2006 Facility Master Plan Update
Bow Lake Transfer/Recycling Station

February 2007

King County
Department of
Natural Resources and Parks
Solid Waste Division

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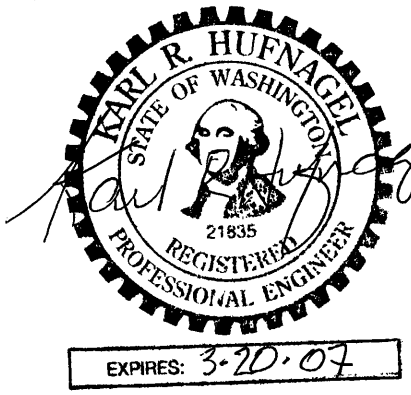

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Contents

Tables

Figures

1. Introduction and Summary

1.1 PURPOSE

Consistent with the 2001 Comprehensive Solid Waste Management Plan, this 2006 update to the 1998 Bow Lake Transfer/Recycling Station Facility Master Plan (1998 FMP) has been prepared to provide a blueprint for replacing the existing Bow Lake Transfer/Recycling Station for its enhanced role within the County's solid waste management system, including improved operational efficiency, compliance with current building and environmental standards, enhanced customer service, customer and employee safety improvements, and to prepare the facility for eventual out-of-county waste export. This FMP update is consistent with, and an extension of, the system wide planning efforts that are discussed in the next paragraph.

1.2 RELATED SOLID WASTE PLANNING EFFORTS

The 1998 FMP, which is discussed in more detail in Section 1.6, focused on upgrades to the Bow Lake Transfer/Recycling Station in the areas of safety and operational efficiency. The addition of solid waste compactors was part of the efficiency improvements developed in this plan.

The 2001 Comprehensive Solid Waste Management Plan (2001 CSWMP) directs that waste compactors be installed at transfer stations to increase operating efficiencies, reduce truck traffic, save transportation and equipment costs and reduce odor and litter as well as prepare stations for waste export.

The Solid Waste Division and its employees, the private haulers, the Solid Waste Advisory Committee, and its city partners are currently preparing a waste export system plan that defines the overall system components and the steps to be taken to upgrade the system so that it is ready for waste export when the County's Cedar Hills Regional Landfill closes. King County Ordinance 14971 directs the preparation of the waste export system plan including four milestone reports. These four reports have been completed and include:

- Milestone Report 1 – Transfer System Level of Service Evaluation Criteria and Standards
- Milestone Report 2 – Analysis of Transfer System Needs and Capacity
- Milestone Report 3 – Public/Private Options for Ownership/Operation of Transfer and Intermodal Facilities
- Milestone Report 4 – Preliminary Transfer and Waste Export Facility Recommendations and Estimated System Costs, Rate Impacts and Financial Policy Assumptions

The 2001 CSWMP, Milestone Report 4 and the draft waste export system plan recommend rebuilding the Bow Lake Transfer/Recycling Station at its current location. Construction would begin by April 2008 and be completed by October 2010. It also recommends that the station continue to provide service for commercial customers throughout the redevelopment period with residential self-haul customers being diverted to other County facilities as necessary.

1.3 FACILITY BACKGROUND

The current Bow Lake Transfer/Recycling Station was constructed in 1977 on the site of a closed landfill located north of the intersection of Orillia Road and South 188th Street in south King County.

The eight acre, moderately steep hillside site is located along the east edge of the Interstate 5 corridor overlooking the Duwamish Valley (Figure 1). Prior to construction of the current transfer station, a much more basic, uncovered transfer station was operated at the site beginning in 1961. The site was a landfill which commenced operation the early 1940s. At the time it closed as a landfill, The Bow Lake Landfill was the largest landfill in King County. A small incinerator was installed at the site on an experimental basis in 1955, but this apparently did not prove effective and was discontinued shortly after testing started. Ash residue has been found in some of the site geotechnical borings.

Figure 1 – Bow Lake Transfer/Recycling Station Viewed From South

Since May 2005, the Bow Lake Transfer/Recycling Station is operated on a 24 hours per day, Monday through Friday and 8:30 a.m. to 5:30 p.m. on weekends, and is the busiest transfer station in the King County system based on total tonnage handled. The site is open to both commercial haulers and residential and business self-haul customers.

The site has a number of significant challenges that influence upgrading the facility including:

- Difficult access from the public highway system because of the heavy traffic flow on Orillia Road and South 188th Street and the proximity of the site entrance to the on/off ramp intersection on the east side of Interstate 5
- Sufficient but not unlimited usable site area
- Moderately steep hillside terrain
- Refuse and ash underneath large areas of the site
- Located in the Washington State Department of Transportation's Interstate Highway 5 "limited access zone"

On the other hand, the site is highly favorable for continued use as a solid waste facility because of:

- Excellent location within the service area
- Excellent location relative to major roads and highways
- Lack of any immediate neighbors, including residential housing
- Proximity to the Interstate 5 corridor which provides noise cover 24 hour per day
- Potential expansion property to the north and south through purchase of adjacent property (Note: purchase of property to the north is currently being pursued with the Washington State Department of Transportation (WSDOT))
- Historic use as a solid waste management site

1.4 EXISTING FACILITY DESCRIPTION

The existing facility (Figure 2) includes a scale house with two scales, a 33,000 square foot open-sided transfer building, trailer parking yard, a "paid recycling" area for appliances (white goods), and a small "free recycling" area on leased property outside the main gate.

Because of the poor foundation conditions due to the old refuse and ash deposits at the site, the transfer building has a timber pile foundation. Sections of the paved areas of the site have experienced significant settlement since the station was constructed due to refuse decomposition, necessitating periodic filling and repaving of the settled areas. A Transfer Station Operators' (TSO) building is located within the transfer building, over the south end of the waste pit and under the transfer building roof.

Figure 2 – Google Aerial Photograph of Project Site

A seismic study for the existing transfer and TSO buildings in 2005 revealed that these buildings will not meet the County's requirement for immediate occupancy following a significant seismic event.

Customers weigh in at the scale facility (Figure 3), and then proceed to the transfer building where self-haul and commercial traffic is segregated to opposite sides of a central waste receiving pit (maceration pit) as seen in Figure 4. After unloading, customers return to the scale facility where their transaction is completed. Commercial customers with known tare weights do not need to rescale upon exiting.

A bulldozer works in the waste receiving pit. The bulldozer pushes the waste from the south (deep) end of the pit to the north (shallow) end where it falls through a chute into an open-topped transfer trailer parked in the loading bay at a lower level. The bulldozer also breaks up (macerates) and mixes the waste which results in more homogeneous material that helps create denser transfer trailer loads. A knuckleboom crane (Figure 5), also called a refuse crane or packer, is situated at the north side of the chute. It helps load the trailer, distributing material within the load and tamping the load to improve density.

Figure 3 – Existing Scale Facility

Figure 4 – Existing Central Waste Pit

Figure 5 – Existing Knuckleboom Crane

There are no weighing scales in the trailer loading bay to help the operators determine when the trailer reaches optimum load. Trailer payloads average around 18 tons. After loading, the trailer is pulled out of the loading bay and parked in the trailer yard (Figure 6) located north of the transfer building. A yard tractor is used to move the trailers on site. After unhooking from the loaded trailer, the yard tractor is connected to an empty trailer and returns to the loading bay. Waste load out is interrupted during the trailer switch-out. Ramps at each end of the loading bay accommodate the grade transition between the loading bay and the trailer yard.

Figure 6 – Existing Transfer Trailer Yard

The station has an average daily design capacity of around 750 tons and 800 customer vehicles in a ten hour day, and a peak capacity of around 1,400 tons per day during a 24 hour day. Throughput tonnage capacity is controlled by the rate at which waste trailers can be loaded out. Throughput customer capacity is controlled primarily by the rate at which customers can be processed at the scale facility and secondarily by the number of unloading stalls. The central waste pit provides surge capacity within the facility to accommodate peaks in the waste delivery rate.

The County began operating the facility on an around-the-clock basis in May 2005 after the Regional Direct rate (disposal rate charged to commercial haulers delivering waste directly to the Cedar Hills Landfill rather than to the County's transfer stations) was increased and the private collection companies redirected commercial waste loads from Cedar Hills or their own transfer stations to the County system. This resulted in a great deal more waste being brought to Bow Lake. The transfer station is now processing an average of about 800 tons per day and a peak of about 1,250 tons per day (150 tons below its design capacity). A summary of the tonnage and customer vehicles received at the facility from 2001 through 2005 is provided in Table 1.

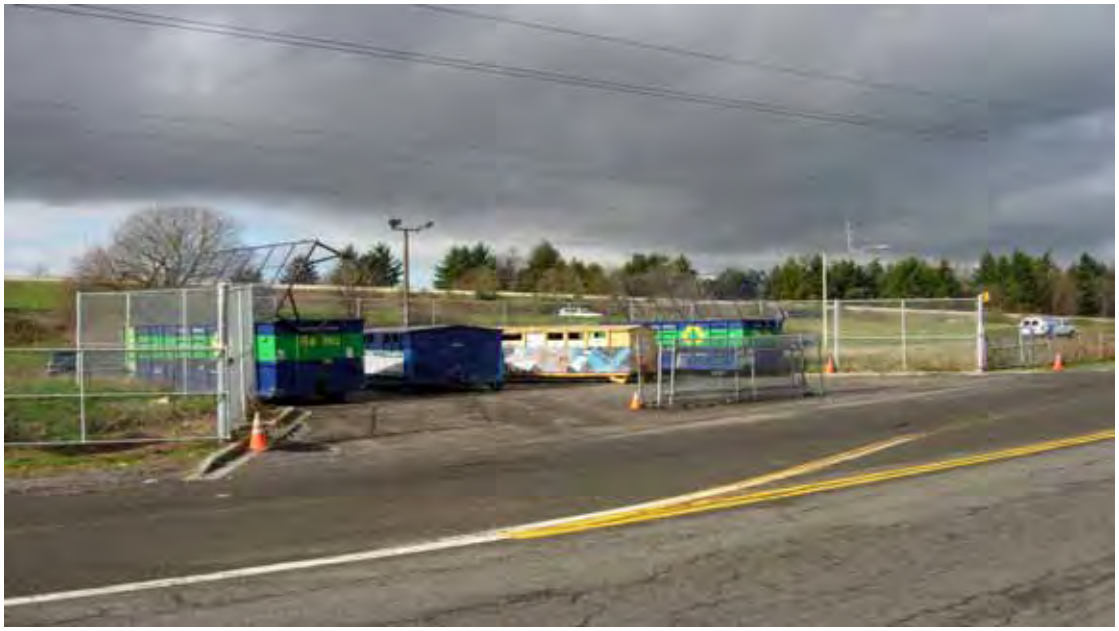
Table 1
Tonnage and Traffic Summary 2001–2005 and 2030 Forecast[1]

Description	2001	2002	2003	2004	2005	2030[2]
Average Daily Tonnage	354	414	374	628	792	1,384
Peak Hourly Tonnage	264	168	144	248	174	346
Peak Daily Tonnage	603	854	599	1,109	1,235	2,468
90th Percentile Peak Daily Tonnage	417	465	425	890	977	1,696
Total Annual Tonnage	129,303	150,974	136,347	229,883	288,936	505,000
Average Daily Customer Traffic	332	411	398	475	528	1,047
Peak Hourly Customer Traffic	104	121	108	120	108	295
Peak Daily Customer Traffic	797	822	794	781	767	2,104
90th Percentile Peak Daily Traffic	421	488	453	488	495	1,219
Total Annual Customer Traffic	121,014	150,115	145,273	173,861	193,251	382,000
Total Yard/Wood Waste Tonnage[3]	--	--	--	--	--	

1. Readers should note that the forecast year of the FMP is 2030 as compared to 2025 used in the Waste Export System Plan Report. Additional information was available for the 2030 forecast as well. Therefore, forecasted values will be different between that report and this FMP.
2. The 2030 projections are based on the assumption that the service area and hours of operation remain the same as in 2005. 2030 hourly peak tonnage and traffic based on estimated 14% of daily peak tonnage and traffic.
3. Yard/wood waste is not currently separately received and weighed. Once the new station is constructed it will be separately received and weighed.

An unattended free recycling area (Figure 7) is located outside the facility entrance gate on property leased from the WSDOT. The small area available at this site restricts the number of containers and therefore the variety of recyclable materials that can be collected and number of customers that can unload at any one time. In 2005 the free recycling area averaged around 132 tons per month (1582 tons per year).

Figure 7 – Existing Free Recycling Area



A fee (paid), unattended recycling area (Figure 8) for white goods (appliances) is located between the scale facility and the transfer building on the east side of the service road. In 2005 this site averaged around 566 appliances per month (6,791 appliances for the year).

Figure 8 – Existing Paid Recycling Area

Because there are no separate facilities for collecting yard waste at the station, yard waste is accepted as garbage. There is no household hazardous waste (HHW) collection and processing facility at the site.

Stormwater runoff from the trailer parking yard, washdown water from inside the transfer building and domestic sewage from the TSO building and the scale house are collected and piped to a holding tank on the east side of the site. The collected wastewater is pumped into a tanker truck and hauled to the Cedar Hills Landfill leachate ponds. The site does not have a connection to the municipal sanitary sewer system. In 2005 around

706,000 gallons of wastewater in 7,000 gallon tanker loads (average of one load approximately every 3.5 days) were hauled to Cedar Hills.

Clean stormwater runoff from other paved areas and the transfer building and scale house roofs is discharged by sheet flow and through various piped outlets onto the downhill slope east of the developed site.

1.5 SIGNIFICANT FACTORS INFLUENCING SITE DEVELOPMENT

Several factors play an important role in determining how easily and to what extent the site can be developed to achieve the County's objectives, including:

- Limited useable site area and steep hillside topography
- Availability of additional property from adjacent property owners
- Requirement to continue commercial waste transfer at the site during the redevelopment period
- Difficult site access for customer and transfer trailer traffic
- Waste and ash deposits on the site and adjacent property to the north
- Location of site within the WSDOT Interstate 5 "limited access zone" (Note: WSDOT restricts development in a 200 foot zone adjacent to the I-5 corridor)

Each of these factors was considered in development of the updated Facility Master Plan. Of all the constraints, the availability of additional property is the most significant.

1.6 1998 FMP SUMMARY

Because the 2006 FMP is an update of the 1998 FMP, a basic understanding of the 1998 FMP is relevant. A more detailed description of the 1998 FMP can be found in Section 3.

The 1998 FMP addressed a number of immediate safety and efficiency needs, some of which, such as a new scale facility, pit repairs and misting system have been implemented. The 1998 FMP also addressed longer range issues such as the addition of solid waste compactors to increase long term efficiency of the

solid waste transport system. The major elements of the 1998 FMP long term plan included the following:

- Acquisition of a small, privately owned parcel to the south of the site to accommodate a new recycling area
- A large recycling area which would include free and paid recycling and a covered yard waste drop off with two top-load trailers
- A new scale house with two new scales at the same location as the current facility
- Enlargement and conversion of the existing transfer building from a maceration pit and top-loading of waste to a flat floor pit with a single solid waste compactor and with room to add a second compactor later, boosting the overall design throughput of the station from 750 tons per day to 900 tons per day based on an 8 hour day (1,800 tons per day for two compactors)
- Acquisition of a small piece of the WSDOT property to the north and expansion of the transfer trailer yard
- Upgrades to the on-site utility systems and fencing, and a new sanitary sewer connection to the municipal system
- Upgrades to the transfer station operators building
- A public facilities building (public toilets and information kiosk)
- A rudimentary equipment maintenance shelter
- Maintaining the general site circulation pattern of the existing station
- Closure of the station to commercial and self-haul customers during the construction period

At the time the 1998 FMP was prepared, the County's policy did not require that the transfer station be capable of immediate occupancy following a major seismic event.

The total estimated construction cost of the 1998 long term improvements (1998 dollars) not including property acquisition was around $9,600,000. The 1998 FMP did not include an estimate of the annual operating cost.

