable.

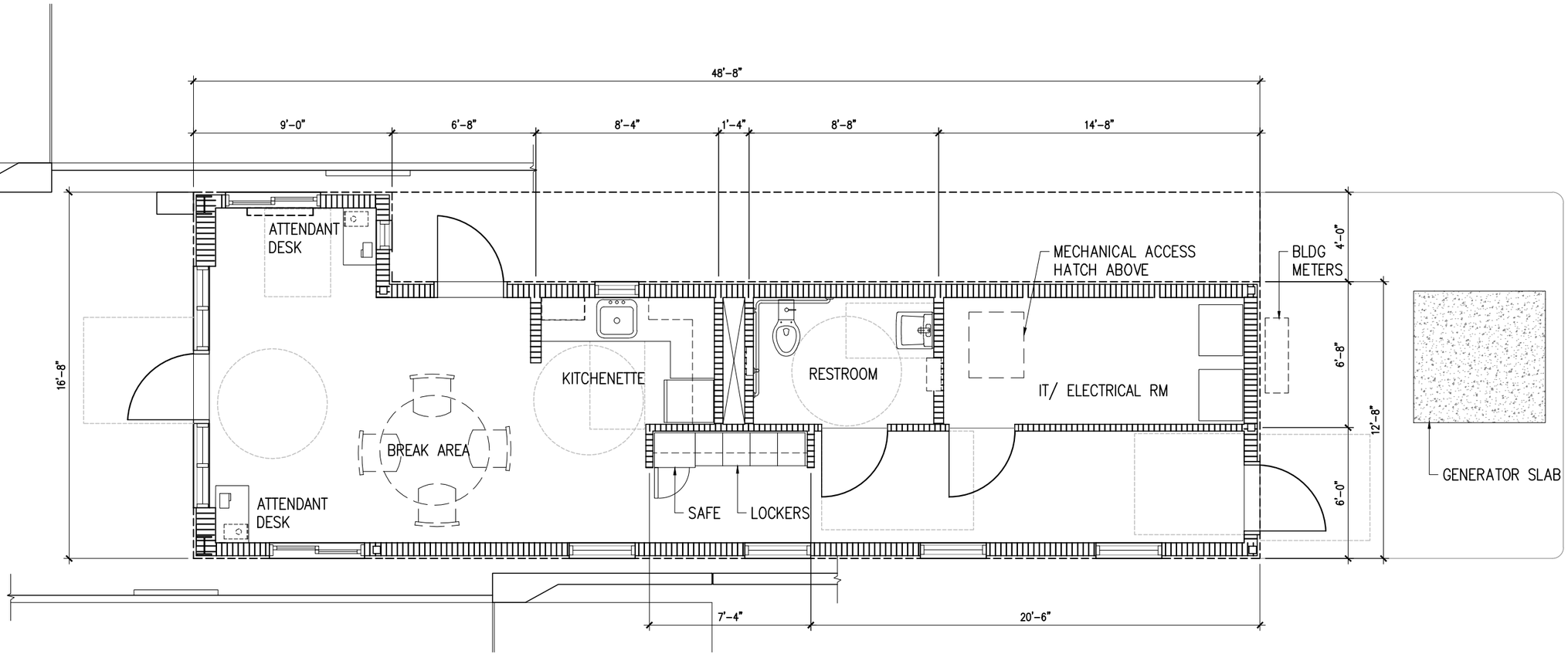
Silverdale RAGF ATTACHMENT A

Customer Counts

Kitsap County Solid Waste Division

	County-Wide Population		Disposal Tonnage		Customers, Peak Daily	
Year	Capital Facilities Plan	Calculated Projections	Refuse	Recycling	Garbage-Only/ Garbage-Plus-Recycling	Recycle-Only
2012	254,500	254,500				
2013	257,775	257,775				
2014	261,051	261,051				
2015	264,326	264,326	3,037	978	238	159
2016	267,601	267,601	3,647	1,102	250	167
2017	270,876	270,877	3,968	1,126	309	206
2018	274,152	274,152	4,016	1,346	313	209
2019	277,427	277,427	4,064	1,362	317	211
2020	280,702	280,702	4,112	1,379	320	214
2021	283,977	283,978	4,160	1,395	324	216
2022	287,253	287,253	4,208	1,411	328	219
2023	290,528	290,528	4,256	1,427	332	221
2024	293,803	293,804	4,304	1,444	335	224
2025	297,078	297,079	4,352	1,460	339	226
2026	300,354	300,354	4,400	1,476	343	229
2027	303,629	303,630	4,448	1,492	347	231
2028	306,904	306,905	4,496	1,509	351	234
2029	310,179	310,180	4,544	1,525	354	236
2030	313,455	313,455	4,592	1,541	358	239
2031	316,730	316,731	4,640	1,558	362	241
2032	320,005	320,006	4,688	1,574	366	244
2033	323,280	323,281	4,736	1,590	370	246
2034	326,556	326,557	4,784	1,606	373	249
2035	329,831	329,832	4,832	1,623	377	251
2036	333,106	333,107	4,880	1,639	381	254
2037		336,383	4,928	1,655	385	256
2038		339,658	4,976	1,671	388	259
2039		342,933	5,024	1,688	392	261
2040		346,208	5,072	1,704	396	264
2041		349,484	5,120	1,720	400	267
2042		352,759	5,168	1,737	404	269
2043		356,034	5,216	1,753	407	272
2044		359,310	5,264	1,769	411	274
2045		362,585	5,312	1,785	415	277
2046		365,860	5,360	1,802	419	279
2047		369,136	5,408	1,818	422	282

ATTACHMENT E



A/1 ATTENDANT BUILDING FLOOR PLAN

SCALE: 3/8" = 1'–0"

KPG
Interdisciplinary Design
3131 Elliott Ave, Suite 400, Seattle, WA 98121, (206) 286-1640
2502 Jefferson Ave, Tacoma, WA 98402, (253) 627-0720, www.kpg.com

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ATTENDANT BUILDING PLAN

SILVERDALE RAGF

REVISIONS

NO.	DATE	BY	APPR.

SCALE: ONE INCH AS DRAWN

Approved By

QA/QC MANAGER DATE

PROJECT MANAGER S. FISCHER DATE

PROJECT ARCHITECT DATE

X_A301_FP.dwg
FILENAME

C. WENTWORTH
DESIGNED BY DATE

C. WENTWORTH
DRAWN BY DATE

S. FISCHER 2/13/18
CHECKED BY DATE

SHT _____ OF _____

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Appendix H

Alternatives Analysis Memorandum

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ALTERNATIVES ANALYSIS

DATE: June 13, 2018

TO: Keli McKay-Means

FROM: Ian Sutton

PROJECT NUMBER: 553-1578-148

PROJECT NAME: Silverdale Recycling and Garbage Facility
Facility Master Plan

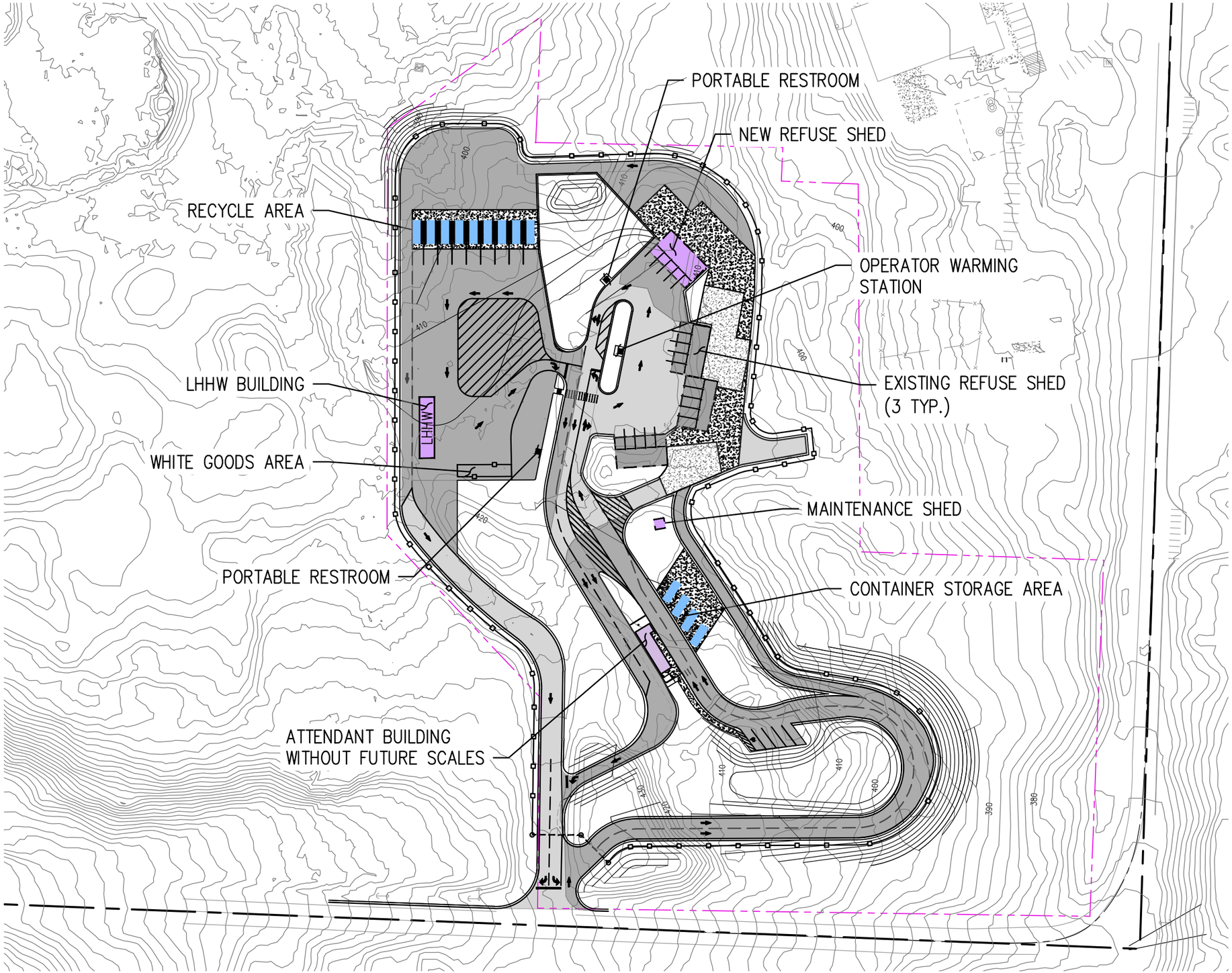
Conceptual alternatives for the Silverdale Recycling and Garbage Facility (RAGF) redevelopment were presented to Kitsap County (County) in the Alternatives Identification Memorandum. The memorandum was presented to the following stakeholders for their consideration of the alternatives in relation to the previously established Facility Programming/Needs Statement and Alternatives Evaluation Criteria.