1.7 2006 FMP SUMMARY

The 2006 Facility Master Plan (2006 FMP) is an update of the 1998 FMP and is based in part on the 2001 Comprehensive Solid Waste Management Plan and on the draft Solid Waste Export System Plan which is being prepared in parallel with this 2006 FMP. The 2006 FMP reflects system wide requirements and needs at the County's transfer stations for more efficient and safe site operations, to deal with growing waste tonnage and customer vehicle counts, to improve customer service, to provide more recycling opportunities, to reduce truck traffic and increase transportation efficiency by compacting more waste in each outgoing load, to meet current building and environmental codes and standards, and to

prepare the solid waste system for waste export. The major elements of the 2006 FMP include the following:

- Demolition of all existing on site facilities
- Acquisition of a large piece of the WSDOT property to the north which is critical to developing the facility described in this FMP
- Two new scale facilities including a three-scale, single scale house facility for self-haul customers that is expandable to include a fourth scale and a two-scale unattended scale facility for commercial customers
- Separate site access points, roadways and tipping areas for self-haul and commercial customers
- A large, flat-floor transfer building with two stationary solid waste compactors and two top-load bays for yard waste
- Immediate occupancy following a major seismic event
- Mobile equipment including two rubber-tired front-end loaders, two yard tractors, and a backhoe with an extended arm
- A paid recycling area contiguous with the yard waste drop-off area
- A free recycling area
- An informational kiosk for self-haul recycling customers
- Integration of public art at the facility
- A refueling station for site mobile equipment
- An equipment maintenance building for light maintenance of site equipment and transfer trailer equipment
- A transfer station operators area within the transfer building
- A transfer trailer maneuvering and parking yard
- Room for other future facilities such as household hazardous waste facility, vactor decant facility, and truck and additional trailer parking
- A complex stormwater management system with underground detention and treatment vaults and off-site discharge connection to the local conveyance system
- A wastewater collection and holding system
- Maintaining commercial customer service at the site throughout the construction period

The total estimated construction cost (2006 dollars) of the 2006 FMP including contingency and sales tax but not including property acquisition is $44,200,000.

The cost of mobile equipment needed at the station (2006 dollars) including sales tax is $940,000.

The estimated annual operating and maintenance cost for the facility (2006 dollars) is approximately $3,800,000 when the station fully reopens in 2011.

1.8 SCHEDULE

A preliminary project schedule is included in Appendix A. Major milestones in that schedule include:

Start of design – Spring 2007
Design completion – Fall 2008
Permits acquired by – Spring 2009
Start of construction – Spring 2008
Completion of construction – Summer 2011

2. Development Criteria

2.1 Functional Requirements and General Design Criteria

The 1998 FMP included a statement of functional requirements for the facility (Section 3, "Program Plan," of the 1998 FMP) but did not include a detailed statement of the design criteria. Design criteria are specific, measurable parameters developed to ensure that the functional requirements for the facility are met. They are used as a standard by providing a checklist against which existing or proposed conditions of the facility can be assessed.

The functional requirements for the Bow Lake Transfer/Recycling Station have evolved significantly since the 1998 FMP and are covered in Section 2.2. These functional requirements and design criteria are based on the evaluation criteria and standards established in the Milestone Report 1 of the waste export system planning process directed by King County Ordinance 14971 as discussed in Section 1.2. In general the functional requirements and design criteria are much more detailed and site-specific than the Milestone Report I evaluation criteria and standards. Detailed facility design criteria are listed in the paragraphs following the functional requirements. Design criteria required by building codes, such as seismic criteria, are not listed but will be addressed in the basis of design report prepared at the beginning of the design phase.

2.2 Functional Requirements

Waste Flow and Vehicle Forecasts

The new facility should be capable of handling the tonnages and customer vehicle numbers forecasted for year 2030 as indicated in Table 2.

Table 2
Projected Waste and Vehicle Flows

Component	2030 Quantity (tons)	2030 Vehicles
MSW, Average Daily	1,384	1,047
MSW, Peak Daily	2,468	2,104
Yard Waste, Average Daily	38	150
Yard Waste, Peak Daily	127	428

The projections shown in the table are based primarily on forecasts of population and economic activity. Actual waste quantities and vehicle counts could vary due to future changes in the service area, in recycling rates, and in public policy and programs directed towards waste reduction, diversion and recycling. Development of new transfer facilities and closure or modification of existing

transfer stations in the south county area, as recommended in Milestone Report 4 and the draft waste export system plan, could affect the waste flows to the Bow Lake Transfer/Recycling Station. The facility should be designed to provide maximum flexibility to respond to changing conditions. Given the site's constrained area for development, the proposed new station will use most of the existing site plus the planned purchase of the WSDOT property to the north leaving very little room for further expansion in the future. However, should it become available in the future, the County might consider acquiring adjacent privately-owned property at the south end of the site. Until and unless that property becomes available, the station's flexibility to respond to change will need to come from the facilities to be built during the reconstruction and from limited space on site set aside for future growth or expansion.

Traffic Movement and Queuing

An essential principle in planning the site is to separate customer traffic (commercial and self-haul) from the transfer trailer traffic, if possible, using separate entries. It is also important for both safety and efficiency to separate the commercial hauler vehicles from self-haul vehicles throughout the facility to the maximum extent possible. This usually means separate lanes throughout the facility from entrance to exit. Depending on the scale facility configuration and number of scales, there may be some lane sharing at the scale facility. However, if possible, it is desirable for commercial haulers to have a separate entrance and scales for maximum efficiency and safety.

Self-haul customers with fee recyclables must also pass through a checkpoint where fees can be assessed and collected. Ideally this would also include weighing. Since the scale facility is the logical place for this to happen, this places the paid or fee recycling area after the scale facility. Customers with paid recycling may also have trash to drop off in the transfer building, and since this is at a different rate, customers must be able to return to the scale facility to rescale. Therefore a turn around loop is needed in the road system after passing through the scale facility in the outbound direction.

Customers with free recycling do not need to go through the scale facility and should have a separate entry and exit.

In general traffic circulation through the facility should be in a counterclockwise direction in order to reduce the number of traffic crossing points since vehicles are driven on the right side of the road. Within the transfer building, at the recycling areas, and elsewhere where self-haul 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 not to require vehicles to double back against the traffic flow when leaving an area as this creates the potential for traffic crossings and accidents, and generally slows down traffic movements.

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 scale facilities, at the entrances to the transfer building, and the fee and free recycling areas.

Municipal Solid Waste Processing

Compaction Technology

The primary reasons for replacement of the existing Bow Lake Transfer/Recycling Station are to increase operational efficiency and safety, improve customer service, increase waste transport efficiency and to prepare the station for waste export operations. Waste export involves long-haul transport of waste in containers via truck or train to remote regional landfills. Given the amount of waste that will be exported and the long distances involved (more than 350 miles one way from the Puget Sound area to the closest regional landfill), optimizing the new facility for waste processing and efficient packaging of waste through compaction technology, is a very high priority in order to contain costs. "Preload compaction" of waste has proven to be the most efficient and effective technology for loading waste into containers and is in use at three other King County transfer stations [Vashon Island, Enumclaw and First Northeast (2007)]. Preload compaction is being used successfully in the City of Seattle's and Snohomish County's solid waste systems where collectively over 1,000,000 tons of waste is compacted annually.

A preload compactor is a large piece of fixed equipment that incorporates an internal compaction chamber. Through a series of compression cycles utilizing a platen and hydraulic ram, the compactor compresses waste into an untied bale or slug prior to ejecting the bale into a specially designed shipping container. In the ideal arrangement, incoming waste is pushed to a hopper at an upper level and falls by gravity into the compaction chamber. Preload compaction technology allows adjustment of the weight of the bale and its placement within the container to achieve close to the maximum allowable weight given the axle configuration of the transfer vehicle. Because the compressed bale does not exert strong forces on the sides or top of the container, the container can be designed as a light weight unit to maximize the payload.

Compared to the current practice of loading waste into open-top trailers with some tamping using a knuckleboom crane, preload compaction technology produces much higher densities and therefore will reduce the total number of loads to be transported. Typically, in Washington State, preload compacted containers transport between 27 and 30 tons of waste, while top-loaded trailers carry around 18 tons of waste.

The new Bow Lake facility will be designed to incorporate two preload compactors. Two units are needed to meet the peak waste throughput at the station, and to provide redundancy in case one unit is down for maintenance or repair. The typical preload compactor (illustrated in Figure 9) includes a tall

vertical slide gate at the discharge end of the compactor. In order to avoid a large floor-to-floor separation for the equipment which can increase the cost of the building, the guide rails for the slide gate will extend through an opening in the upper floor. This approach also eliminates a long floor-to-floor drop for waste that is top-loaded into containers if there is also a top-load operation in the building.

Figure 9 – Typical Preload Compactor

A significant benefit of preload compaction is that waste does not need to be macerated, as is currently done at the Bow Lake facility, in order to achieve optimum payload density. The compactor produces dense loads and thus eliminates the need for a tracked vehicle to run back and forth over the waste to reduce size or mix the waste prior to loading. The compactor saves wear and tear on expensive equipment and the building, labor time, and fuel per ton of material transferred. It also eliminates air pollution from engine exhaust and fugitive dust released during the churning (maceration) of debris. There will still be some engine exhaust and dust created by the rubber-tired floor equipment that pushes the waste to the compactor hopper.

Waste Screening, Processing and Storage Capacity

There are some waste materials that may be unsuitable for feeding into a preload compactor because they can damage or jam the machine (for example steel cable, propane cylinders, large bolts of carpet, or large blocks of metal or concrete). There are some materials that can be sorted out from the waste

stream and diverted for recycling (wood pallets, carpet and scrap metal for example). Primary waste sorting is usually carried out by heavy machinery, such as rubber-tired floor loaders and rubber-tired or tracked excavators. Smaller "Bobcats" (skid-steers) can also be used for this purpose. The receiving floor where waste is deposited should include sufficient space to spread waste out when necessary to remove the unsuitable and recyclable materials. Space is also needed to temporarily hold the materials that will be recycled. Storage could be in bunkers or in bins on the receiving floor.

The waste receiving floor must also be sized to provide emergency waste storage capacity as well as routine surge capacity. A minimum of three average days of emergency capacity has been established as a design criterion for the Bow Lake station. The average daily total waste through the transfer station in 2030 is projected to be about 1,400 tons; therefore total emergency storage should be around 4,200 tons. An example of emergency floor storage in a similar flat floor transfer station is shown in the two photographs illustrated as Figure 10.

Figure 10 – Emergency Waste Storage in a Flat Floor Transfer Station

Figure 10 (continued)

Tipping Floor Configuration

Typically, waste is deposited onto the receiving floor from vehicles at designated tipping stalls. Stalls can be located either on the same level as the receiving floor (called a flat floor configuration) or at a tipping floor elevated above the receiving floor (called a tipping wall configuration and illustrated in Figure 11). Tipping wall configurations provide a vertical separation between the customer and the waste handling operations on the receiving floor. The primary benefit of a tipping wall configuration is safety, but it also provides some short-term storage capacity at each stall since several small-load vehicles can unload at a stall location without building up waste to the point that further unloading is impractical. One safety aspect of the tipping wall configuration is that customers do not have to walk on a slick, "dirty" floor as they unload their vehicle, thus reducing the possibility of a fall. However, the floor separation does increase the risk of injury if a customer falls over the wall. A supplemental fall restraint system such as post-and-cables can be mounted on top of the wall to decrease the fall hazard. Such a system is not used in the installation illustrated in Figure 11.

Figure 11 – Typical Grade-Separated Self-Haul Tipping Floor Above Waste Receiving Floor

Flat floor configurations are ideally suited to large commercial vehicles and promote efficient vehicle movements and unloading. On a flat floor there are no fixed obstructions that vehicles can collide with. For large customer vehicle loads, flat floors require that the waste dropped off by one vehicle be moved before the next vehicle can unload, or else the next vehicle must drop its load in front of the previous load which may not always be possible depending on floor size.

The widely accepted floor configuration for transfer buildings that must accommodate both self-haul and commercial customers is to have a flat floor for the commercial vehicles and a tipping wall for self-haul customers. Current practice is to use a vertical separation between the self-haul tipping floor and the commercial tipping and receiving floor of between 4 and 5 feet, with an additional wall height above the self-haul tipping floor of at least 42 inches. A supplemental fall restraint system using post-and-cables may be mounted on top of the tipping wall to further reduce the risk of falls by self-haul customers standing on the beds or tailgates of their vehicles. This is the configuration that has been selected for the new Bow Lake facility.

Container/Trailer Maneuvering and Storage Yard

The container/trailer maneuvering and storage yard should facilitate efficient movement of trailer-mounted containers and open-top trailers to and from the compactor loading bay and the top-load bay. The yard should also provide appropriate locations to park full and empty container-mounted trailers convenient to where they are used. The parking area, which provides space for both garbage and yard waste containers, should also accommodate stacking of containers at least two-high as an alternative to leaving them mounted on the trailer chassis.

Parking for at least of 44 containers on trailers (22 full containers and 22 empty containers) or 88 double-stacked containers should be provided. The number of stalls is based on 2005 waste arrival distribution information, tonnage forecast in 2030, and an assumed 27 ton average payload. Based on this information and assumptions, it is expected that in 2030 around 20 full container loads of MSW will accumulate during the nighttime hours of 8:00 p.m. to 5:00 a.m. These are the current 2006 non-hauling hours. It's likely that when the Cedar Hills Landfill closes, hauling to the intermodal facility will occur around the clock. However, to be conservative it is assumed that hauling will follow the current practice and be halted during the night hours. The 22 stalls for full containers provide an allowance for four yard waste trailers (two in parking stalls plus two in the loading bay stalls).

All of the parking stalls should be configured with drainage collection at the rear to collect any leakage from full containers and route this to the station sanitary sewer system. The drainage system should be configured with valves so that drainage from the stalls that are normally used to park empty trailers can be directed to the stormwater management system to minimize the amount of precipitation runoff going to the sanitary sewer system.

To promote proper surface water runoff, the paved yard areas will need to have some slope. Slope should be kept to a maximum of 1%, and counter-posing slopes that create ridges and valleys should be restricted to not more than 2% total change in grade in order to accommodate trailer movements with landing gear in the down position, parking of trailers and stable stacking of containers.

A minimum of 150 feet of maneuvering distance should be maintained in front of the entrance to compactor and top-load bays to facilitate trailer movements.

Concrete pavement should be used where containers are stacked or where trailer landing gear regularly stand due to the heavy point loads that this equipment places on the pavement.

Employee Facilities

Staff duties at the transfer building are primarily to operate equipment, change out waste containers, and intervene in customer activities if necessary. Therefore employee facilities should be configured and located to allow for

convenient, direct staff access to operational areas, and to provide visual oversight of tipping and waste receiving areas. Modern transfer facilities are large with multiple levels, which can require a great deal of walking for employees during their shift. It is therefore important that the employee facility be located and configured to minimize walking distances and stair climbing as much as possible. An elevator connecting the various levels of the transfer building would be appropriate in a multi-level facility.

The employee facilities should include a break area with light kitchen facilities (microwave oven, refrigerator, and sink), men's and women's restrooms and locker rooms, a training/meeting room and at least one office. Space for mechanical and electrical equipment is also needed. Employee parking should be located conveniently to the employee facilities. Placement of the employee facilities towards the south side of the transfer building with tipping areas to the north would be ideal for providing visual oversight of other areas of the facility or provide access to an outdoor break area.

Recycling Facilities

Recycling facilities at the Bow Lake station should consist of areas where self-haul customers can drop off free and fee recyclable materials.

Free Recycling

The County's current policy is to allow free drop off for the following materials:

- Containers (glass, tin, steel, aluminum and limited plastics)
- News paper
- Corrugated cardboard
- Mixed paper
- Textiles

The facilities needed to accommodate these types of materials are typically side-loading drop boxes set at grade. Concrete is the preferred pavement under the drop boxes due to the heavy point loads from the steel rollers and feet of the boxes. Ideally, the area would allow the addition of grade separated drop off boxes too, in case other more bulky items are added to the free recyclable materials list in the future.

Since there are no charges for using the free recycling area, access to this area should not require having to pass through the scale facility. However, it would be beneficial to locate this area so staff can visually monitor it. Night lighting is needed since this area will be accessible outside daylight hours.

Fee Recycling Including Yard Waste

The County expects to continue its current practice of charging a fee for some recycled materials including yard waste, wood waste and appliances. The

County has not yet determined what recyclable materials will be accepted at the Bow Lake site. A list of other potential fee-materials could include:

- Appliances
- Tires
- Electronic waste
- Fluorescent tubes
- Carpet

The facilities needed to accommodate most of these materials are typically drop boxes set at grade or with grade separation. Concrete is the preferred pavement under the drop boxes due to the heavy point loads from the steel rollers and feet of the boxes. Given the uncertain nature of the materials that may be dropped off, it is preferable for the area on which the drop boxes are placed to drain to the sanitary sewer rather than the stormwater system in the event that there might be spills or leaching of toxic materials.

The facilities needed to accommodate yard waste are top-load trailers located at a lower level than the customer so that the material can be dropped into the trailers with minimal lifting. Because of the quantity and bulkiness of yard waste, trailers rather than large drop boxes are preferred for this material. Ideally, the yard waste trailers and the customer unloading area would be located under cover to avoid accumulation of rainwater in the trailers and to provide some protection for the customers. Compaction and tamping equipment are needed at each trailer to distribute material in the trailers and to compact loads.