Keli McKay-Means, Solid Waste Division
Pat Campbell, Solid Waste Division
Marshon Coppinger, Solid Waste Division
Rick Gilbert, Solid Waste Division
Leslie Haynes, Solid Waste Division
David Tucker, Public Works
Joey Pellecchia, Waste Management
Mike Frye, Waste Management

A workshop was held at the County's office on May 23, 2018 to receive and discuss stakeholder feedback, and rank the alternatives. Based on the alternatives analysis performed, it was determined that the primary Concept A, Initial Build Out alternative (Attachment A) should be modified as follows.

1. Incorporate a finger wall configuration into the recycle area with grade separation between customer and hauler use. The configuration will facilitate safer and more convenient area use. The finger wall will not initially include a canopy cover; however, the foundation will be designed to accommodate future canopy installation.
2. Provide a completely separate entrance for haulers and an entrance queue exit opportunity for entering customers.
3. Extend the refuse maneuvering area paved surface, adjacent to Refuse Sheds A and B, further east by approximately 5 feet. This will assist in the backup maneuver when using a tandem trailer haul vehicle.
4. Maintain the Limited HHW Building location and pavement extents within the vicinity of the building as shown with the understanding that these may be modified during detailed design.

Concept A will be revised to incorporate the modifications, above, and will become the Preferred Site Plan within the Facility Master Plan to be developed under Task 5. Concept A and these modifications were selected based on the alternative's ability to meet the long-term facility needs as described in the Facility Programming/Needs Statement. This includes the ability to accommodate the future installation of vehicle scales in the inbound and outbound lanes adjacent to the attendant building. The planning-level opinion of probable cost (OPC) for the construction of the Preferred Site Plan, with an expected accuracy range of -20% to +30%, is estimated to be $4,400,000 based on the estimates within the Alternatives Identification Memorandum.



KEY
EX CONC
CONC
LANDSCAPE
EX BLDG, TO REMAIN
NEW BLDG
CANOPY OVHD
STRIPED ASPHALT
PAVING SHOULDER
TRAFFIC DIRECTION
NEW PAVING
EXISTING PAVING
FENCE

1"

ATTACHMENT A

SITE PLAN CONCEPT A INITIAL BUILD OUT

1:100

0 25 50 100 150

SCALE IN FEET

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KITSAP COUNTY 1857 WASHINGTON

PROJECT
Silverdale Recycling and Garbage Facility

DRAWING TITLE
SITE PLAN CONCEPT A INITIAL BUILD OUT

DATE 3/30/18	PROJECT No.
SCALE 1:100	DRAWING No.
DRAWN BY	
CHECKED	

Appendix I

Conceptual Stormwater Management

SILVERDALE RAGF STORMWATER MANAGEMENT
CONSIDERATIONS AND ASSUMPTIONS

- Surface Water Basin Transfers: The project would modify the basin boundary between Strawberry Creek and Koch Creek. An adjustment to 2016 Kitsap County Stormwater Design Manual Minimum Requirement 4 - Preservation of Natural Drainage Systems and Outfalls - must be reviewed and approved by the authorized Kitsap County department.

- Flow Control Concept Facility Sizing: Estimated runoff and pond sizing assumed the following:

    - No infiltration is included in the pond design. This assumption should be adjusted accordingly based on geotechnical review conducted as part of detailed project design.

    - Ponds were sized based on total on-site impervious surfaces, including existing undisturbed impervious surfaces to be maintained as part of the project. These undisturbed surfaces do not trigger flow control requirements based on the 2016 Kitsap County Stormwater Design Manual requirements for redevelopment sites.

- Water Quality Treatment: The proposed project must comply with 2016 Kitsap County Stormwater Design Manual Minimum Requirement 6 – Runoff Treatment. Infiltration capacity will impact water quality treatment selection, and water quality treatment practices should be determined as part of detailed project design.

- Wetland Protection: The proposed project must comply with 2016 Kitsap County Stormwater Design Manual Minimum Requirement 8 – Wetland Protection. Therefore, site stormwater runoff discharging to wetlands must be managed in accordance with Guide Sheets 1 through 3 in Volume I, Appendix 1-D of the 2014 Ecology Stormwater Management Manual for Western Washington. Runoff analysis must be conducted to compare the hydroperiods of the wetlands under existing conditions and control proposed runoff to maintain the post-project hydroperiod within allowable parameters.

- Catch basins: Inlets were spaced to be no more than 300 feet apart, and no more than 50 feet away from an open-ended pipe inflow, based on guidance for pipes smaller than 48 inches from the 2016 Kitsap County Stormwater Design Manual and the 2017 WSDOT Hydraulics Manual. 12-inch pipe size was assumed. Quantitative inlet and pipe sizing should be conducted as part of detailed project design.

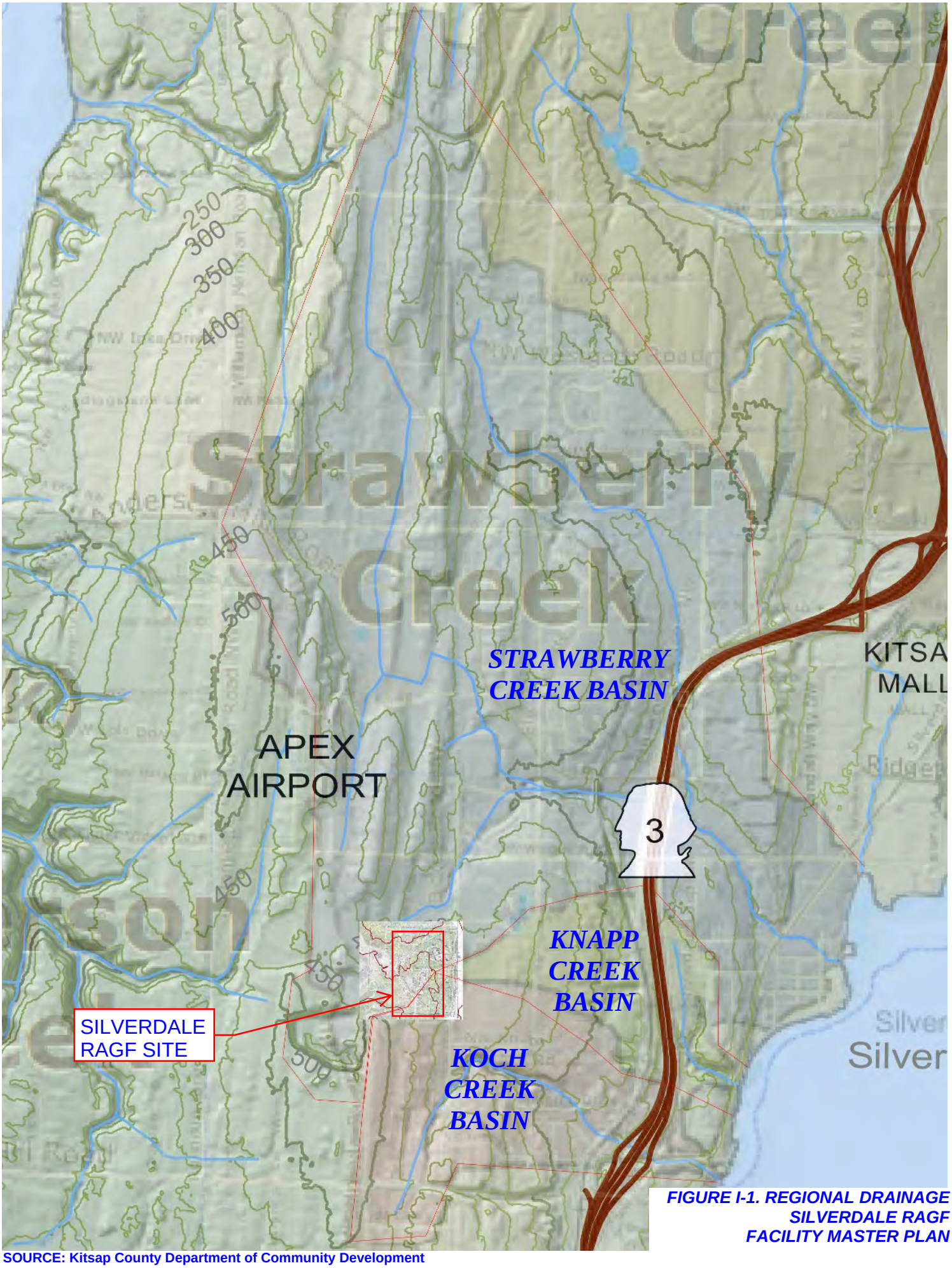

FIGURE I-1. REGIONAL DRAINAGE SILVERDALE RAGF FACILITY MASTER PLAN

SOURCE: Kitsap County Department of Community Development

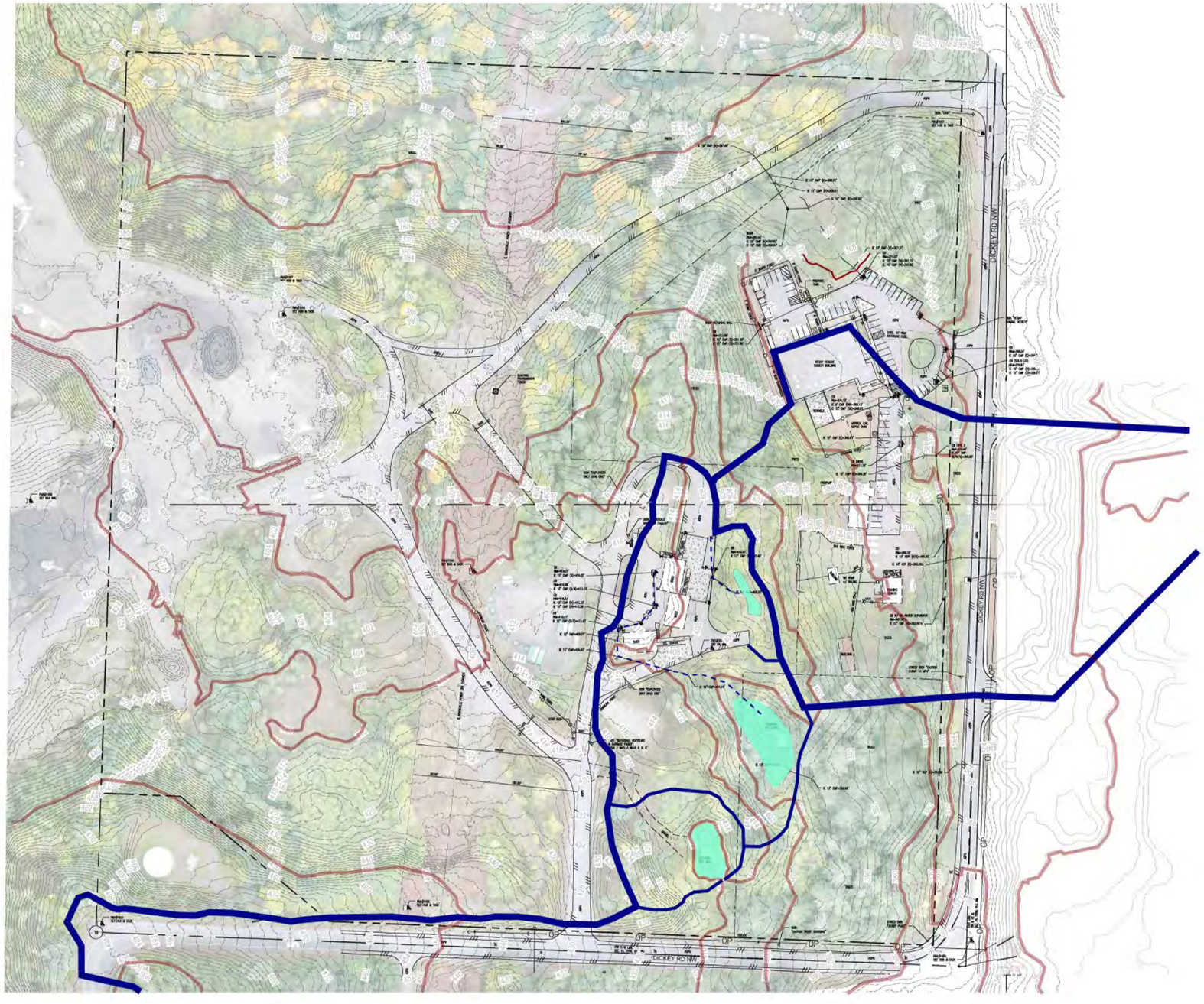

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FIGURE I-2
ON-SITE BASIN DELINEATIONS
SILVERDALE RAGF

FILE: 553-1578-148 SV BASE LAYOUT: 24x36 BOT IMAGES: 15781489AGF_transparent_mosaic_group1 |
DATE: Dec 11, 2017 – 10:12am PLOTTED BY: sharpsite XREFS: topo.tif

Proposed Site

Existing Basin Boundary

Proposed Basin Boundary

Koch to Strawberry:
4,310 sf

Strawberry to Koch:
4,310 sf

100 ft

FIGURE I-3
BASIN TRANSFERS
SILVERDALE RAGF

FIGURE I-4
SOILS
SILVERDALE RAGF

Land Cover	Area (sq ft)	(ac)
Strawberry Creek		
Forest	61,566	1.41
Grass	-	-
Impervious	50,021	1.15
Total Area	111,587	2.56
% Imperv	45%	45%
Koch Creek		
Forest	89,853	2.06
Grass	-	-
Impervious	31,917	0.73
Total Area	121,770	2.80
% Imperv	26%	26%
Total Site		
Forest	151,419	3.48
Grass	-	-
Impervious	81,937	1.88
Total Area	233,357	5.36
% Imperv	35%	35%