Scale Facilities

Because of the high traffic volumes and site size constraints that limit the queuing lengths that can be developed, it is essential that the self-haul scale facility include provisions for up to four scales (one inbound, one outbound and two reversible) in order to assure rapid processing of customers in both directions. Initially fewer scales may be sufficient. To further the efficiency of the scale facilities, some of the scales should be designed for unattended operation using some form of rapid vehicle identification and data capture such as radio frequency identification (RFID), bar code or magnetic swipe cards, and/or customer keypad identification. These scales should also have the option for adding attended operation.

The existing scale house was replaced in 2002 and meets the County's functional criteria. However, based on the construction phasing that is discussed in Section 4, reuse of the existing scales and scale house may not be practical.

Public Facilities

Public Restrooms: The County has decided that public restrooms will not be provided at the Bow Lake station because customers don't expect these services.

Informational Kiosk: A kiosk for providing information to self-haul recycling customers is needed to explain the opportunities available for recycling and to instruct customers on the dos and don'ts of recycling. It is preferable to locate the kiosk where it will not interfere with operations. Parking stalls are needed for several customer vehicles at the information kiosk area.

Equipment Maintenance

Routine preventive maintenance and minor repairs of onsite mobile equipment, such as rubber-tired floor loaders and yard tractors, will be performed at the station. For major repairs and overhauls the equipment will be trucked to another site. An enclosed, area safely out of the way of operations is required for the routine service and should include lubrication equipment and an area for storing parts and consumables. Knuckleboom cranes, if used at the yard waste loading hoppers, and the compactors will also require regular service and occasional repairs.

Other Facility Considerations

Sustainable Design and Leadership in Energy and Environmental Design (LEED™) Rating

The King County Solid Waste Division has made sustainability a central project goal of the 2006 FMP. The project should demonstrate good environmental stewardship through utilization of sustainable design principles in the design and construction of the new facility. The success of this effort will be measured through the LEED™ rating program. The U.S. Green Building Council developed the LEED™ system to provide a framework for assessing site and building performance in meeting sustainability goals, based on well founded scientific standards. The LEED™ frame work is organized into six categories:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Air Quality
- Innovation and Design

Based on a point rating system, projects can obtain various LEED™ ratings. The King County Solid Waste Division's stated project goal is a LEED™ Silver rating.

On November 2, 2005, an Eco Charrette was conducted by the King County Solid Waste Division to help identify potential sustainable development strategies to pursue and to document as potential facility design criteria. An Eco Charrette Strategy Report and initial tabulation of potential rating points is included in Appendix B, "LEED™ Evaluation Materials." To help ensure the greatest likelihood of achieving the Silver rating, all facility related decision making should

include an assessment of sustainable design implications relative to LEED™ the rating system.

Property Acquisition

Both the 1998 Preferred Alternative Site Plan (1998 Plan) and the 2006 Preferred Alternative Site Plan (Figure 14) depend on acquiring a portion of the WSDOT property located to the north of the existing site. Discussions with the WSDOT are currently underway. The WSDOT has previously indicated their willingness to sell the parcel associated with the 1998 Plan. The results of the current discussions are expected before the end of 2006. As indicated in Section 1.7, "2006 FMP Summary," acquisition of the WSDOT parcel that is shown in Figure 12 is critical to the County's development plans for the Bow Lake Transfer/Recycling Station.

Figure 12 – WSDOT Property Needed for Facility Expansion

Site Access

As noted in Section 1.3, "Facility Background," access to and from the site is currently difficult and at times dangerous because of traffic conditions and the road layout on South 188th Street and Orillia Road in the vicinity of the I-5 interchange (see Figure 13).

Figure 13 – Google Aerial Photograph of Site Entrance at Orillia Road/I-5 Interchange

To further the Solid Waste Division's understanding of the potential for improvements to conditions at this location, a traffic impact analysis was completed and is summarized in Appendix C. An order of magnitude cost estimate was prepared for the traffic improvement option that includes a new single point intersection, a separate right turn access from the northbound off-ramp to eastbound Orillia Road, and the development of a flyover structure to intercept westbound Orillia Road traffic destined for northbound I-5. A preliminary estimate of the cost of these improvements in 2006 dollars is around $26,000,000.

Although these improvements would significantly improve access to the site during the peak AM and PM hour traffic, there are many other entities and a much larger segment of the non-transfer station customer traveling public who would realize significant benefits from these improvements. A road improvement

project incorporating these changes would be a regional benefit and should be developed and paid for by a regional collaboration of entities. Construction of these improvements is therefore not proposed as part of the Facility Master Plan project, but this information is included for reference.

Public Art

Per King County Code, all County funded capital construction projects shall include a budgeted line item for Public Art. The 1%-for-Art program for King County, which is managed by 4Culture, is participating in developing the public art for this project. The public art is intended to be integrated into the architecture and site of the facility, and to further an educational message about waste management, recycling of resources and diversion of materials from the waste stream.

The total budget for public art for the Bow Lake project is $150,000. The artwork implementation portion of the budget is $125,000, and will be used to augment the construction budget for artwork elements included in the construction documents and fabricated by the General Contractor. The artwork implementation budget may also be used to fund elements that are fabricated by the Artist(s) under a separate artwork implementation agreement.

The new 4Culture Artist Registry was used in the Fall of 2006 to select the Bow Lake project artist. A selection panel comprised of community members and public representatives from the project area, design and arts professionals, and design team advisors participated in the selection process.

Permitting and Regulatory Issues

Implementation of the Bow Lake Transfer/Recycling Station project will require various environmental permits and approvals from federal, state, county, and city jurisdictions. These requirements are summarized in Appendix D, "Permits and Approvals Summary." Several of the key permits and approvals are discussed below.

- **Zoning and Land Use:** The project site is located within the City of Tukwila's Valley South District. According to the City Municipal Code, the facility will require an Unclassified Use Permit. The application process is expected to take a minimum of 120 days and will require a city council public hearing.
- Expansion of the Transfer Station 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 **Stormwater System** for the expanded transfer station site will likely involve discharge to the Green River. This system will require approvals from the City of Tukwila, Army Corps of Engineers, and other agencies involved in flood control issues. Ecology will require a National Pollutant Discharge Elimination System (NPDES) permit for stormwater related to construction

activities such as clearing, grading, and excavation. Sensitive areas review and approval will be required from the City of Tukwila.

- A **Solid Waste Transfer Station Operating Permit** will be required from the Seattle & King County Health District.
- **Sensitive areas** designated by Tukwila as potentially occurring within the project footprint or immediately off-site are wetlands, streams, fish and wildlife habitat conservation areas, landslide hazard areas, steep slopes and erosion hazard areas. Approvals for **tree removal** will be required by the City of Tukwila under tree clearing regulations.
- A Clearing/Grading Permit, Tree Clearing Permit and a Building Permit will also be required from the City of Tukwila.
- **Retaining walls** necessary for site development and stabilization will need approval from the City of Tukwila, which requires approval of any retaining wall over four feet in height.
- Approvals and/or use permits will be needed for any construction activities occurring within **WSDOT, City of Tukwila, and King County rights-of-way.**
- **Purchase of WSDOT property** will require approvals from King County and the State of Washington as well as requisite documentation and compensation for the transfer to the County.

2.3 DESIGN CRITERIA

As noted in the introduction to this section, design criteria provide site-specific standards that when met will ensure that the Bow Lake Transfer/Recycling Station satisfies the functional requirements set out above and in the facility evaluation criteria and standards enunciated in Milestone Report 1. The design criteria outlined below are based on the facility when it is fully built out.

General Site Development Criteria

- New facility developed with minimized interference with ongoing operations
- 100 Foot buffer between facility active area and nearest residence (Milestone Report 1 criterion 16)
- 50 Foot buffer zone from operations areas to nearest property line
- 50 Foot buffer from east edge of I-5 mainline and on ramp pavement to retaining walls and/or public frontage road
- Design Life per Table 3:

Table 3
Facility Design Life

Facility Element	Design Life[1] (years)
Buildings and Structures	25
Stationary Operating Equipment	10

Mobile Operating Equipment	5 – 7
Site Roads and Pavements	20
Site Utility Systems	30
Fencing, Signage and Site Appurtenances	15

1. Useful life before major renewal or replacement unless

- Minimized visual impact "across the valley" (Milestone Report 1 criterion 17)
- Noise levels in compliance with City of Tukwila and King County noise ordinances (Milestone Report 1 criterion 13)
- Surface water controls in accordance with City of Tukwila and King County drainage ordinances
- All buildings and structures available for immediate occupancy following a major seismic event (International Building Code 2003/ASCE 7-02 Minimum Design Loads for Buildings and Other Structures; Seismic Use Group III Function) (Milestone Report 1 criterion 12)

Site Access Criteria

- Separate site entrances and exits for transfer trailers and customers if possible
- Separate site entrances, if possible, for commercial haulers and self-haul customers
- All traffic queuing on site (Milestone Report 1 criterion 15)
- Fenced site perimeter with gated entrance and exit points

Scales and Scalehouse Criteria

- Low-profile above grade scales with possibility of two scales being reversible. Shallow pit scales may be used if width restrictions require
- Capacity to handle 150 customers per hour in each direction (300 transactions total) in the peak hour at the self-haul scale facility
- Commercial scale facility to include 40 foot unattended scales
- Scale house with high intrusion security protection and comprehensive environmental controls to ensure operator safety and comfort (Milestone Report 1 criterion 10)
- Room for future development of scale house or scale booth at unattended scales
- Canopy with 16 foot minimum vertical clearance over scales
- Scale house equipped with toilet room and breakroom
- Breakroom with kitchenette (microwave oven, under counter refrigerator, sink, counters and cabinets) and lockers
- Carbon monoxide and nitrogen dioxide monitoring inside scale house (Milestone Report 1 criterion 10)

- Ergonomically appropriate work surfaces for scale operators

Waste Receiving Criteria

- Ability to accommodate and provide surge capacity for waste flows indicated in Table 4 (Milestone Report 1 criteria 5 and 6)

Table 4
Projected Waste and Vehicle Flows

Component	2030 Quantity (Tons)	2030 Vehicles
MSW, Average Daily	1,384	1,047
MSW, Peak Daily	2,468	2,104
Yard Waste, Average Daily	38	150
Yard Waste, Peak Daily	127	428

Note: The 2030 projections are based on the assumption that the service area and operating hours remain the same as in 2005

- Separate tipping areas in transfer building for commercial and self-haul customers (Milestone Report 1 criterion 10)
- Separate tipping area for yard waste customers, preferably in transfer building
- Commercial customer vehicle tarping and untarping areas outside transfer building
- Flat receiving (tipping) floor for commercial customers
- Grade separated tipping wall for self-haul customers (Milestone Report 1 criterion 10)
- Minimum of 5 tipping stalls for commercial customers
- Minimum of 18 tipping stalls for self-haul MSW customers (90 vehicles per hour at average 12 minute unloading time)
- Minimum of 8 tipping stalls for self-haul yard waste customers (24 vehicles per hour at average 20 minute unloading time)
- Minimum 20 foot wide commercial tipping stalls (Milestone Report 1 criterion 10)
- Minimum 11 foot wide self-haul tipping stalls (Milestone Report 1 criterion 10)
- Sufficient receiving floor space for 200 tons temporary surge storage and for spreading loads to facilitate screening and removal of bulky or hard-to-handle materials
- Three days (4,200 tons) emergency storage including on floor storage and storage in containers parked on site (Milestone Report 1 criterion 7)
- Temporary storage space on receiving floor for bulky or hard-to-handle materials

- Wheel washes and track-off grates for commercial customers at exit to prevent tracking out waste to outside pavement areas

Waste Loading Criteria

- Two 100 ton-per-hour preload compactors as primary waste loading technology for mixed municipal solid waste (MSW) (Milestone Report 1 criterion 11)

  Note: two compactors theoretically exceed the projected daily peak throughput of the station in 2030 if operated 20 hours per day with 4 hours down for routine preventive maintenance and cleaning. Two compactors are needed to provide for redundancy in the event one compactor is down for either preventive maintenance or unexpected repairs.

- Average intermodal container payload of 27 tons
- Average top-load container payload of 19 tons for MSW and 18 tons for yard waste
- Top-load emergency bypass capability for MSW
- Two nominal 45 foot long top-load bays (8 customer unloading stalls) for yard waste loading (may be used to satisfy emergency bypass capability for MSW) with knuckleboom cranes for load distribution and tamping
- Pit-type axle scales in top-load bays with readouts at tipping floor level

Transfer Trailer Yard Criteria

- Nominally flat with maximum grade in parking areas of 1%
- Uncovered parking area for 22 (approximately 600 tons at 27 tons per container) full chassis-mounted containers and trailers (8.5 feet by 53 feet) or 44 (approximately 1,200 tons at 27 tons per container) two-high stacked intermodal containers (8 feet by 48 feet) at full build out of facility and half this amount at initial construction. (Milestone Report 1 criterion 11)
- The full container area normally drained to sanitary sewer system but capable of being drained to storm sewer system
- Uncovered parking area for 22 empty chassis-mounted containers and trailers (8.5 feet by 53 feet) or 44 two-high stacked intermodal containers (8 feet by 48 feet) at full build out of facility and half this amount at initial construction.
- The empty container area normally drained to sanitary storm system but capable of being drained to sanitary sewer system
- Adequate maneuvering for top-pick loaders used to stack and load/unload intermodal containers on and off chassis
- "Drive through" design (one way traffic pattern) for highway tractor-trailers preferred to minimize turning movements, but common entrance and exit if necessary due to space limitations
- Transfer trailer yard located in close proximity to compactor and top-load bays to minimize shuttle time for full and empty trailers

- Concrete pavement for trailer/container parking stalls

Self-Haul Recycling Criteria

- Provide separate fee (paid) and free recycling areas to meet waste reduction and recycling goals (Milestone Report 1 criterion 4)
- No requirement for covered unloading areas except for yard waste unloading area
- Drainage from open-top dropboxes should be drained to sanitary sewer in case these boxes are used to collect materials, such as scrap metal, that could leach metals or other pollutants
- Free recycling area should have separate entrance and exit if possible
- Paid recycling area could include or be associated with yard waste dropoff
- Paid recycling area requires a scale for weight transactions and if possible should be located after the Scale Facility to avoid needing a separate scale(s)
- Flexibility to change the types of materials collected and types and number of containers used for collection in both the free and paid recycling areas
- Free and paid recycling should accommodate recycling quantities as shown in Table 5

Employee Facility Criteria (TSO Building)

- Parking for at least 12 vehicles and one bus parking stall
- Multi-purpose room (break/meeting/training) for 12 people
- Men's and women's locker rooms with lockers, benches, accessible shower stall, toilet and lavatory fixtures in each room
- Breakroom with kitchen casework, sink, full size refrigerator, microwave oven, built in range, and tables and seating for 12 people with viewing capability over the tipping and receiving floors and fee recycling area
- Site supervisor's office (minimum 150 square feet) with viewing capability over the tipping and receiving floors
- Second office (minimum 100 square feet)
- Mechanical room
- Carbon monoxide and nitrogen dioxide monitoring system (Milestone Report 1 criterion 10)
- Outdoor covered and screened break area
- Convenient access to elevator to lower levels and to roof

Table 5
2030 Recycling Quantities

Component	2030 Quantity (Annual Tons)	Type of Receiving Container
Free Recycling		
Glass	220–440	At Grade, Side-Load-in 40 CY Dropbox
Mixed Waste Paper	1,200	At Grade, Side-Load-in 40 CY Dropbox
Newspaper	210–420	At Grade, Side-Load-in 40 CY Dropbox
Aluminum, Tin, Steel, Plastic Bottles	600	At Grade, Side-Load-in 40 CY Dropbox
Cardboard	1200	At Grade, Side-Load-in 40 CY Dropbox
Paid Recycling		At Grade, Side-Load-in 40 CY Dropbox
Appliances	12,300	At Grade, Walk-in 40 CY Dropbox
Tires	210–420	At Grade, Walk-in 40 CY Dropbox
Electronics	220–440	40 Ft Walk-in or Drive-in Trailer @ Loading Dock
Scrap Metal	2,900–5,900	Grade Separated 30 or 40 CY Dropbox
Wood Waste	3,100–6,200	Grade Separated 30 or 40 CY Dropbox
Yard Waste	38–127/average daily	Top-Load Container or Trailer
Carpet	1,665–3,230	Grade Separated 30 or 40 CY Dropbox