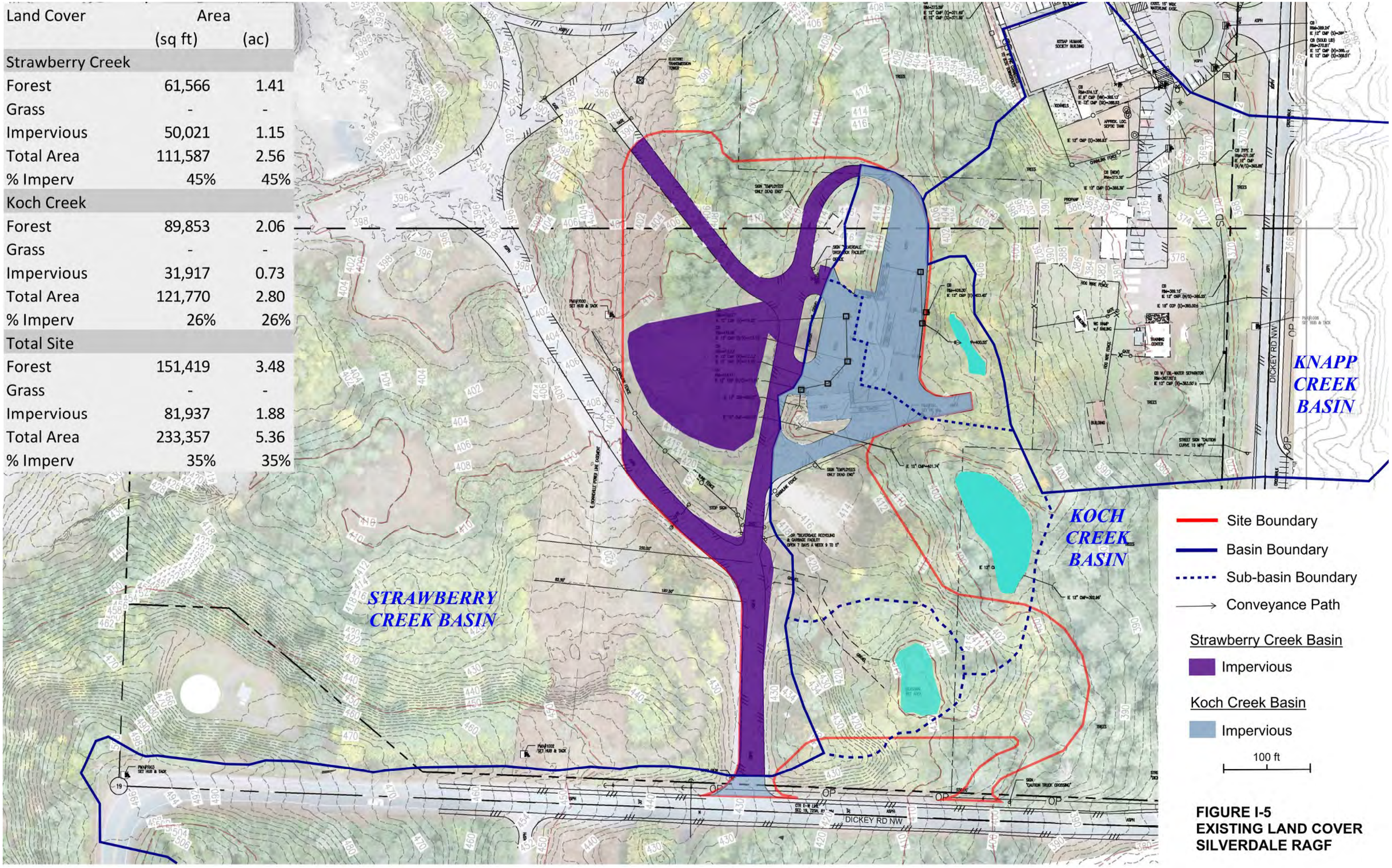


FIGURE I-5
EXISTING LAND COVER
SILVERDALE RAGF

	Runoff Area (sq ft)		Runoff Area (ac)	
	Target	Project	Target	Project
Strawberry Creek				
Forest	111,587	-	2.56	-
Impervious Pond	-	28,472	-	0.65
Impervious Pavement	-	83,114	-	1.91
Total Area	111,587	111,587	2.56	2.56
% Imperv	0%	74%	0%	75%
Pond Volume	78,000	cu-ft	1.80	ac-ft
Koch Creek				
Forest	121,770	-	2.80	-
Grass	-	32,141	-	0.74
Impervious Pond	-	8,788	-	0.20
Impervious Pavement	-	89,629	-	2.06
Total Area	121,770	121,770	2.80	2.80
% Imperv	0%	74%	0%	74%
Koch Creek Pond Subbasin				
Forest	51,883	-	1.19	-
Grass	-	13,510	-	0.31
Impervious Pond	-	8,788	-	0.20
Impervious Pavement	-	29,585	-	0.68
Total Area	51,883	51,883	1.19	1.19
Pond Volume	32,000	cu-ft	0.73	ac-ft
Total Site				
Forest	233,357	-	5.36	-
Grass	-	60,613	-	1.39
Impervious	-	172,743	-	3.97
Total Area	233,357	233,357	5.36	5.36
% Imperv	0%	74%	0%	74%

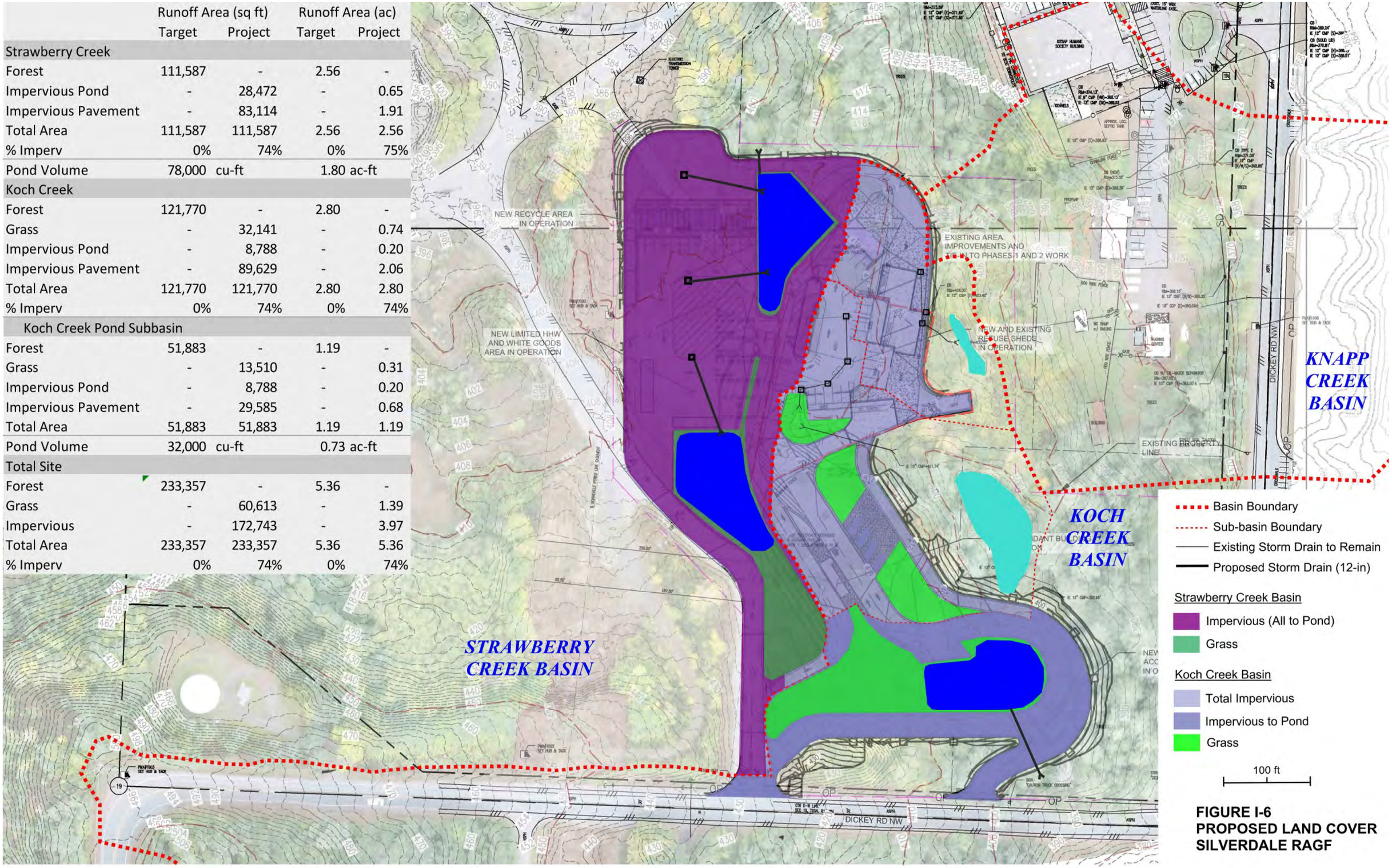


FIGURE I-6
PROPOSED LAND COVER
SILVERDALE RAGF

WWHM2012
PROJECT REPORT

Project Name: RAGF_WestPond
Site Name: Silverdale RAGF
Site Address: 8843 Dickey Rd NW
City : Silverdale, WA
Report Date: 8/6/2018
Gage : Quilcene
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 0.80
Version Date: 2018/03/02
Version : 4.2.14

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Site West (Strawberry Creek)
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	2.56
Pervious Total	**2.56**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**2.56**

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Site West (Strawberry Creek)
Bypass: No

GroundWater: No

Pervious Land Use	acre
Pervious Total	**0**

Impervious Land Use	acre
ROADS MOD	1.91
POND	0.65
Impervious Total	**2.56**
Basin Total	**2.56**

Element Flows To:

Surface	Interflow	Groundwater
West Side Pond Concept	West Side Pond Concept	

Name : West Side Pond Concept
Bottom Length: 70.00 ft.
Bottom Width: 100.00 ft.
Depth: 7 ft.
Volume at riser head: 1.4673 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.4 in. **Elevation:** 0 ft.
Orifice 2 Diameter: 1.5 in. **Elevation:** 4.5 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.160	0.000	0.000	0.000
0.0778	0.162	0.012	0.014	0.000
0.1556	0.164	0.025	0.021	0.000
0.2333	0.166	0.038	0.025	0.000
0.3111	0.168	0.051	0.029	0.000
0.3889	0.169	0.064	0.033	0.000
0.4667	0.171	0.077	0.036	0.000
0.5444	0.173	0.091	0.039	0.000
0.6222	0.175	0.104	0.042	0.000
0.7000	0.177	0.118	0.044	0.000
0.7778	0.179	0.132	0.046	0.000
0.8556	0.181	0.146	0.049	0.000
0.9333	0.183	0.160	0.051	0.000
1.0111	0.185	0.174	0.053	0.000
1.0889	0.187	0.189	0.055	0.000
1.1667	0.189	0.203	0.057	0.000
1.2444	0.191	0.218	0.059	0.000
1.3222	0.193	0.233	0.061	0.000
1.4000	0.195	0.248	0.062	0.000
1.4778	0.197	0.263	0.064	0.000
1.5556	0.199	0.279	0.066	0.000
1.6333	0.201	0.294	0.068	0.000
1.7111	0.203	0.310	0.069	0.000
1.7889	0.205	0.326	0.071	0.000
1.8667	0.207	0.342	0.072	0.000
1.9444	0.209	0.358	0.074	0.000
2.0222	0.211	0.375	0.075	0.000
2.1000	0.213	0.391	0.077	0.000
2.1778	0.215	0.408	0.078	0.000
2.2556	0.217	0.425	0.079	0.000
2.3333	0.219	0.442	0.081	0.000
2.4111	0.222	0.459	0.082	0.000
2.4889	0.224	0.476	0.083	0.000
2.5667	0.226	0.494	0.085	0.000
2.6444	0.228	0.511	0.086	0.000
2.7222	0.230	0.529	0.087	0.000

2.8000	0.232	0.547	0.089	0.000
2.8778	0.234	0.566	0.090	0.000
2.9556	0.237	0.584	0.091	0.000
3.0333	0.239	0.602	0.092	0.000
3.1111	0.241	0.621	0.093	0.000
3.1889	0.243	0.640	0.095	0.000
3.2667	0.246	0.659	0.096	0.000
3.3444	0.248	0.678	0.097	0.000
3.4222	0.250	0.698	0.098	0.000
3.5000	0.252	0.717	0.099	0.000
3.5778	0.255	0.737	0.100	0.000
3.6556	0.257	0.757	0.101	0.000
3.7333	0.259	0.777	0.102	0.000
3.8111	0.261	0.797	0.103	0.000
3.8889	0.264	0.818	0.104	0.000
3.9667	0.266	0.838	0.105	0.000
4.0444	0.268	0.859	0.107	0.000
4.1222	0.271	0.880	0.108	0.000
4.2000	0.273	0.901	0.109	0.000
4.2778	0.276	0.923	0.110	0.000
4.3556	0.278	0.944	0.111	0.000
4.4333	0.280	0.966	0.112	0.000
4.5111	0.283	0.988	0.119	0.000
4.5889	0.285	1.010	0.132	0.000
4.6667	0.288	1.032	0.139	0.000
4.7444	0.290	1.055	0.146	0.000
4.8222	0.292	1.078	0.151	0.000
4.9000	0.295	1.100	0.156	0.000
4.9778	0.297	1.124	0.160	0.000
5.0556	0.300	1.147	0.165	0.000
5.1333	0.302	1.170	0.169	0.000
5.2111	0.305	1.194	0.172	0.000
5.2889	0.307	1.218	0.176	0.000
5.3667	0.310	1.242	0.180	0.000
5.4444	0.312	1.266	0.183	0.000
5.5222	0.315	1.290	0.186	0.000
5.6000	0.317	1.315	0.189	0.000
5.6778	0.320	1.340	0.193	0.000
5.7556	0.322	1.365	0.196	0.000
5.8333	0.325	1.390	0.199	0.000
5.9111	0.328	1.415	0.201	0.000
5.9889	0.330	1.441	0.204	0.000
6.0667	0.333	1.467	0.481	0.000
6.1444	0.335	1.493	1.079	0.000
6.2222	0.338	1.519	1.849	0.000
6.3000	0.341	1.546	2.716	0.000
6.3778	0.343	1.572	3.604	0.000
6.4556	0.346	1.599	4.436	0.000
6.5333	0.349	1.626	5.147	0.000
6.6111	0.351	1.653	5.693	0.000
6.6889	0.354	1.681	6.076	0.000
6.7667	0.357	1.708	6.435	0.000
6.8444	0.359	1.736	6.744	0.000
6.9222	0.362	1.764	7.040	0.000
7.0000	0.365	1.793	7.323	0.000
7.0778	0.367	1.821	7.596	0.000

ANALYSIS RESULTS
Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:2.56
Total Impervious Area:0

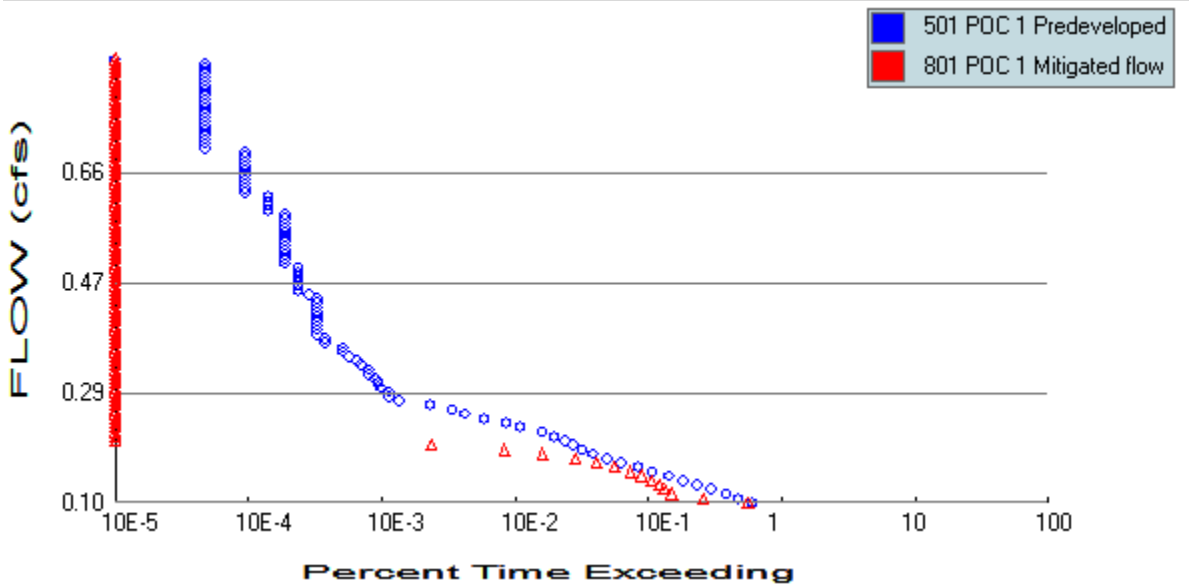
Mitigated Landuse Totals for POC #1
Total Pervious Area:0
Total Impervious Area:2.56

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.201444
5 year	0.353914
10 year	0.481122
25 year	0.673936
50 year	0.84231
100 year	1.033098

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.106048
5 year	0.135775
10 year	0.157026
25 year	0.185716
50 year	0.208463
100 year	0.232426



Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.383	0.108
1950	0.123	0.094
1951	0.276	0.110
1952	0.122	0.093
1953	0.163	0.110
1954	0.446	0.136
1955	0.347	0.093
1956	1.912	0.111
1957	0.298	0.157
1958	0.453	0.094
1959	0.365	0.203
1960	0.203	0.104
1961	0.594	0.097
1962	0.134	0.102
1963	0.187	0.154
1964	0.149	0.085
1965	0.093	0.087
1966	0.502	0.091
1967	0.272	0.188
1968	0.291	0.111
1969	0.214	0.103
1970	0.230	0.112
1971	0.368	0.099
1972	0.330	0.096
1973	0.173	0.104
1974	0.247	0.191
1975	0.265	0.085
1976	0.310	0.095
1977	0.146	0.099
1978	0.260	0.097
1979	0.199	0.106
1980	0.147	0.095
1981	0.116	0.091
1982	0.092	0.089
1983	0.217	0.185
1984	0.083	0.082
1985	0.040	0.070
1986	0.206	0.111
1987	0.173	0.103
1988	0.139	0.103
1989	0.086	0.080
1990	0.083	0.107
1991	0.178	0.126
1992	0.223	0.200
1993	0.103	0.083
1994	0.261	0.190
1995	0.241	0.117
1996	0.309	0.177
1997	0.203	0.111
1998	0.250	0.148
1999	0.370	0.184
2000	0.102	0.091
2001	0.049	0.084
2002	0.625	0.101

2003	0.330	0.144
2004	0.091	0.082
2005	0.172	0.084
2006	0.337	0.110
2007	0.218	0.093
2008	0.249	0.106
2009	0.076	0.061

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.9115	0.2034
2	0.6247	0.1996
3	0.5939	0.1913
4	0.5022	0.1901
5	0.4531	0.1881
6	0.4455	0.1849
7	0.3830	0.1838
8	0.3698	0.1767
9	0.3681	0.1572
10	0.3651	0.1545
11	0.3466	0.1477
12	0.3369	0.1442
13	0.3302	0.1361
14	0.3300	0.1265
15	0.3105	0.1168
16	0.3086	0.1115
17	0.2979	0.1112
18	0.2914	0.1111
19	0.2762	0.1107
20	0.2720	0.1106
21	0.2648	0.1097
22	0.2612	0.1097
23	0.2600	0.1096
24	0.2505	0.1076
25	0.2489	0.1066
26	0.2474	0.1062
27	0.2409	0.1062
28	0.2299	0.1043
29	0.2230	0.1039
30	0.2179	0.1029
31	0.2166	0.1028
32	0.2137	0.1027
33	0.2064	0.1023
34	0.2033	0.1014
35	0.2032	0.0987
36	0.1993	0.0985
37	0.1865	0.0967
38	0.1785	0.0965
39	0.1735	0.0961
40	0.1732	0.0950
41	0.1718	0.0947
42	0.1633	0.0941
43	0.1489	0.0940
44	0.1469	0.0930
45	0.1458	0.0929

46	0.1391	0.0928
47	0.1343	0.0914
48	0.1235	0.0909
49	0.1217	0.0908
50	0.1159	0.0886
51	0.1029	0.0866
52	0.1017	0.0852
53	0.0925	0.0846
54	0.0917	0.0840
55	0.0908	0.0835
56	0.0860	0.0827
57	0.0831	0.0821
58	0.0829	0.0817
59	0.0762	0.0804
60	0.0494	0.0701
61	0.0402	0.0613