Public Facility Criteria

- Parking for two self-haul customers vehicles
- Covered information kiosk

Queuing and Traffic Circulation Criteria

Commercial Haulers

- Maximum time spent on site, including waste unloading: 16 minutes (Milestone Report 1 criterion 2a)

Business and Residential Self-Haulers

Maximum time spent on site, including waste unloading: 60 minutes (Milestone Report 1 criteria 2b and c)

All Customers

- Maximum road grades for all types of vehicles, including loaded transfer trailers: 8%
- Minimum turning radii for vehicle types as specified in Table 6:

Table 6
Vehicle Design Criteria

Vehicle Type	Length (ft)	Width (ft)	Height Normal (ft)	Height Extended (ft)	Minimum Turning Radius (ft)
Car or Pickup Truck	12 – 35[a]	7	5 – 7	N/A	21 – 24
Packer Truck	20 – 30	8	10 – 13	10 – 20	21 – 60
Roll Off Truck	20 – 40	8	7 – 21	24 – 30	21 – 60
Transfer Trailer	70 – 86	8.5	13.5	N/A	60 – 75

1. Includes self-haul vehicle with trailer

- Minimum lane width 12 feet
- Minimized traffic crossings
- Turn around loop for self-haul customers who must leave the site to rescale for a second type of commodity

Transfer Building Structural and Environmental Criteria

- Fully enclosed, unheated, pre-engineered metal building
- Clear span construction with no interior columns
- Modified flat floor design
- Minimum 30 foot vertical clearance from receiving floor to lowest obstruction (Milestone Report 1 criterion 9 – 25 feet minimum)
- 40 foot-candles lighting level at the tipping and receiving floor levels (Milestone Report 1 criterion 10)
- High pressure, low volume water misting system for dust and odor control (Milestone Report 1 criteria 10 and 14)
- Mechanical exhaust ventilation systems for dust and odor control including dust extraction system (Milestone Report 1 criteria 10 and 14)
- Maximum use of passive ventilation and natural lighting
- Hardened concrete topping for floor slab areas subject to high wear
- Steel armor plating for high wear areas of walls and around hopper throats

- Steel rails embedded in floor extending out from steel floor plates at hopper throats
- Carbon monoxide and nitrogen dioxide monitoring on the tipping floors and in the loading bays (Milestone Report 1 criterion 10)

Equipment Maintenance Area Criteria

- Fully enclosed, pre-engineered metal building, nominally 50 feet by 50 feet with 20 foot vertical clearance
- Clear span construction with no interior columns
- Coiling overhead doors for equipment access
- Concrete floor
- Equipment suitable for minor maintenance
- No overhead cranes
- Storage area for parts and fluids
- Good ventilation and task lighting

Future Expansion Criteria

- If possible, space on site or on adjacent property for future expansion of existing facilities such as additional scales and a second scale house and additional trailer/container parking, or for the addition of other new facilities such as a household hazardous waste facility, a vactor decant facility, highway tractor over-night parking (Milestone Report 1 criterion 8)

3. 1998 Facility Master Plan

The following discussion summarizes the 1998 Facility Master Plan. It is included here as a point of reference only since the facility defined in the 1998 FMP no longer meets the county's current and forecasted future needs as determined in Milestone Reports 1 and 2. In the eight years since the 1998 FMP was completed, a number of significant project elements have been added to the requirements for the Bow Lake site including:

- Replacement transfer building
- Second compactor
- Perimeter service road
- Separate scale facilities for the commercial and self-haul customers
- Stormwater utility connection

Table 7 compares in summary format the 1998 FMP and 2006 FMP.

The 1998 FMP included a suite of short term improvements related to immediate safety and operating efficiency needs. A number of these improvements have already been instituted including replacement of the scale house, repairs to the waste receiving pit, and installation of a misting system to control dust in the transfer building.

All of the site constraints listed in Section 1.3, "Facility Background," were applicable to the 1998 FMP. At the time the 1998 FMP was developed, some of these constraints, such as the impact of off-site traffic on site access, and the amount of property available were not considered as significant as they are today.

The preferred alternative of the 1998 FMP focused on maximum reuse of the existing facilities with the least amount of site disturbance. Additional property was assumed to be added to the east of the existing scale facility to accommodate access to the free portion of a new recycle area located to the northeast of the existing scale facility, and property to the north of the site for an expanded trailer parking area. Access to the paid portion of the recycle area was provided from the on-site road system. The paid recycle area included two covered top-load trailer bays for yard waste and two uncovered top-load drop box stalls for bulky waste such as scrap metal. The covered top-load bays were proposed to provide a small temporary MSW transfer area that would be used while the main facility is being reconstructed.

Table 7
Comparison of 1998 FMP and 2006 FMP

Design Element or Criteria	1998 FMP	2006 FMP
Planning Year	2020	2030
Projected Ave. Daily MSW	442 tons/day	1,384 tons/day
Property Acquisition/Expansion	1.5 acres public/5 acres private	6.6 acres public/0 acres private
Scale Facilities	Two-scale, single scale house for all customers	Three scale, single scale house expandable to four scales with two scale houses and one scale booth for self-haul customers and separate two scale unattended scale facility for commercial haulers
Transfer Building	Existing, 33,100 square feet with 10 self-haul stalls and 3 commercial hauler stalls	New, 68,000 square feet with 18 self-haul stalls and 5 commercial hauler stalls
MSW Receiving & Transfer	Shallow, flat floor pit with one 100 tph preload compactor	Flat floor with two 100 tph compactors
Yard Waste Receiving	Two covered top-load trailer bays in paid recycle area	Two covered top-load trailer bays in paid recycle area/transfer building with loading scales
Free Recycling	New free recycle area	Existing recycle area
Paid Recycling	New paid recycle area after scale facility and co-located but separate from free recycle area	New paid recycle area after scale facility
Trailer Parking	17 empty trailer stalls and 16 full trailer stalls without room for expansion	22 each empty and full trailer stalls (44 total)
Customer Access	Combined self-haul and commercial hauler access through a common scale facility	Separate self-haul and commercial hauler access through separate scale facilities unattended scales for the commercial haulers
Refueling Facility	No	Yes
Public Facility	Customer restrooms and informational kiosk	Customer informational kiosk
Employee Facilities	Existing remodeled 750 square foot area	New 4,200 square foot area
Maintenance Building	New 450 square foot single bay enclosed shelter	New 2,500 square foot, two bay enclosed shelter
Sewer Connections to Local Municipal Systems	Sanitary sewer – yes; storm sewer - no	Storm sewer –yes; sanitary sewer no
Wastewater Pretreatment System	No	Yes
U.S. Green Building Council LEED Rating	No	Silver Rating

A new two-scale scale facility was located at the same approximate location of the existing scale facility.

Alterations to the transfer building included widening the waste receiving floor (pit) by 39 feet to 77 feet. The receiving floor was also changed from a sloping to a flat floor with a single compactor hopper located at the north end. The existing, bermed west wall of the commercial tipping floor (the west floor) was removed to provide more maneuvering room and exit area for the commercial vehicles. The existing top load bay was widened to provide a bypass lane so that transfer vehicles could pull past the compactor and then back up to the compactor. The widening included enough space to add a future second compactor. Addition of the second compactor would require revisions to the north wall of the receiving floor. An equipment maintenance shelter was provided south of the floor equipment access to the tipping floor.

The existing employee facility located over the south end of the receiving floor was remodeled and enlarged and handicap access ramps are added.

The existing transfer trailer yard, with parking stalls for 16 trailers, was retained for full trailer parking and a new 17 stall yard was developed on a small parcel to the north on what is currently WSDOT property.

A public facility building was added along the existing site exit lane to the southwest of the transfer building.

Entirely new water, sewer and electrical systems were included. A new sanitary sewer connection to the municipal system located in the valley to the east of the site was also included. The proposed stormwater management system included new collection and detention facilities, but did not include a piped system to deliver the site discharge to the regional stormwater management system located in the valley to the east of the site.

As mentioned above, a temporary transfer station consisting of two covered top-load trailer stalls in the new recycle area was included.

There were no off-site access improvements contemplated in the 1998 Plan.

The estimated construction cost (1998 dollars) for all elements of the preferred alternative exclusive of land acquisition costs was $9,590,000. The 1998 FMP did not include an estimate of the annual operating and maintenance cost of the new facilities.

Drawings from the 1998 FMP are included in Appendix E.

4. Preferred Facility Master Plan Alternative

4.1 Alternative Site Plan Review Process

The County considered more than two dozen alternative site plans, including numerous variations of several key concept approaches, in arriving at the preferred facility master plan alternative for the Bow Lake Transfer/Recycling Station (the Preferred Site Plan). The Preferred Site Plan is illustrated in Figure 14.

A project Task Force consisting of representatives of the various County stakeholder groups, including transfer station operators, scale operators, truck drivers, facility maintenance, facility planning and engineering, the household hazardous waste program, the recycling program, public involvement and outreach, and solid waste system management, and the R. W. Beck consultant team conferred on several occasions to develop a broad spectrum of alternatives. During this process, alternative arrangements that showed significant promise were identified and refined in an attempt to eliminate weaknesses and further improve advantages.

This development process occurred over a period of more than two years during which time there were several periods when activity was placed on hold while the County focused on other planning activities related to the overall solid waste system and the waste export plan.

The Eco Charrette, also called a "green building workshop" (see Appendix B), held in November 2005 played a pivotal part in arriving at the Preferred Site Plan. During this all-day work session significant new ideas and approaches surfaced which led to several major revisions to the site plan such as shifting the transfer building to the north half of the site.

4.2 Preferred Facility Master Plan

Summary Description

The Preferred Site Plan involves a 6.6 acre expansion to the north of the existing site on property currently owned by the Washington State Department of Transportation (WSDOT). The County is in discussions with WSDOT to acquire this additional property which is necessary in order to accommodate all of the County's functional requirements for the facility. An access road paralleling the I-5 corridor along the western side of the site is a key element of the Preferred Site Plan as it provides a separate entrance for commercial customers.

The new station development covers approximately 11.5 acres of site area. A free recycling area and an informational kiosk are co-located approximate 300 feet south of the south site entrance on the west side of the main site entrance road.

The new 68,000 square foot transfer building footprint is located in the north 40% of the site and will accept both MSW and yard waste. A series of rooms located within the building footprint near the south end of the transfer building accommodates TSO activities. These rooms are located above the main tipping and receiving floor level and afford visual monitoring of operations from a break room and from the site supervisor's office. TSO employee parking is located on the west and east sides of the building. An elevator located inside the transfer building provides for vertical access for employees from the loading bay level to the TSO building level. A stairway continues to the roof level for maintenance access. The transfer trailer maneuvering and parking yard is located to the east and south of the transfer building.

The overall traffic flow around the site is depicted in Figure 15. There are two customer entrances to the site. Business and residential self-haul customers and oversize (such as tractor-trailers) commercial vehicles enter at the south entrance and commercial haulers enter using the north access road. After entering through the south site entrance, self-haul customer traffic turns north and passes through the south scale facility before proceeding to the self-haul and commercial customer entrances of the transfer building, or to the entrance to the yard waste and paid recycling area located at the south end of the transfer building. Commercial hauler traffic, except oversize vehicles, will enter through the north access road, pass through the unattended north scale facility and enter the transfer building at the north end of the building.

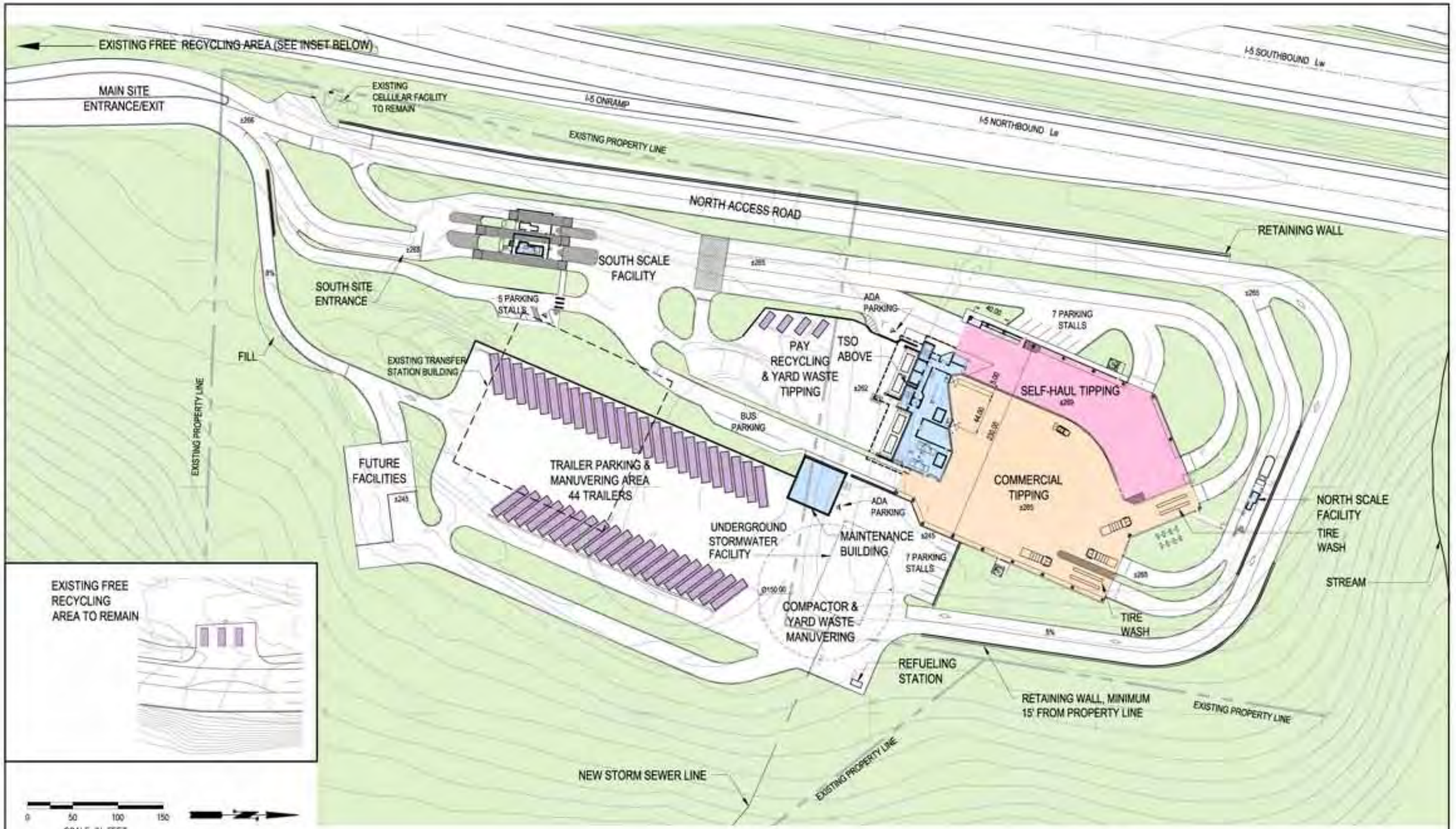
Self-haul customers exit from the west and north sides of the transfer building from either of two doors and return to the south scale facility for reweighing. Commercial haulers (except oversize vehicles) exit the building at the northeast corner, pass back through the north scale facility and exit the site. Oversize commercial traffic will exit through the alternative commercial exit door and loop back to the south scale facility for reweighing and completion of payment.

Self-haul customers with mixed loads who need to make multiple passes through the facility can utilize the turn around loop located opposite the south site entrance.

Transfer trailer traffic flow will normally be one directional, by entering at the south and exiting to the north. However, the transfer trailer traffic will also be able to enter from the north entrance as well. Employees will enter from the south or the north entrances.

Underground stormwater detention vaults will be used due to the limited site area available for surface ponds.

A refueling station for County equipment will be located east of the transfer building near the northeast corner of the trailer maneuvering yard.



KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Preferred Site Plan

Scale 1"=100'

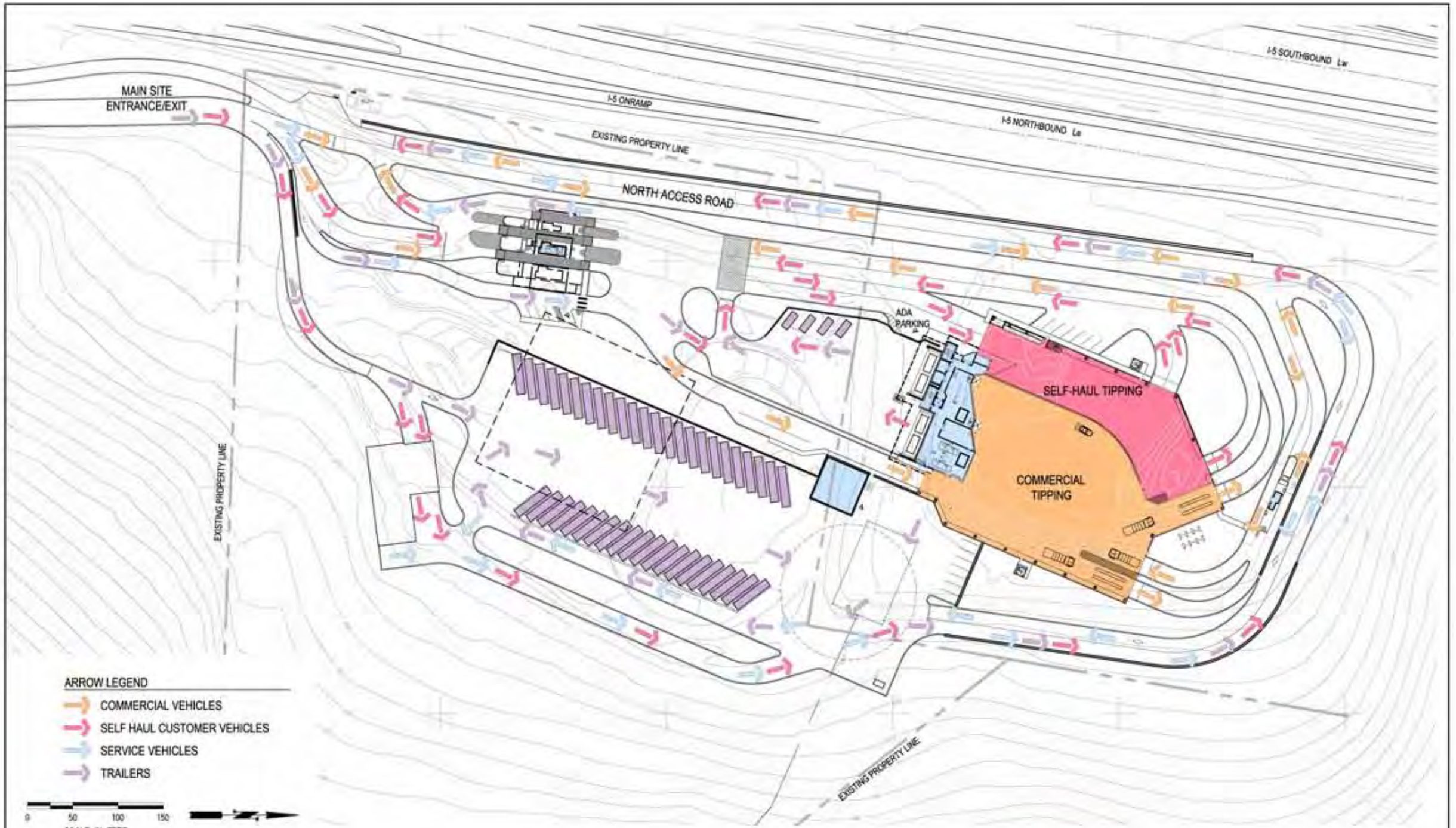
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 14

JULY 2006



KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Traffic Circulation Plan

Scale 1"=100'

KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 15

JULY 2006

Area is preserved in the southeast portion of the site for future development of other facilities. This could include facilities such as a vactor decant facility, truck parking or a household hazardous waste facility (HHW). The floor plan for a typical HHW facility is illustrated in Figure 16.

North Access Road

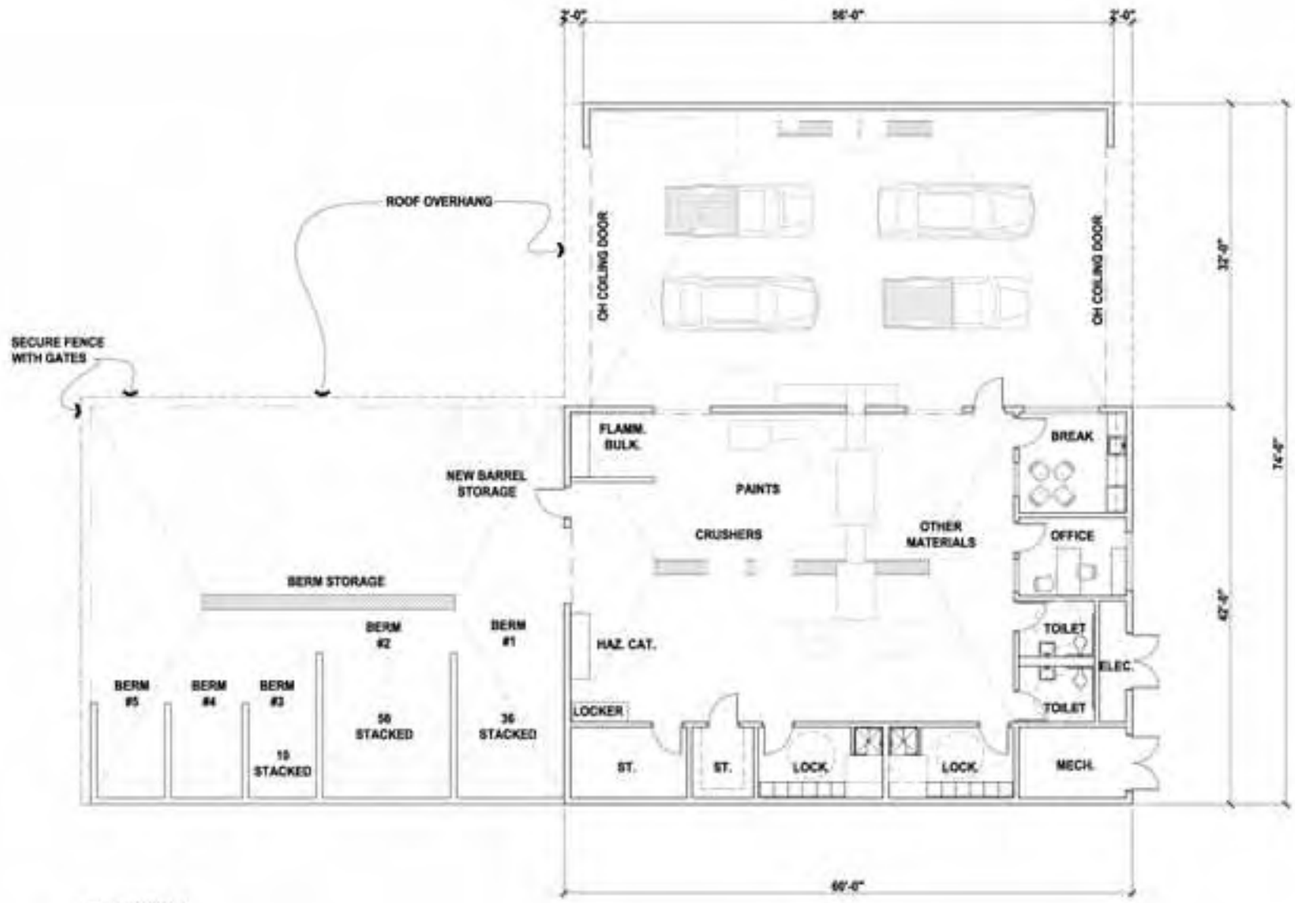
An element essential to the success of the Preferred Site Plan is the creation of a commercial hauler access road parallel to the freeway corridor. This new road provides the opportunity for multiple site access points for the transfer station. The access road consists of a 30 foot wide paved road with shoulders (two 12 foot wide paved lanes). The west edge of the road is well back from a 50 foot setback from the east edge of pavement of the I-5 corridor as requested by the WSDOT. Retaining walls are needed in some areas along the west side of the new perimeter road due to the grade separation between the freeway corridor and the service road. These walls will need to be designed for the additional load from traffic in case the freeway corridor is widened to the east.

Scale Facilities

Two scale facilities are provided: the south (self-haul and oversize commercial) scale facility and the north (commercial hauler only) scale facility. A detailed arrangement of the south scale facility is shown in Figure 17. The full build out elements are shown screened back. A detailed floor plan for the scale house is shown in Figure 18. The south scale facility is laid out to accommodate up to four scales with bypass lanes in both directions. Initially it is constructed with three shallow pit scales, and one scale house with a canopy covering the entire customer area. Shallow pit scales are used rather than low-profile above grade scales because of width restrictions at the site. The fourth scale, when and if ever needed, would be located east of the initial three scales. The island between scales 2 and 3 will be wide enough to accommodate a future scale booth. The island between scales 1 and the future scale will be wide enough to accommodate a future scale house. Scales 1 and 2 will be long enough to be operated as reversible scales. There is approximately 400 feet (~ 18 self-haul vehicles) of pre-scale queuing length for inbound customers. Outbound queuing length is discussed under the transfer building description.

As initially constructed, Scale 3 operates as an unattended scale. The scale is equipped with a kiosk that includes a card reader or some other form of customer identification, digital readout, ticket printer and an intercom for communicating to the scale house operators. The middle scale (Scale 2) is a reversible scale which means that it can be used for inbound or for outbound traffic. The direction of customer traffic will be determined by the scale operators based on the flow of traffic in each direction. Overhead lane control lights are provided to guide customers to the correct scale.

Bypass lanes are provided on each side of the scale facility to accommodate staff and emergency vehicles and exiting customers who do not need to rescale. Scale operator parking is provided to the east of the scale facility.



BERM STORAGE
#1 - FLAMMABLES
#2 - INERTS
#3 - POISONS, FLUORESCENT BULBS
#4 - ACIDS, CAR BATTERIES
#5 - BASES

1"

KING COUNTY
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SOLID WASTE DIVISION

HOUSEHOLD HAZARDOUS WASTE FACILITY

Typical Schematic Floor Plan

SCALE: 1/8" = 1'-0"

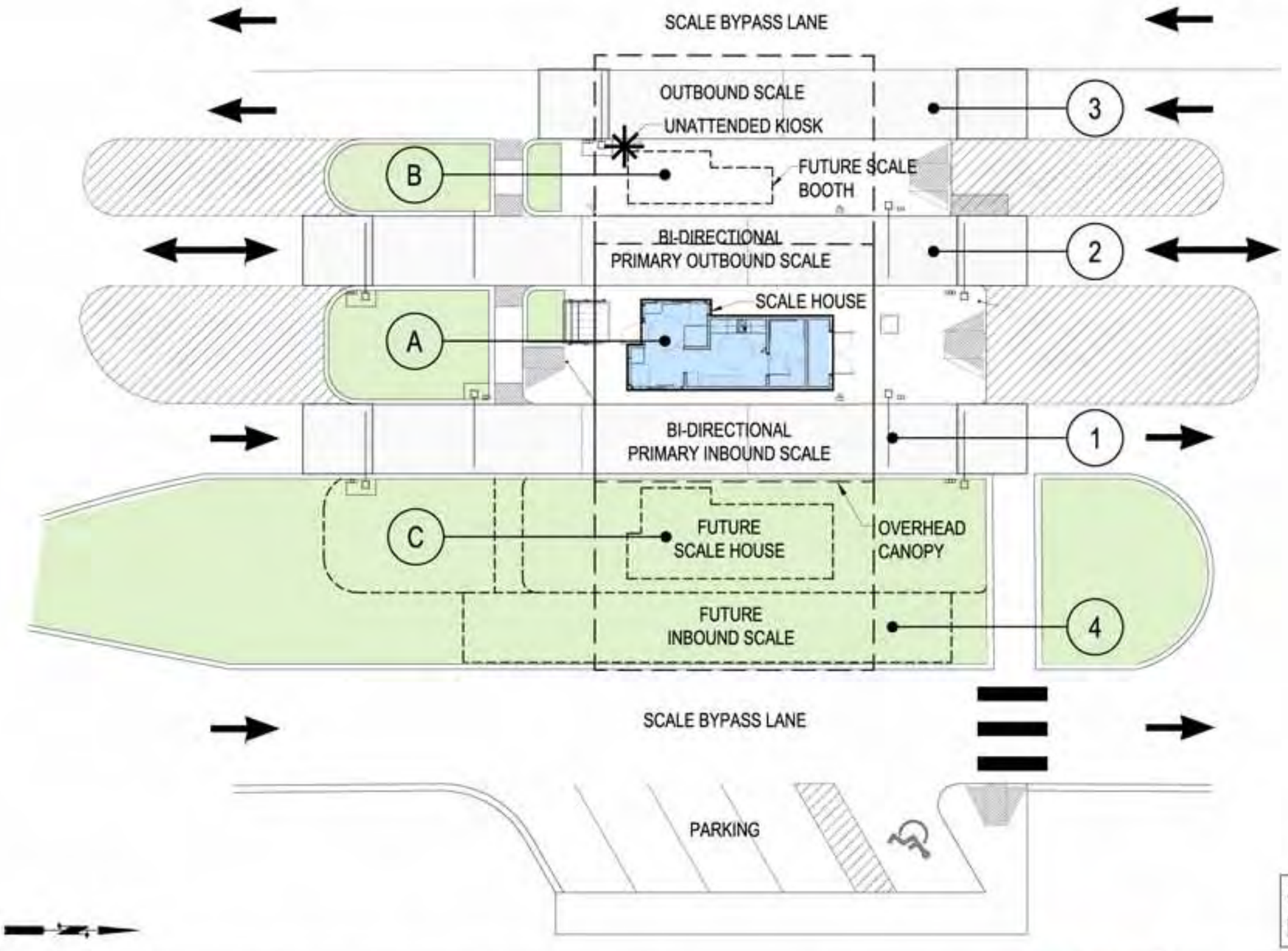
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 16

JULY 2006



SCALE HOUSE FLOOR PLAN, SEE FIG 18

KING COUNTY
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SOLID WASTE DIVISION

South Scale Facility General Arrangement Plan

SCALE: 1/16" = 1'-0"

KPG
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BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 17

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Scale House Floor Plan

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

KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 18

JULY 2006

A similar, multi-scale facility configuration is shown in Figure 19.

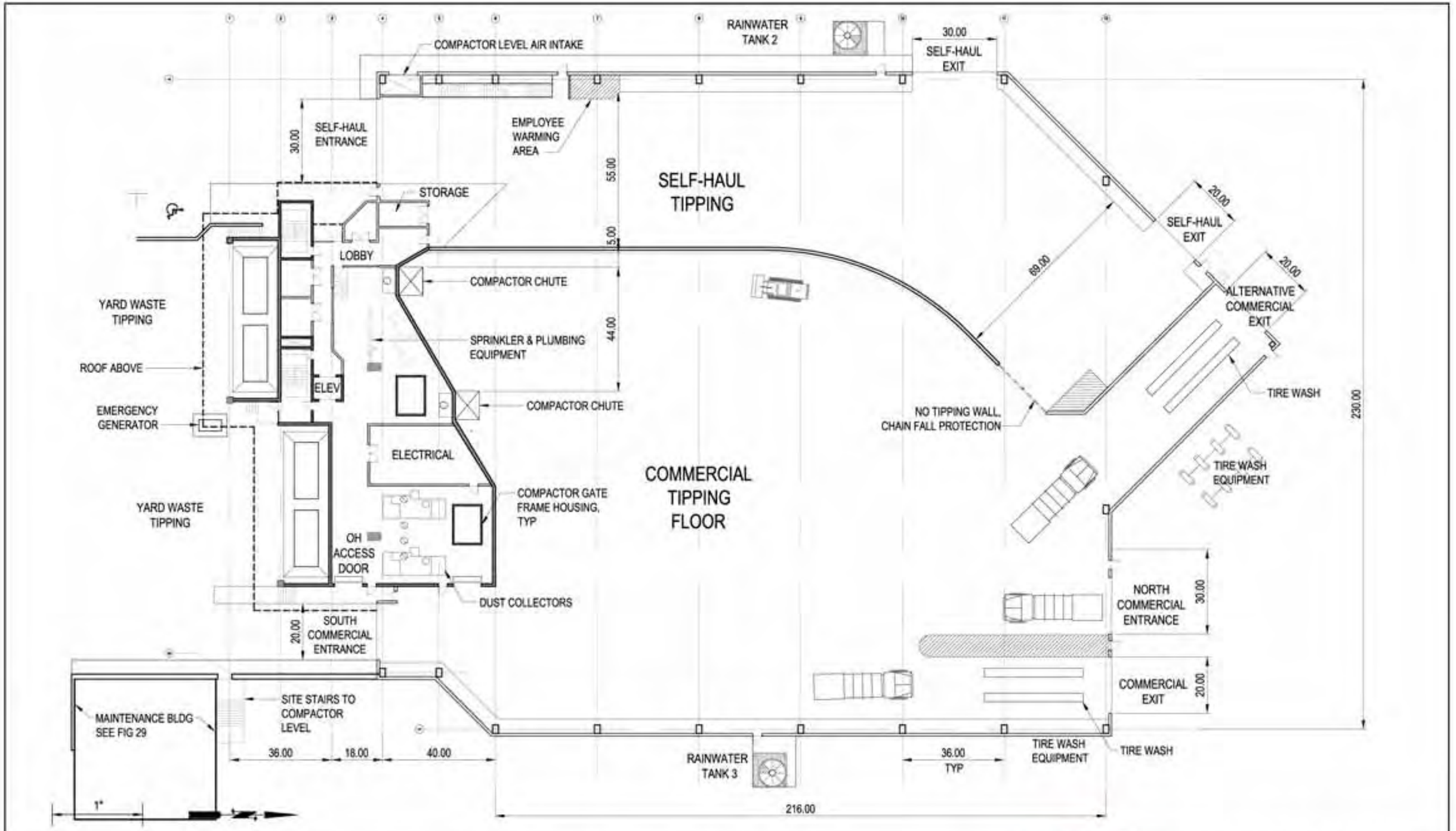
Inbound residential and business self-haul customer traffic approaching the transfer building from the south will diverge upon leaving the south scale facility, with the business self-haul vehicles staying to the far right. There are approximately 330 feet of queuing distance (~ 10 to 11 truck lengths) for this traffic before the entrance to the transfer building. Residential self-haul customers leaving the scale facility will proceed straight ahead to the west entrance of the transfer building where there are two parallel queuing lanes with a total queuing length of approximately 540 feet (~ 24 vehicle lengths).