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1007	12733	11944	93	Pass
0.1082	10040	5529	55	Pass
0.1157	8147	3187	39	Pass
0.1232	6293	2802	44	Pass
0.1307	4971	2571	51	Pass
0.1382	3831	2231	58	Pass
0.1457	3044	1903	62	Pass
0.1532	2278	1566	68	Pass
0.1606	1783	1183	66	Pass
0.1681	1313	867	66	Pass
0.1756	1046	602	57	Pass
0.1831	818	342	41	Pass
0.1906	679	177	26	Pass
0.1981	575	50	8	Pass
0.2056	507	0	0	Pass
0.2131	416	0	0	Pass
0.2206	338	0	0	Pass
0.2281	233	0	0	Pass
0.2356	183	0	0	Pass
0.2430	125	0	0	Pass
0.2505	89	0	0	Pass
0.2580	72	0	0	Pass
0.2655	49	0	0	Pass
0.2730	29	0	0	Pass
0.2805	24	0	0	Pass
0.2880	24	0	0	Pass
0.2955	21	0	0	Pass
0.3030	20	0	0	Pass
0.3105	19	0	0	Pass
0.3180	17	0	0	Pass
0.3254	17	0	0	Pass
0.3329	15	0	0	Pass

0.3404	14	0	0	Pass
0.3479	12	0	0	Pass
0.3554	11	0	0	Pass
0.3629	11	0	0	Pass
0.3704	8	0	0	Pass
0.3779	8	0	0	Pass
0.3854	7	0	0	Pass
0.3929	7	0	0	Pass
0.4004	7	0	0	Pass
0.4078	7	0	0	Pass
0.4153	7	0	0	Pass
0.4228	7	0	0	Pass
0.4303	7	0	0	Pass
0.4378	7	0	0	Pass
0.4453	7	0	0	Pass
0.4528	6	0	0	Pass
0.4603	5	0	0	Pass
0.4678	5	0	0	Pass
0.4753	5	0	0	Pass
0.4828	5	0	0	Pass
0.4902	5	0	0	Pass
0.4977	5	0	0	Pass
0.5052	4	0	0	Pass
0.5127	4	0	0	Pass
0.5202	4	0	0	Pass
0.5277	4	0	0	Pass
0.5352	4	0	0	Pass
0.5427	4	0	0	Pass
0.5502	4	0	0	Pass
0.5577	4	0	0	Pass
0.5652	4	0	0	Pass
0.5726	4	0	0	Pass
0.5801	4	0	0	Pass
0.5876	4	0	0	Pass
0.5951	3	0	0	Pass
0.6026	3	0	0	Pass
0.6101	3	0	0	Pass
0.6176	3	0	0	Pass
0.6251	2	0	0	Pass
0.6326	2	0	0	Pass
0.6401	2	0	0	Pass
0.6475	2	0	0	Pass
0.6550	2	0	0	Pass
0.6625	2	0	0	Pass
0.6700	2	0	0	Pass
0.6775	2	0	0	Pass
0.6850	2	0	0	Pass
0.6925	2	0	0	Pass
0.7000	1	0	0	Pass
0.7075	1	0	0	Pass
0.7150	1	0	0	Pass
0.7225	1	0	0	Pass
0.7299	1	0	0	Pass
0.7374	1	0	0	Pass
0.7449	1	0	0	Pass
0.7524	1	0	0	Pass
0.7599	1	0	0	Pass

0.7674	1	0	0	Pass
0.7749	1	0	0	Pass
0.7824	1	0	0	Pass
0.7899	1	0	0	Pass
0.7974	1	0	0	Pass
0.8049	1	0	0	Pass
0.8123	1	0	0	Pass
0.8198	1	0	0	Pass
0.8273	1	0	0	Pass
0.8348	1	0	0	Pass
0.8423	1	0	0	Pass

Perlnd and Implnd Changes

No changes have been made.

Facility Geometry

Adapted from: MGS Software LLC

Side Slopes (z)	3.0 Ft/Ft	Bottom Elevation:	0.00 Ft
Length:	100.0 Ft	Riser Height:	6.00 Ft
Width:	70.0 Ft	Overflow Elevation:	6.00 Ft
Bottom Area:	7,000 Sq Ft	Total Facility Depth:	7.00 Ft
Infiltration Rate:	0.00 in/hr	Top of Facility Elev:	7.00 Ft
Riser Diameter:	18.00 In	Spillway Width:	0.00 Ft
		Volume at Overflow:	59830 Cu Ft
1/2 Q_2:	0.101 cfs		
Q_{50}:	0.842 cfs		

Orifice:	#1	#2	notch	riser	spillway
dia/width (in)=	1.40	1.50	0.00	56.55	0.00
height (ft)=	0.00	4.50	0.00	6.00	n/a
elev (ft)=	0.00	4.50	0.00	6.00	n/a

depth ft	area s.f.	strg vol cu.ft.	strg vol (ac.ft)	flow cfs	flow cfs	flow cfs	flow cfs	flow cfs	total outflow cfs	Total Infiltrn cfs	Orifice
0.00	7000	0	0	-	-	-	-	-	-	-	#1
0.20	7202	1420	0.033	0.024	-	-	-	-	0.024	-	
0.40	7407	2881	0.066	0.034	-	-	-	-	0.034	-	
0.60	7615	4383	0.101	0.041	-	-	-	-	0.041	-	
0.80	7826	5928	0.136	0.048	-	-	-	-	0.048	-	
1.00	8040	7514	0.173	0.053	-	-	-	-	0.053	-	
1.20	8257	9144	0.210	0.058	-	-	-	-	0.058	-	
1.40	8476	10817	0.248	0.063	-	-	-	-	0.063	-	
1.60	8699	12535	0.288	0.067	-	-	-	-	0.067	-	
1.80	8924	14297	0.328	0.071	-	-	-	-	0.071	-	
2.00	9152	16104	0.370	0.075	-	-	-	-	0.075	-	
2.20	9383	17958	0.412	0.079	-	-	-	-	0.079	-	
2.40	9617	19858	0.456	0.082	-	-	-	-	0.082	-	
2.60	9854	21805	0.501	0.086	-	-	-	-	0.086	-	
2.80	10093	23800	0.546	0.089	-	-	-	-	0.089	-	
3.00	10336	25843	0.593	0.092	-	-	-	-	0.092	-	
3.20	10581	27934	0.641	0.095	-	-	-	-	0.095	-	
3.40	10830	30076	0.690	0.098	-	-	-	-	0.098	-	
3.60	11081	32267	0.741	0.101	-	-	-	-	0.101	-	
3.80	11335	34508	0.792	0.104	-	-	-	-	0.104	-	
4.00	11592	36801	0.845	0.106	-	-	-	-	0.106	-	
4.20	11852	39145	0.899	0.109	-	-	-	-	0.109	-	
4.40	12115	41542	0.954	0.112	-	-	-	-	0.112	-	
4.60	12380	43991	1.010	0.114	0.019	-	-	-	0.133	-	
4.80	12649	46494	1.067	0.116	0.033	-	-	-	0.150	-	
5.00	12920	49051	1.126	0.119	0.043	-	-	-	0.162	-	
5.20	13194	51663	1.186	0.121	0.051	-	-	-	0.172	-	
5.40	13471	54329	1.247	0.124	0.058	-	-	-	0.181	-	
5.60	13751	57051	1.310	0.126	0.064	-	-	-	0.190	-	
5.80	14034	59830	1.374	0.128	0.070	-	-	-	0.198	-	
6.00	14320	62665	1.439	0.130	0.075	-	0.000	-	0.205	-	Riser
6.20	14609	65558	1.505	0.132	0.080	-	1.404	-	1.615	-	
6.40	14900	68509	1.573	0.134	0.084	-	3.970	-	4.188	-	
6.60	15195	71518	1.642	0.137	0.088	-	7.293	-	7.518	-	
6.80	15492	74587	1.712	0.139	0.093	-	11.228	-	11.460	-	
7.00	15792	77715	1.784	0.141	0.096	-	15.692	-	15.929	-	

Flow control target range: 1/2 Q_2 to Q_{50}

WWHM2012
PROJECT REPORT

Project Name: RAGF_EastPond
Site Name: Silverdale RAGF
Site Address: 8843 Dickey Rd NW
City : Silverdale, WA
Report Date: 8/7/2018
Gage : Quilcene
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 0.80
Version Date: 2018/03/02
Version : 4.2.14

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Site East/South Subbasin (Koch Creek)
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	1.19
Pervious Total	1.19

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.19

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Site East/South Subbasin (Koch Creek)
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Mod	.31
Pervious Total	0.31

Impervious Land Use	acre
ROADS MOD	0.68
POND	0.2
Impervious Total	0.88
Basin Total	1.19

Element Flows To:

Surface	Interflow	Groundwater
East Side Pond Concept	East Side Pond Concept	

Name : East Side Pond Concept
Bottom Length: 80.00 ft.
Bottom Width: 50.00 ft.
Depth: 5.5 ft.
Volume at riser head: 0.6238 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1 in. **Elevation:** 0 ft.
Orifice 2 Diameter: 1.5 in. **Elevation:** 3.5 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.091	0.000	0.000	0.000
0.0611	0.092	0.005	0.006	0.000
0.1222	0.094	0.011	0.009	0.000
0.1833	0.095	0.017	0.011	0.000
0.2444	0.096	0.023	0.013	0.000
0.3056	0.097	0.028	0.015	0.000
0.3667	0.098	0.034	0.016	0.000
0.4278	0.099	0.040	0.017	0.000
0.4889	0.100	0.047	0.019	0.000
0.5500	0.101	0.053	0.020	0.000
0.6111	0.103	0.059	0.021	0.000
0.6722	0.104	0.065	0.022	0.000
0.7333	0.105	0.072	0.023	0.000
0.7944	0.106	0.078	0.024	0.000
0.8556	0.107	0.085	0.025	0.000
0.9167	0.108	0.091	0.026	0.000
0.9778	0.110	0.098	0.026	0.000
1.0389	0.111	0.105	0.027	0.000
1.1000	0.112	0.112	0.028	0.000
1.1611	0.113	0.119	0.029	0.000
1.2222	0.114	0.126	0.030	0.000
1.2833	0.116	0.133	0.030	0.000
1.3444	0.117	0.140	0.031	0.000
1.4056	0.118	0.147	0.032	0.000
1.4667	0.119	0.154	0.032	0.000
1.5278	0.121	0.162	0.033	0.000
1.5889	0.122	0.169	0.034	0.000
1.6500	0.123	0.177	0.034	0.000
1.7111	0.124	0.184	0.035	0.000
1.7722	0.126	0.192	0.036	0.000
1.8333	0.127	0.200	0.036	0.000
1.8944	0.128	0.208	0.037	0.000
1.9556	0.130	0.215	0.037	0.000
2.0167	0.131	0.223	0.038	0.000
2.0778	0.132	0.231	0.039	0.000
2.1389	0.133	0.240	0.039	0.000

2.2000	0.135	0.248	0.040	0.000
2.2611	0.136	0.256	0.040	0.000
2.3222	0.137	0.265	0.041	0.000
2.3833	0.139	0.273	0.041	0.000
2.4444	0.140	0.282	0.042	0.000
2.5056	0.141	0.290	0.043	0.000
2.5667	0.143	0.299	0.043	0.000
2.6278	0.144	0.308	0.044	0.000
2.6889	0.146	0.317	0.044	0.000
2.7500	0.147	0.326	0.045	0.000
2.8111	0.148	0.335	0.045	0.000
2.8722	0.150	0.344	0.046	0.000
2.9333	0.151	0.353	0.046	0.000
2.9944	0.152	0.362	0.047	0.000
3.0556	0.154	0.372	0.047	0.000
3.1167	0.155	0.381	0.047	0.000
3.1778	0.157	0.391	0.048	0.000
3.2389	0.158	0.400	0.048	0.000
3.3000	0.159	0.410	0.049	0.000
3.3611	0.161	0.420	0.049	0.000
3.4222	0.162	0.430	0.050	0.000
3.4833	0.164	0.440	0.050	0.000
3.5444	0.165	0.450	0.064	0.000
3.6056	0.167	0.460	0.071	0.000
3.6667	0.168	0.470	0.076	0.000
3.7278	0.170	0.481	0.081	0.000
3.7889	0.171	0.491	0.085	0.000
3.8500	0.173	0.502	0.089	0.000
3.9111	0.174	0.512	0.092	0.000
3.9722	0.176	0.523	0.096	0.000
4.0333	0.177	0.534	0.099	0.000
4.0944	0.179	0.545	0.102	0.000
4.1556	0.180	0.556	0.104	0.000
4.2167	0.182	0.567	0.107	0.000
4.2778	0.183	0.578	0.110	0.000
4.3389	0.185	0.589	0.112	0.000
4.4000	0.186	0.600	0.114	0.000
4.4611	0.188	0.612	0.117	0.000
4.5222	0.189	0.623	0.172	0.000
4.5833	0.191	0.635	0.503	0.000
4.6444	0.192	0.647	0.992	0.000
4.7056	0.194	0.659	1.587	0.000
4.7667	0.196	0.671	2.251	0.000
4.8278	0.197	0.683	2.949	0.000
4.8889	0.199	0.695	3.641	0.000
4.9500	0.200	0.707	4.294	0.000
5.0111	0.202	0.719	4.873	0.000
5.0722	0.203	0.732	5.355	0.000
5.1333	0.205	0.744	5.731	0.000
5.1944	0.207	0.757	6.012	0.000
5.2556	0.208	0.769	6.303	0.000
5.3167	0.210	0.782	6.549	0.000
5.3778	0.212	0.795	6.786	0.000
5.4389	0.213	0.808	7.015	0.000
5.5000	0.215	0.821	7.236	0.000
5.5611	0.217	0.834	7.451	0.000

ANALYSIS RESULTS
Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:1.19
Total Impervious Area:0

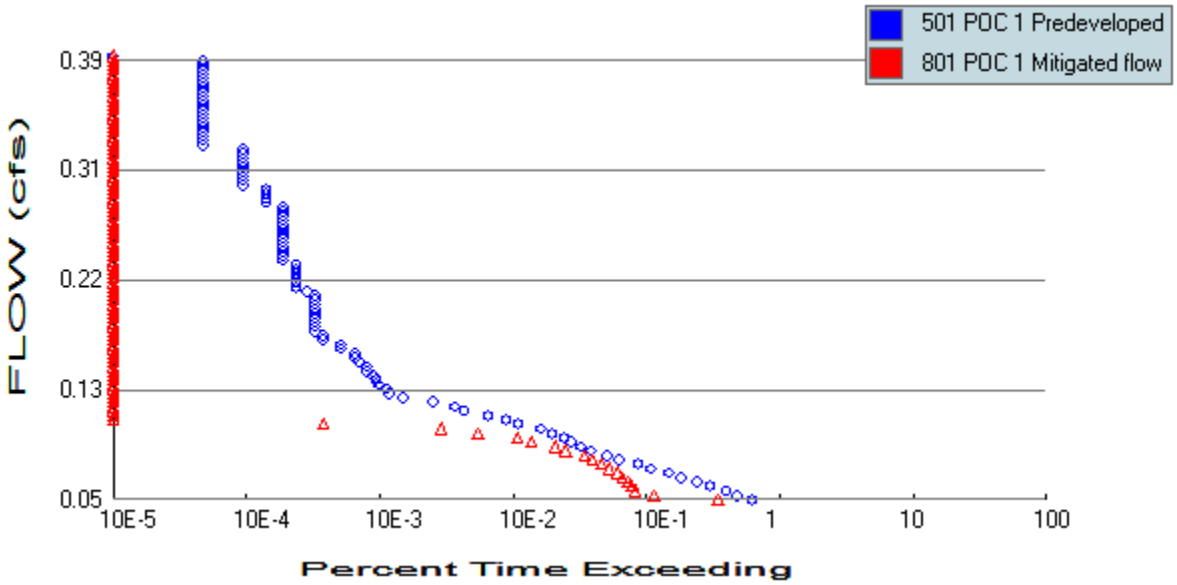
Mitigated Landuse Totals for POC #1
Total Pervious Area:0.31
Total Impervious Area:0.88

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.09364
5 year	0.164515
10 year	0.223646
25 year	0.313275
50 year	0.391543
100 year	0.480229

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.044694
5 year	0.059624
10 year	0.070868
25 year	0.086699
50 year	0.099731
100 year	0.113878



Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.178	0.046
1950	0.057	0.039
1951	0.128	0.047
1952	0.057	0.040
1953	0.076	0.047
1954	0.207	0.052
1955	0.161	0.039
1956	0.889	0.048
1957	0.138	0.062
1958	0.211	0.039
1959	0.170	0.107
1960	0.095	0.044
1961	0.276	0.041
1962	0.062	0.043
1963	0.087	0.050
1964	0.069	0.036
1965	0.043	0.036
1966	0.233	0.038
1967	0.126	0.098
1968	0.135	0.048
1969	0.099	0.044
1970	0.107	0.048
1971	0.171	0.042
1972	0.153	0.041
1973	0.081	0.043
1974	0.115	0.098
1975	0.123	0.035
1976	0.144	0.040
1977	0.068	0.042
1978	0.121	0.042
1979	0.093	0.045
1980	0.068	0.041
1981	0.054	0.039
1982	0.043	0.037
1983	0.101	0.074
1984	0.039	0.034
1985	0.019	0.028
1986	0.096	0.048
1987	0.081	0.045
1988	0.065	0.043
1989	0.040	0.034
1990	0.039	0.044
1991	0.083	0.049
1992	0.104	0.105
1993	0.048	0.034
1994	0.121	0.092
1995	0.112	0.048
1996	0.143	0.089
1997	0.094	0.047
1998	0.116	0.059
1999	0.172	0.092
2000	0.047	0.037
2001	0.023	0.034
2002	0.290	0.044

2003	0.154	0.050
2004	0.042	0.034
2005	0.080	0.035
2006	0.157	0.047
2007	0.101	0.040
2008	0.116	0.045
2009	0.035	0.025