The north scale facility is laid out with two 40-foot shallow pit scales with space between for a future scale house, should this become necessary. The facility is configured for unattended operation. Each scale is equipped with a kiosk which includes a card reader or some other form of automated data collection, ticket printer, digital readout and intercom connection to the south scale facility. The island between the two scales is wide enough to accommodate a scale house in the future if needed and as discussed later on under Capacity Considerations and Operating Strategies to Deal with Growth. The north scale facility is also an essential element of the construction phasing plan which is discussed later in the FMP.

Figure 19 – Airport Road Recycling and Transfer Station Scale Facility, Snohomish County, Washington

Transfer Building

The transfer building consists of a multi-level, cast-in-place concrete substructure and floor system with a clear span metal building superstructure with precast concrete panels on the lower wall areas for a more durable surface. Detailed floor plans of the main or tipping floor and lower or loading bay floor are shown in Figures 20 and 21. The building roof plan is shown in Figure 22. Building elevations are shown in Figures 23 and 24. A section through the building is shown in Figure 25. The main axis of the building is orientated more or less north-south. A large canopy area extends out from the south wall to cover the yard waste dropoff hoppers and customer unloading stalls.



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SOLID WASTE DIVISION

Transfer Building Main Floor Plan

SCALE: 1/32" = 1'-0"

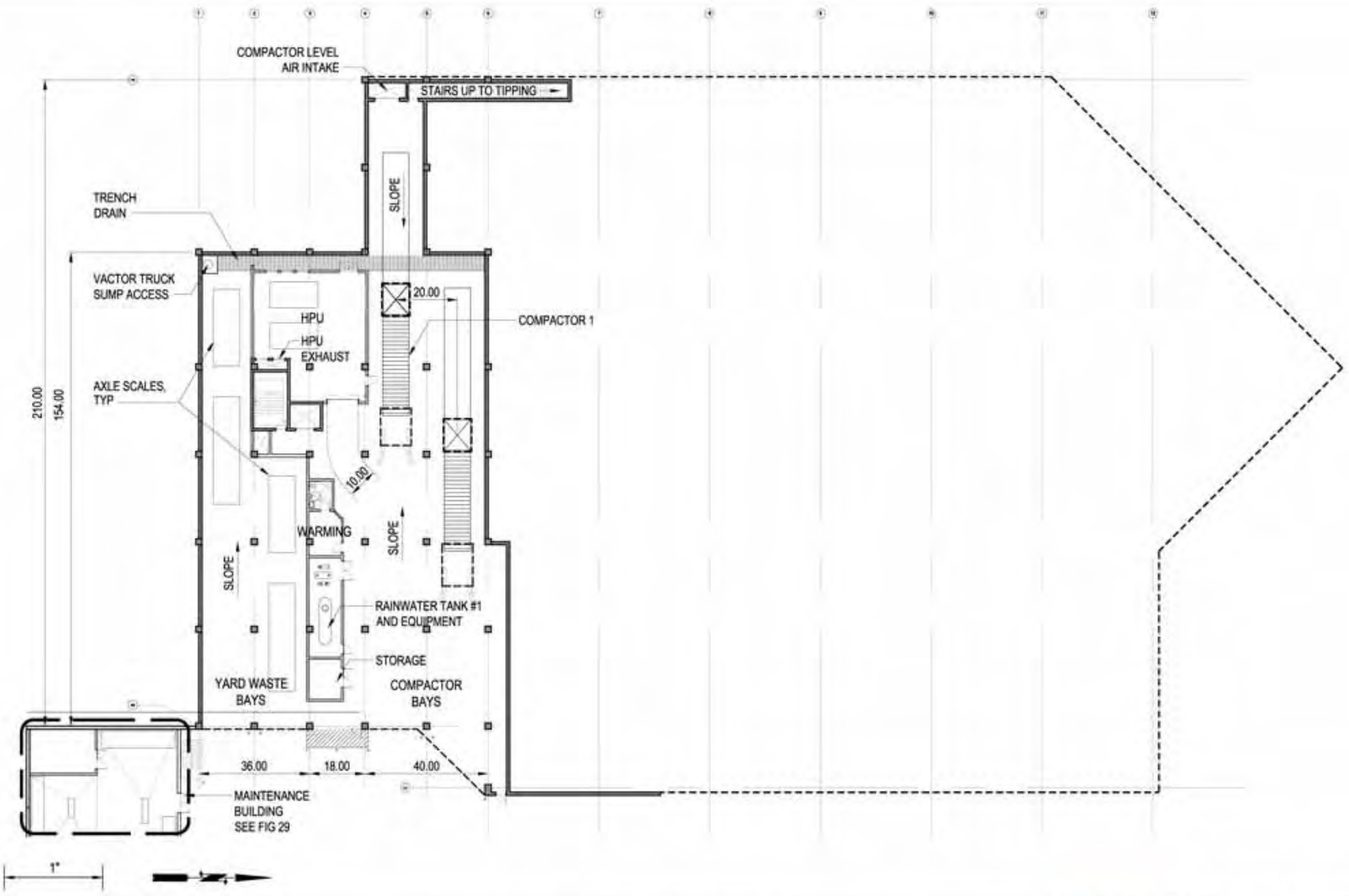
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 20

JULY 2006



KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Transfer Building Lower Level Floor Plan

SCALE: 1/32" = 1'-0"

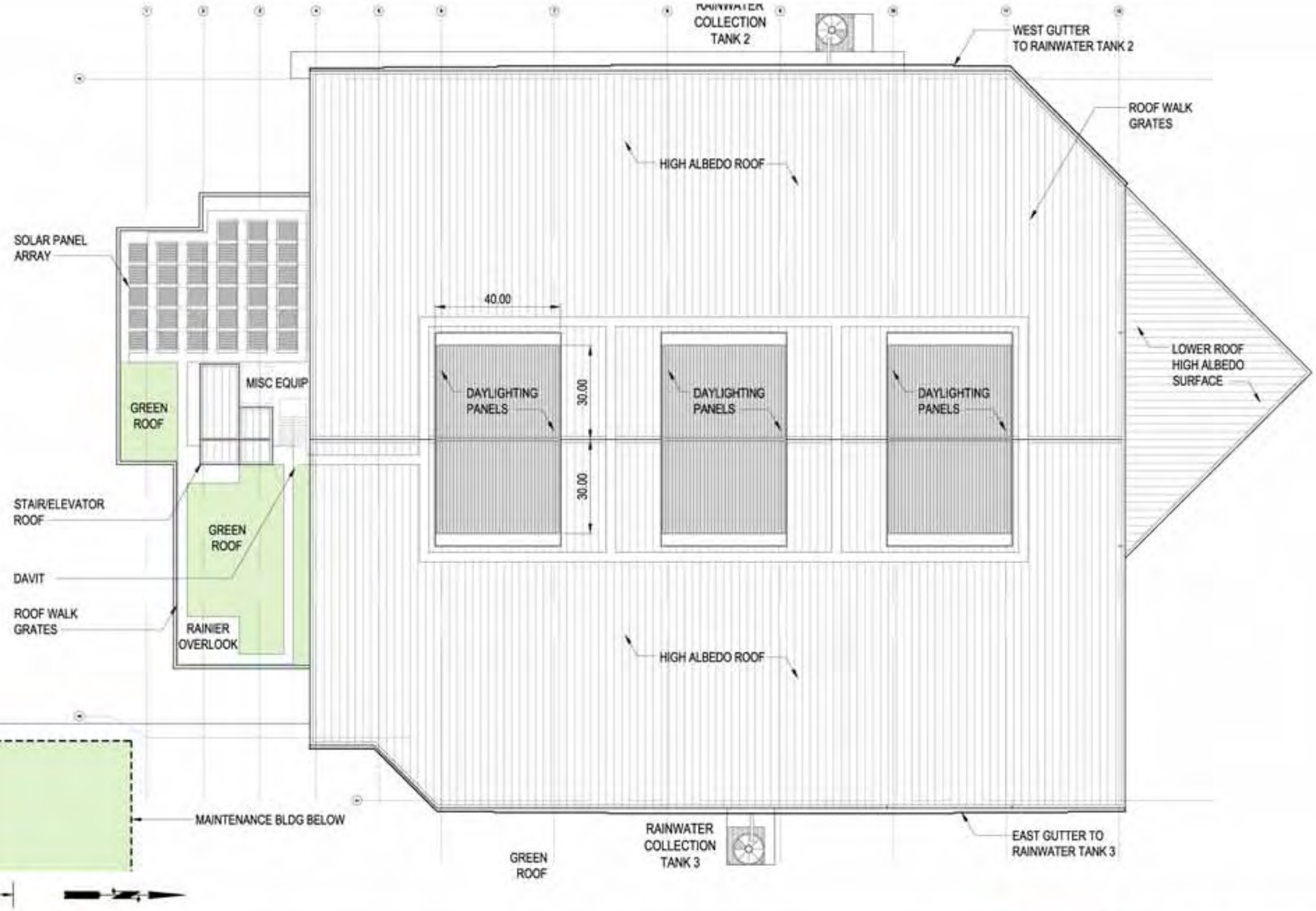
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 21

JULY 2006



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SOLID WASTE DIVISION

Transfer Building Roof Plan

SCALE: 1/32" = 1'-0"

KPG
R·W·BECK

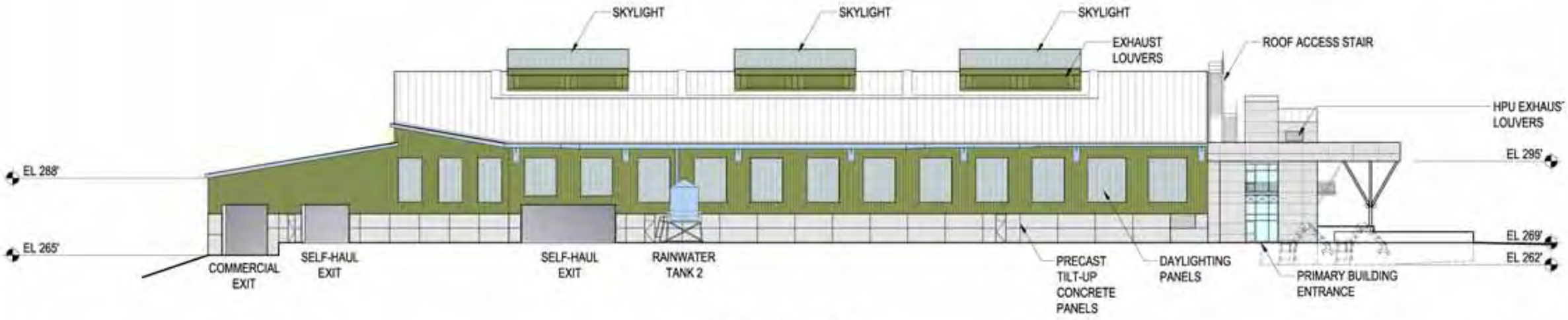
BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 22

JULY 2006

SOUTH ELEVATION



WEST ELEVATION

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SOLID WASTE DIVISION

Transfer Building South and West Elevations

SCALE: 1/32" = 1'-0"

KPG
R·W·BECK

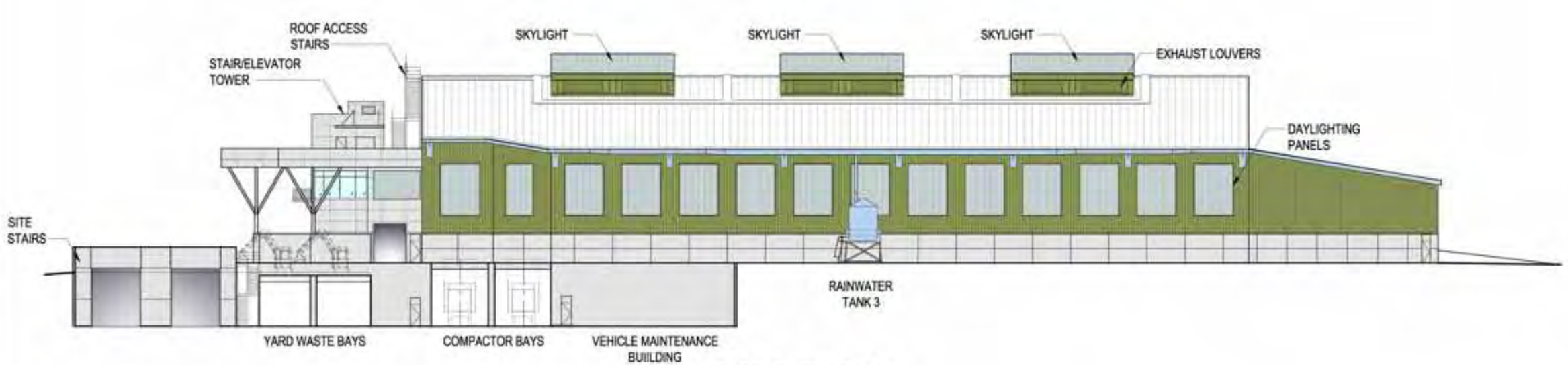
BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 23

JULY 2006

NORTH ELEVATION



EAST ELEVATION

KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Transfer Building North and East Elevations

SCALE: 1/32" = 1'-0"

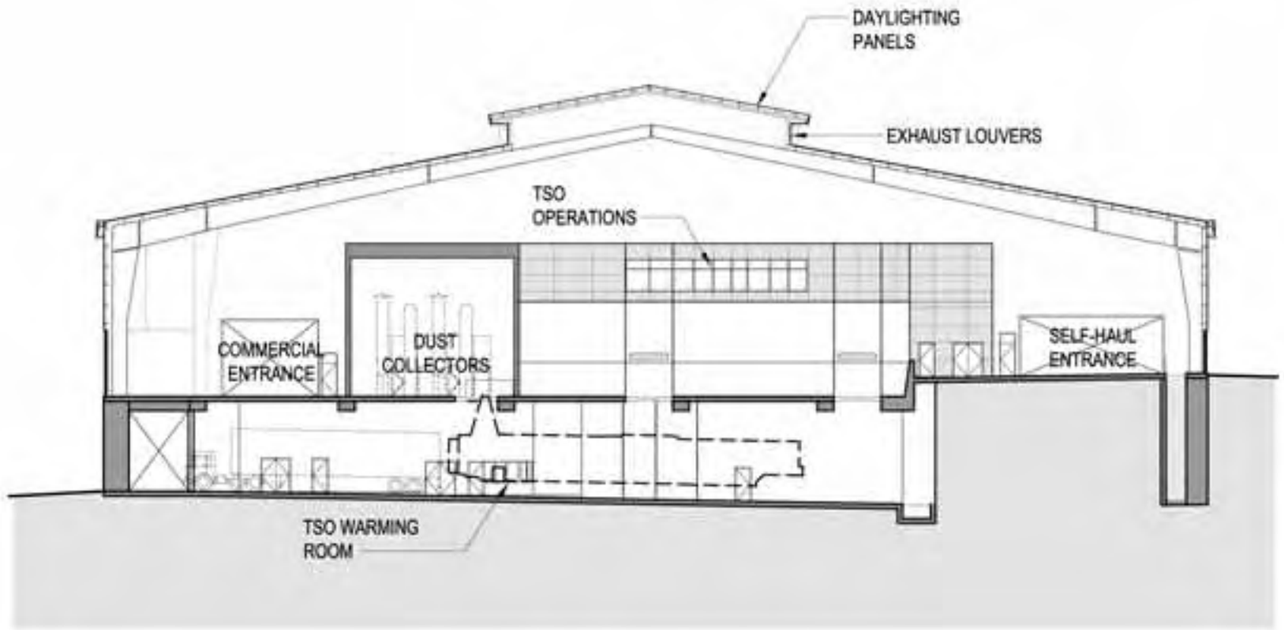
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 24

JULY 2006



EAST TO WEST SECTION
LOOKING SOUTH

1"

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DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Transfer Building Section

SCALE: 1/32" = 1'-0"

KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 25

JULY 2006

The upper metal-clad area of the superstructure will include large translucent panel areas on the walls such as depicted in Figure 26 to provide significant natural lighting levels. There may also be skylights to increase the lighting in the interior areas of the main floor.