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.8886	0.1065
2	0.2904	0.1052
3	0.2761	0.0982
4	0.2335	0.0975
5	0.2106	0.0922
6	0.2071	0.0919
7	0.1780	0.0890
8	0.1719	0.0745
9	0.1711	0.0621
10	0.1697	0.0594
11	0.1611	0.0522
12	0.1566	0.0502
13	0.1535	0.0501
14	0.1534	0.0488
15	0.1443	0.0481
16	0.1435	0.0480
17	0.1385	0.0479
18	0.1355	0.0477
19	0.1284	0.0476
20	0.1264	0.0474
21	0.1231	0.0473
22	0.1214	0.0469
23	0.1209	0.0469
24	0.1164	0.0462
25	0.1157	0.0452
26	0.1150	0.0452
27	0.1120	0.0446
28	0.1068	0.0441
29	0.1037	0.0439
30	0.1013	0.0438
31	0.1007	0.0435
32	0.0993	0.0434
33	0.0959	0.0428
34	0.0945	0.0426
35	0.0944	0.0419
36	0.0927	0.0419
37	0.0867	0.0417
38	0.0830	0.0411
39	0.0806	0.0407
40	0.0805	0.0406
41	0.0798	0.0404
42	0.0759	0.0398
43	0.0692	0.0397
44	0.0683	0.0394
45	0.0678	0.0393

46	0.0647	0.0389
47	0.0624	0.0389
48	0.0574	0.0385
49	0.0566	0.0370
50	0.0539	0.0370
51	0.0478	0.0365
52	0.0473	0.0356
53	0.0430	0.0355
54	0.0426	0.0348
55	0.0422	0.0343
56	0.0400	0.0342
57	0.0387	0.0341
58	0.0385	0.0340
59	0.0354	0.0336
60	0.0230	0.0282
61	0.0187	0.0249

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0468	13169	7362	55	Pass
0.0503	10164	2428	23	Pass
0.0538	8395	1756	20	Pass
0.0573	6374	1635	25	Pass
0.0607	5118	1549	30	Pass
0.0642	3867	1419	36	Pass
0.0677	3129	1299	41	Pass
0.0712	2304	1121	48	Pass
0.0747	1837	975	53	Pass
0.0782	1320	838	63	Pass
0.0816	1080	737	68	Pass
0.0851	823	530	64	Pass
0.0886	689	441	64	Pass
0.0921	575	291	50	Pass
0.0956	513	228	44	Pass
0.0991	417	116	27	Pass
0.1025	346	62	17	Pass
0.1060	233	8	3	Pass
0.1095	188	0	0	Pass
0.1130	138	0	0	Pass
0.1165	91	0	0	Pass
0.1199	78	0	0	Pass
0.1234	53	0	0	Pass
0.1269	32	0	0	Pass
0.1304	25	0	0	Pass
0.1339	24	0	0	Pass
0.1374	21	0	0	Pass
0.1408	20	0	0	Pass
0.1443	19	0	0	Pass
0.1478	17	0	0	Pass
0.1513	17	0	0	Pass
0.1548	15	0	0	Pass

0.1582	14	0	0	Pass
0.1617	14	0	0	Pass
0.1652	11	0	0	Pass
0.1687	11	0	0	Pass
0.1722	8	0	0	Pass
0.1757	8	0	0	Pass
0.1791	7	0	0	Pass
0.1826	7	0	0	Pass
0.1861	7	0	0	Pass
0.1896	7	0	0	Pass
0.1931	7	0	0	Pass
0.1965	7	0	0	Pass
0.2000	7	0	0	Pass
0.2035	7	0	0	Pass
0.2070	7	0	0	Pass
0.2105	6	0	0	Pass
0.2140	5	0	0	Pass
0.2174	5	0	0	Pass
0.2209	5	0	0	Pass
0.2244	5	0	0	Pass
0.2279	5	0	0	Pass
0.2314	5	0	0	Pass
0.2349	4	0	0	Pass
0.2383	4	0	0	Pass
0.2418	4	0	0	Pass
0.2453	4	0	0	Pass
0.2488	4	0	0	Pass
0.2523	4	0	0	Pass
0.2557	4	0	0	Pass
0.2592	4	0	0	Pass
0.2627	4	0	0	Pass
0.2662	4	0	0	Pass
0.2697	4	0	0	Pass
0.2732	4	0	0	Pass
0.2766	4	0	0	Pass
0.2801	3	0	0	Pass
0.2836	3	0	0	Pass
0.2871	3	0	0	Pass
0.2906	3	0	0	Pass
0.2940	2	0	0	Pass
0.2975	2	0	0	Pass
0.3010	2	0	0	Pass
0.3045	2	0	0	Pass
0.3080	2	0	0	Pass
0.3115	2	0	0	Pass
0.3149	2	0	0	Pass
0.3184	2	0	0	Pass
0.3219	2	0	0	Pass
0.3254	1	0	0	Pass
0.3289	1	0	0	Pass
0.3323	1	0	0	Pass
0.3358	1	0	0	Pass
0.3393	1	0	0	Pass
0.3428	1	0	0	Pass
0.3463	1	0	0	Pass
0.3498	1	0	0	Pass
0.3532	1	0	0	Pass

0.3567	1	0	0	Pass
0.3602	1	0	0	Pass
0.3637	1	0	0	Pass
0.3672	1	0	0	Pass
0.3707	1	0	0	Pass
0.3741	1	0	0	Pass
0.3776	1	0	0	Pass
0.3811	1	0	0	Pass
0.3846	1	0	0	Pass
0.3881	1	0	0	Pass
0.3915	1	0	0	Pass

Perlnd and Implnd Changes

No changes have been made.

Facility Geometry

Adapted from: MGS Software LLC

Side Slopes (z)	3.0 Ft/Ft	Bottom Elevation:	0.00 Ft
Length:	70.0 Ft	Riser Height:	4.50 Ft
Width:	50.0 Ft	Overflow Elevation:	4.50 Ft
Bottom Area:	3,500 Sq Ft	Total Facility Depth:	5.50 Ft
Infiltration Rate:	0.00 in/hr	Top of Facility Elev:	5.50 Ft
Riser Diameter:	18.00 In	Spillway Width:	0.00 Ft
		Volume at Overflow:	22568 Cu Ft
1/2 Q_2:	0.0468 cfs		
Q_{50}:	0.3915 cfs		

Orifice:	#1	#2	notch	riser	spillway
dia/width (in)=	1.00	1.50	0.00	56.55	0.00
height (ft)=	0.00	3.50	0.00	4.50	n/a
elev (ft)=	0.00	3.50	0.00	4.50	n/a

depth ft	area s.f.	strg vol cu.ft.	strg vol (ac.ft)	flow cfs	flow cfs	flow cfs	flow cfs	flow cfs	total outflow cfs	Total Infiltrn cfs	Orifice
0.00	3500	0	0	-	-	-	-	-	-	-	#1
0.10	3571	354	0.008	0.009	-	-	-	-	0.009	-	
0.30	3716	1082	0.025	0.015	-	-	-	-	0.015	-	
0.50	3864	1840	0.042	0.019	-	-	-	-	0.019	-	
0.70	4015	2628	0.060	0.023	-	-	-	-	0.023	-	
0.90	4168	3446	0.079	0.026	-	-	-	-	0.026	-	
1.10	4324	4296	0.099	0.028	-	-	-	-	0.028	-	
1.30	4484	5177	0.119	0.031	-	-	-	-	0.031	-	
1.50	4646	6090	0.140	0.033	-	-	-	-	0.033	-	
1.70	4811	7035	0.162	0.035	-	-	-	-	0.035	-	
1.90	4979	8014	0.184	0.037	-	-	-	-	0.037	-	
2.10	5150	9027	0.207	0.039	-	-	-	-	0.039	-	
2.30	5323	10074	0.231	0.041	-	-	-	-	0.041	-	
2.50	5500	11157	0.256	0.043	-	-	-	-	0.043	-	
2.70	5679	12275	0.282	0.045	-	-	-	-	0.045	-	
2.90	5862	13429	0.308	0.046	-	-	-	-	0.046	-	
3.10	6047	14619	0.336	0.048	-	-	-	-	0.048	-	
3.30	6235	15848	0.364	0.049	-	-	-	-	0.049	-	
3.50	6426	17114	0.393	0.051	0.000	-	-	-	0.051	-	#2
3.70	6620	18418	0.423	0.052	0.027	-	-	-	0.079	-	
3.90	6816	19762	0.454	0.054	0.039	-	-	-	0.092	-	
4.10	7016	21145	0.485	0.055	0.047	-	-	-	0.102	-	
4.30	7218	22568	0.518	0.056	0.055	-	-	-	0.111	-	
4.50	7424	24033	0.552	0.058	0.061	-	0.000	-	0.119	-	Riser
4.70	7632	25538	0.586	0.059	0.067	-	1.404	-	1.529	-	
4.90	7843	27086	0.622	0.060	0.072	-	3.970	-	4.102	-	
5.10	8057	28676	0.658	0.061	0.077	-	7.293	-	7.432	-	
5.30	8274	30309	0.696	0.062	0.082	-	11.228	-	11.373	-	
5.50	8494	31985	0.734	0.064	0.086	-	15.692	-	15.842	-	

Flow control target range: 1/2 Q_2 to Q_{50}