Figure 26 – Translucent Siding Panel

The main floor of the transfer building consists of a stepped concrete floor with a self-haul customer tipping floor located on the west side approximately 4 feet above the commercial tipping/receiving floor which occupies the largest area of the building. High wear areas of the receiving floor will receive a hardened corundum aggregate-cementitious topping to extend the life of the floor. Steel rails will be embedded in the floor in extra high wear areas around the compactor hoppers.

Two double-width, back-in tunnels located side-by-side at the south end of the lower level of the building will house two stationary MSW preload compactors and the two top-load chutes for yard waste. The yard waste chutes are located in the southern tunnel which extends approximately two thirds the width of the building. The compactors are located in the northern tunnel which extends approximately three quarters the width of the building. Vactor truck access to service the trench drain system at the rear of the tunnels is provided in the yard

waste tunnel. Both tunnels slope to the rear (west). An elevator and a stairwell connect the two tunnels to the upper floor levels for operations access and for emergency egress purposes. A separate emergency egress stairwell required by code is provided at the rear of the compactor tunnel. A warming room with toilet room is located adjacent to the compactor bay.

Hydraulic power units (HPU) that provide power to the two compactors are located in an enclosed service room on the lower level of the transfer building, in close proximity to the compactors. A typical HPU equipment room is illustrated in Figure 27. Using a separate closed room away from the compactors and waste handling operations provides a clean environment which is beneficial to the life of the equipment and shields occupied spaces from the noise of the HPU equipment. The need for cooling air is satisfied by drawing in filtered air from the compactor bay and exhausting heated air up through a chase that discharges through louvers on the south wall of the transfer building above the yard waste canopy. Maintenance access to the HPU room will be through a coiling overhead door off of the compactor bay.

Dust collection equipment and electrical and mechanical rooms are grouped on the floor above the compactor bay.

Figure 27 – Typical HPU Equipment Room

There are up to 18 unloading stalls for residential self-haul customers and up to six stalls for commercial customers on the main floor. The residential customer stalls are arrayed diagonally along a 42 inch high concrete tipping wall that curves to the east in the north half of the building. After dumping, residential customer traffic exits the building through doors on the west and north sides of the building and merge into a single return lane to the scale facility. This lane provides over 700 feet (~ 28 vehicle lengths) of pre-scale queuing distance for self-haul customers. As discussed under the scale facility description above, most commercial vehicles will exit the north end of the building after passing through a wheel wash, and will reweigh at the north scale facility. Access to the exit scale will be controlled by a card activated gate. Commercial traffic leaving through the north scale facility continues on to the north site entrance and exit. Business self-haul and oversize commercial vehicles must use the west commercial exit door after passing through a wheel wash, and will return to the south scale facility on a dedicated lane. This lane provides over 750 feet of pre-scale queuing length.

An employee warming area is located along the west wall of the building. This is an open area that is equipped with a transparent windscreen facing the self-haul entrance door and some form of radiant heater. Normally the floor staff will be busy helping direct and oversee customer traffic. The warming area is available during lulls in floor activity.

TSO Area (Employee Facility)

A series of rooms with approximately 4,200 square feet of floor space is located on an upper floor level above the dust collector/mechanical/electrical rooms towards the south end of the transfer building. This area houses two offices, a break room, locker rooms, rest rooms, mechanical and storage rooms for the transfer station operations staff. The break room also serves as a meeting room for up to 15 people. A detailed floor plan of the TSO Area is shown in Figure 28. Parking for the operations staff is located along the west side of the building. Additional parking is located along the east side of the transfer building.

There will be several access points to the TSO area. As previously mentioned, a centrally located elevator and an adjacent stairwell provide access down one level to the residential self-haul tipping floor via a corridor, a half floor further down to the dust collector/mechanical/electrical rooms and out onto the commercial tipping floor and finally, down to the loading bay level. A second stairwell located further west and required by code provides access from the TSO level to the residential self-haul tipping area.

The TSO area has two south facing viewing areas that allow the operators to oversee the paid yard waste and recycling area, portions of the trailer parking and maneuvering yard and the area set aside for future facilities. These viewing areas include the break room and a viewing balcony off of a short corridor immediately east of the elevator.

Container/Trailer Maneuvering and Storage Yard

An approximately 136,000 square foot paved trailer maneuvering and storage yard (at full build out) is located east and south of the transfer building as shown in Figure 14. The 150 foot square maneuvering area located to the east of the compactor and yard waste tunnel entrances has sufficient space for all trailer maneuvering requirements. Trailer or container parking is aligned in two diagonal rows or tiers on the east and west sides of the parking area. A central corridor is provided for parking maneuvers and for transit of incoming empty container vehicles. An outside loop lane is provided to the east of the parking tiers to allow for trailer circulation movements.

The trailer parking areas are paved with concrete to accommodate stacking of containers. A top pick loader or reach stacker would be used to unload empty containers and load full containers in the central corridor. Both parking tiers include provisions for surface water runoff to the sanitary sewer system or the stormwater system. Station operators will determine where each tier drains to by using valves in the piping system.

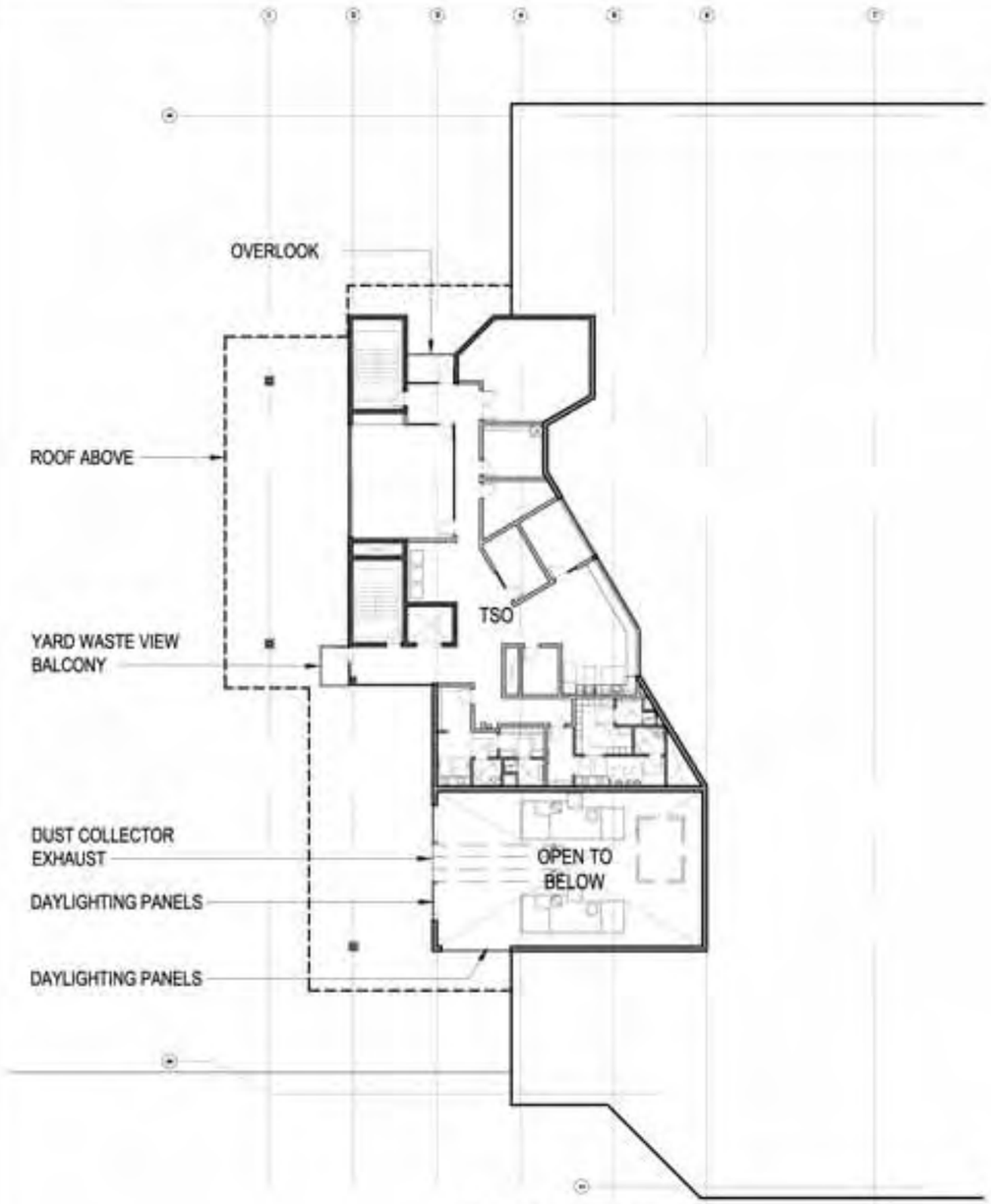
Maintenance Building

A 2,500 square foot, two-bay, vehicle maintenance building is located on the east side of the transfer building. The floor plan for this building is illustrated in Figure 29. This building will accommodate routine light maintenance of the on-site mobile equipment. Light maintenance includes lubrication and fluid changes, replacement of minor parts and other preventive maintenance activities. The building will include space for storage of consumables and small spare parts. It is expected that maintenance staff will visit the site on a periodic basis to carry out routine maintenance activities.

Paid Recycling Area

The paid yard waste and recycling area is located at the south end of the transfer building and includes about 17,000 square feet of paved area. Space for at least five 40 cubic yard at-grade roll-off recycling bins are provided for commodities such as white goods (appliances), tires, wood waste, carpet and scrap metal. In general materials will be placed in these bins through the rear doors. Heavier items, such as appliances, will be placed in the bin by County staff using a fork lift. Although not shown in Figure 14, it's possible that a loading dock will be added in the paid recycling area to accommodate walk-in or forklift drive in of pallets of electronic waste. In addition, a small shelter (not shown) could be provided as an area in which fluorescent tubes are collected and stored and at which electronics waste is dropped off, palletized and shrink wrapped.

Residential and business self-haul customers using scales 1, 2 and 3 can access the paid yard waste and recycling area. Customer vehicles circulate through the area in a counter clockwise direction. Once material is dropped off, customers exit the area and either return to the scale facility or proceed to the right to the transfer building.



TSO FLOOR PLAN

SCALE: 1/32" = 1'-0"

ENLARGED TSO FLOOR PLAN

SCALE: 1/16" = 1'-0"

1"

KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

TSO Area Floor Plan

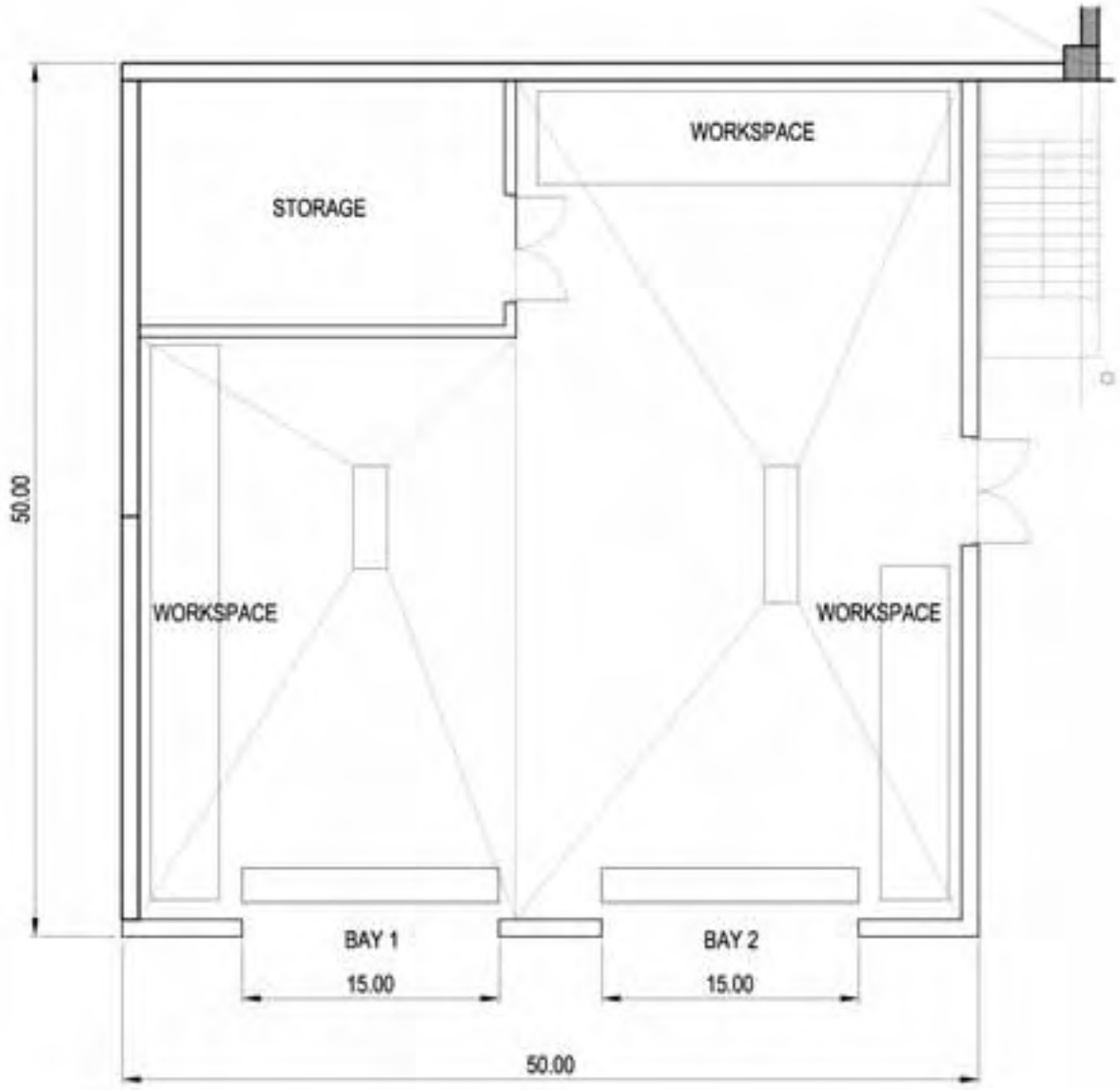
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 28

JULY 2006



Maintenance Building Floor Plan

SCALE 3/16" = 1'-0"

1"

KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

KPG

R·W·BECK

BOW LAKE TRANSFER STATION

FACILITIES MASTER PLAN

FIGURE 29

JULY 2006

Eight covered unloading stalls are provided for yard waste dropoff. Each of the two yard waste load out hoppers is equipped with a knuckleboom crane for compressing the loads.

Free Recycling Area

The existing, approximately 2,000 square foot, paved unattended free recycling area that is located on the west side of the site entrance road near the intersection with Orillia Road will be retained. This area leased from the WSDOT is illustrated in Figures 7 and 14. Space is available for four 40 cubic yard, at-grade roll-off recycling bins for commodities such as mixed paper, glass, cardboard, tin, steel and aluminum containers, newspaper, and plastic containers. The entrance road in front of this area has also served as a customer turnaround area for people needing to go through the station to unload a second type of commodity.

Public Facilities

An informational kiosk will be located at the free recycling area. The kiosk will be used for posting information to customers about recycling services offered at the station as well as other information the public may need to be aware of regarding the County's solid waste management system.

Site Utility Systems

The project site will need new water, sewer, stormwater, fire protection, electrical, telephone, security and data systems all of which will be constructed as underground systems. The existing sewer and stormwater systems at the site do not connect to the municipal systems in the area. The new stormwater system may be extended to the conveyance system located near Southcenter Parkway at the bottom of the slope east of the site or alternatively be designed to disburse flow on the eastern facing hillside similar to the current situation as discussed in Appendix F, "Conceptual Stormwater Management Plan." It may not be feasible to extend the sanitary sewer system to a municipal system connection. If this proves impossible, sanitary sewage and industrial wastewater will be collected on site and hauled by tanker truck to a wastewater treatment facility. It is expected that the industrial wastewater will be pretreated to control pH, total suspended solids, biologic oxygen demand (BOD) and fats, oils and grease (FOG) before it leaves the site.

The electrical power demands for the new facility increase significantly compared to the existing facility due to the preload compactors, the knuckleboom cranes, and the increased building lighting load. A power transformer and standby engine generator with integral fuel tank are located between the two yard waste loading bays on the south side of the transfer building. The generator will be sized to handle the entire site's electrical load except for the two compactors. A photovoltaic generation system will be considered as part of the sustainable building features evaluated during design to help achieve the County's goal of a LEED™ Silver Rating. The photovoltaic array would likely be mounted on the

south-facing canopy over the yard waste hoppers at the transfer building. Such a system is shown on Figure 22. Arrays could also be mounted on the canopy over the scale facility.

A looped fire main system is provided around the site with fire hydrants at various locations that will be determined during detailed design. The transfer building will have a dry pipe fire sprinkler system which will reduce the overall fire flow requirements for the site.

The stormwater management system includes catch basin and curb inlets and a piped collection system that conducts stormwater runoff to underground detention and treatment vaults. The collective discharge from the system vaults is conveyed through a new pipeline to the regional stormwater conveyance system at a location east of the site near Southcenter Parkway. A conceptual stormwater management plan including figures showing the layout of the system is included in Appendix F.

As part of the sustainable building features that will be developed during design to achieve the County's goal of a LEED™ Silver Rating, a portion of the transfer building roof runoff will be collected for non-potable water uses, such as floor washdown and landscape irrigation. Collection tanks are illustrated in Figures 20, 21 and 22. In addition rain harvesting will be evaluated for the runoff from the south scale facility canopy.

4.3 CAPACITY CONSIDERATIONS AND OPERATING STRATEGIES TO DEAL WITH GROWTH

The Preferred Site Plan arrangement and layout of the various project elements provide a high level of operational flexibility that will allow the station to respond positively as the waste and traffic quantities arriving at the station grow over the next 25 years. This flexibility includes space to add a fourth scale at the south scale facility, to enlarge the transfer trailer yard, and to add other types of facilities such as an HHW facility or a vactor decant facility. 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 station which are the scale facilities (inbound and outbound) and the Transfer Building tipping stalls.

Scale Facilities

With two of the initially constructed three scales operating as inbound scales during the peak traffic period (historically on weekends around 1:00 p.m.), and an average inbound scale transaction time of 40 seconds, the two scales would be able to handle 180 vehicles per hour. In 2030 the peak hourly traffic is predicted to be around 240 vehicles, leaving around 60 vehicles in the inbound queue. At an average of 22 feet per queued vehicle this would require in-bound queuing length of around 2,530 feet (about half a mile). The site layout only provides around 440 feet of pre-scale queuing length at the south scale facility. On

weekends when the peak hourly traffic occurs and commercial traffic is minimal, it would be possible to redirect more than 50% of the self-haul customer traffic to the north scale facility which has around 1250 feet of pre-scale queuing and then onto the commercial tipping floor. The addition of the planned fourth scale at the south scale facility would also allow short periods of time when as many as three in-bound scales could be operated at the south scale facility increasing the in-bound capacity of that facility to around 270 vehicles per hour which would greatly decrease the pre-scale queue length required (25 vehicles at 22 feet = 550 feet queuing distance).

Outbound scale transactions typically take longer than inbound transactions, because of the time it takes to process payment, particularly when customers pay with personal checks or debit and credit cards. Assuming an average transaction time 50% longer than inbound (i.e., around 60 seconds), two outbound scales could process 120 vehicles per hour leaving 175 peak hour customers in a queue. Three outbound scales could be employed if the north scale facility is utilized for self-haul customers which would increase the outbound scale capacity to 180 vehicles per hour which would still leave 115 vehicles in a queue during the peak hour (2,530 feet of queuing required). The proposed site arrangement provides the self-haul customers using both the self-haul and commercial tipping floors with around 1,900 feet of outbound queuing in the self-haul floor return lanes and about 330 feet of outbound queuing in the commercial floor return (normally the entrance lane). In addition, there are about 200 feet of outbound queuing immediately north of scales 2 and 3 of the south scale facility and another 200 feet of outbound queuing at the north scale facility. Because there is limited queuing length for outbound self-haul customers using the north scale facility's exit scale, a TSO might be needed to control traffic exiting the commercial tipping floor, directing most traffic to the south scale facility and some customers to the north scale facility.

Transfer Building

The proposed floor layout includes seventeen 11-foot wide unloading stalls for self-haul customers. Initially this floor may be laid out with fewer wider stalls. The stall width would be reduced in later years as traffic increases. On weekends self-haul customers could be directed to the main tipping floor as well where there would be around ten additional stalls. Assuming an average unloading time of around 12 minutes per vehicle (5 vehicles per unloading stall per hour), 27 stalls would accommodate 135 vehicles per hour. This would leave 160 vehicles in queue during the peak hour which would require 3520 feet (about two thirds of a mile) of queuing distance at 22 feet per vehicle.

There are around 540 feet of double lane queuing for the self haul floor and 1,250 feet of single lane queuing for the commercial floor for a total pre-building queuing length of 1,740 feet, which is about half of the required queuing distance in the peak hour. Another option might be to use one of the yard waste hoppers for top-loading of MSW on weekend traffic periods which would add another five unloading stalls (25 vehicles per hour) which would still leave 135 vehicles in a

queue waiting to unload. It is possible that some time prior to 2030 the self-haul customer traffic during the peak hour might exceed the station's unloading stall capacity if the current traffic forecasts hold up. If this happens, queuing lengths and time during the peak hour will necessarily increase. However, even in the later years, average hourly traffic will be much lower than peak flow and the station should have no problem managing the customer flow most of the time.

Waste Tonnage

The station will be capable of managing the forecasted peak daily waste tonnage of around 2,500 tons per day because of the following factors:

- The surge or short term storage capacity of the transfer building;
- The throughput capacity of the two waste compactors;
- The trailer parking capacity at full build out of the station; and
- The planned 24 hours per day station operation.
- The anticipated redistribution of customer traffic peaks during the 24 hour operating day

4.4 PROJECT SCHEDULE, CONSTRUCTION PHASING AND MAINTENANCE OF STATION OPERATIONS

A preliminary project schedule is located in Appendix A and shows design, permitting and construction activities beginning with the adoption of the Facility Master Plan.

As mentioned in Section 1, one of the County's primary objectives for the project is to maintain waste transfer operations for at least commercial customers during the redevelopment of the site and for self-haul customers to the maximum extent possible. To achieve this objective a preliminary phased construction plan has been developed and is outlined below and shown on Figures 30, 31 and 32.

Phase 1

During Phase 1, construction will be completed on the north (commercial hauler) access road beginning at and north of the existing cell tower site, on the transfer building, the north scale facility and all adjacent roads and site work on the WSDOT parcel north of the existing site. A temporary scale house will also be placed at the north scale facility. The new stormwater detention and treatment vault(s) and sewer line connection to the drainage conveyance system east of the site will be constructed during this phase. A significant element of the work during this phase will be the excavation and disposal of excess soils off site.

Transfer station operations at the existing transfer station will continue during Phase 1 for both commercial and self-haul customers. Customer and construction vehicles will share the main site access during Phase 1 which is expected to take 24 to 26 months to complete.

Phase 2

During Phase 2, commercial hauler and business self-haul customer traffic will be redirected to the new north scale facility and the new transfer station. Residential self-haul customers will be redirected to other transfer stations in the region. It's possible that residential self-haul customers could be accommodated at the Bow Lake station on weekends. Phase 2 construction will include demolition of the existing scale facility and completion of all construction on the existing transfer station site. During this phase some transfer trailers may be parked in the area of the existing trailer yard, and some trailers, both full and empty, may have to be parked at other areas of the site or at a temporary yard that could be developed at the north end of the new north access road. Any area used for full trailer parking will need to drain to the sanitary sewer system. The stormwater system of the operational area will be connected to the permanent off-site transmission line by a temporary line. Sanitary sewer flow will be collected in the permanent holding tank and hauled to the Cedar Hills Landfill treatment facility.

Phase 2 is expected to take 10 to 12 months to complete.

Phase 3

During Phase 3, the balance of the work in the permanent transfer trailer yard and along the return road from the transfer station to the south scale facility will be completed. Commercial and business and residential self-haul customers will have full access to the transfer station during this phase, which is expected to take 1 to 2 months to complete.

The total time to complete the site construction is estimated to be between 35 and 40 months.

4.5 SUSTAINABLE DESIGN AND LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED™) RATING

As discussed in Section 2, the County has made sustainability a central goal for the redevelopment of the Bow Lake facility and has established a LEED™ Silver rating for the project. The project has been registered for LEED certification under the U.S. Green Building Council's LEED 2.1 program. Under this rating system, a Silver rating requires a score of 33 to 38 points out of a total of 69 available points in six areas of sustainability:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design Process

An Eco Charrette for the project was conducted on November 2, 2005. The purpose of the charrette was to discuss environmental and economic goals of the project related to the functional requirements for the facility. The discussion was enhanced by the significant LEED experience the SWD gained from the First Northeast Transfer/Recycling Station project which is slated to achieve a Gold rating.

The results of the charrette are summarized in Appendix B and indicate a strong possibility that the Bow Lake facility could achieve a score of at least 40 points without great difficulty, and a Gold rating. The charrette also identified a number of studies and analyses that will need to be undertaken during the design phase of the project to confirm the feasibility and economic value of various sustainable development measures.

4.6 GEOTECHNICAL CONSIDERATIONS

The Bow Lake site presents a geotechnical challenge due to the presence of old solid waste and burnt waste ash deposits on the existing site and extending onto the WSDOT property to the north. The extent of these deposits has not been accurately mapped, but surface settlement and numerous geotechnical borings and test pits over the last 15 years or more do give some indication of location. The following three reports summarize the most recent investigations regarding subsurface conditions at the site and on the WSDOT property.

Supplemental Subsurface Investigation
Bow Lake Transfer Station Improvements
Facility Master Plan
Hong West & Associates, Inc., November 16, 1993

Draft Geotechnical Evaluation Report
WSDOT Property
Bow Lake Transfer/Recycling Facility
HWA Geosciences, Inc., January 16, 2004

Technical Memorandum
Bow Lake Transfer Station
HWA Geosciences, Inc., March 24, 2006

Technical Memorandum
Slope Geotechnical Issues
Bow Lake Transfer/Recycling Station
HWA Geosciences, Inc., November 16, 2006

Copies of these reports and memorandum are included in Appendix G. Based on the information in these reports, it appears likely that a significant quantity of old waste will be encountered during reconstruction of the south scale facility. . Recent experience with the plans for redevelopment of the First Northeast Transfer/Recycling Station site, where there are similar deposits, strongly

suggests that the best method for dealing with these problem foundation materials is to remove them completely from site. This approach has been assumed for the south scale facility in the preliminary cost estimate included in the Facility Master Plan. During preliminary design on-site remediation as well as off-site removal will be evaluated in detail.

The native glacial till materials should adequately meet foundation requirements for buildings and pavements. The weather-sensitive nature due to the high fines (silts and clays) content of some of this material will make it necessary to restrict earthwork activity to the dry months of the year. The groundwater level at the site is deep and therefore don't represent a problem for the development.

Slope stability conditions on the north and east sides of the site have been preliminarily evaluated. Based on this initial assessment, it is believed that slope stability and slope erosion problems will be avoidable through the application of conventional, routine geotechnical design practices and well established temporary erosion and sediment control best management practices.

Site layout will involve extensive use of retaining walls to create the grade separations needed throughout the site. Based on the preliminary geotechnical information it appears that several types of retaining walls, including mechanically stabilized earth (MSE), soldier pile walls, cantilevered concrete, and soil nail walls, will be used.

4.7 CONSTRUCTION COST ESTIMATE

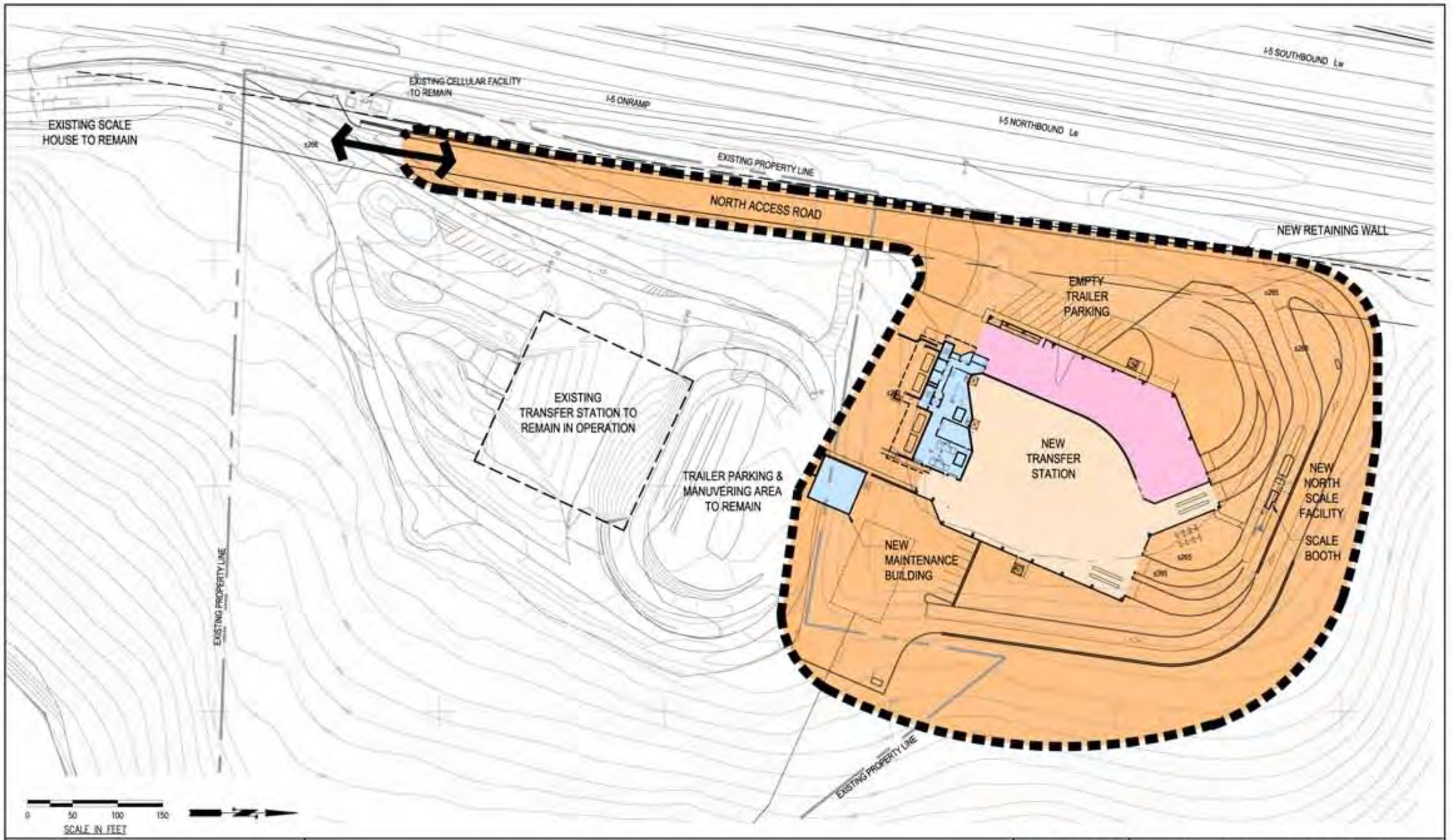
The estimated total construction cost of the new facility, including contingency and sales tax, is around $44,200,000 (2006 dollars), which does not include the cost of property acquisition. A detailed construction cost estimate is included in Appendix H.

4.8 OPERATING COST ESTIMATE

The estimated annual operating cost of the facility when it is open for both commercial and self-haul customers is $2,620,000 (2006 dollars). A detailed operating cost estimate is included in Appendix I.

4.9 PERMIT REQUIREMENTS

A detailed list of federal, state, county and city permits and approvals that may be required is provided in Appendix D. A WSDOT Developer Permit, if required, may require the longest time to acquire, six months.



KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Construction Site Plan Phase 1

Scale 1"=100'

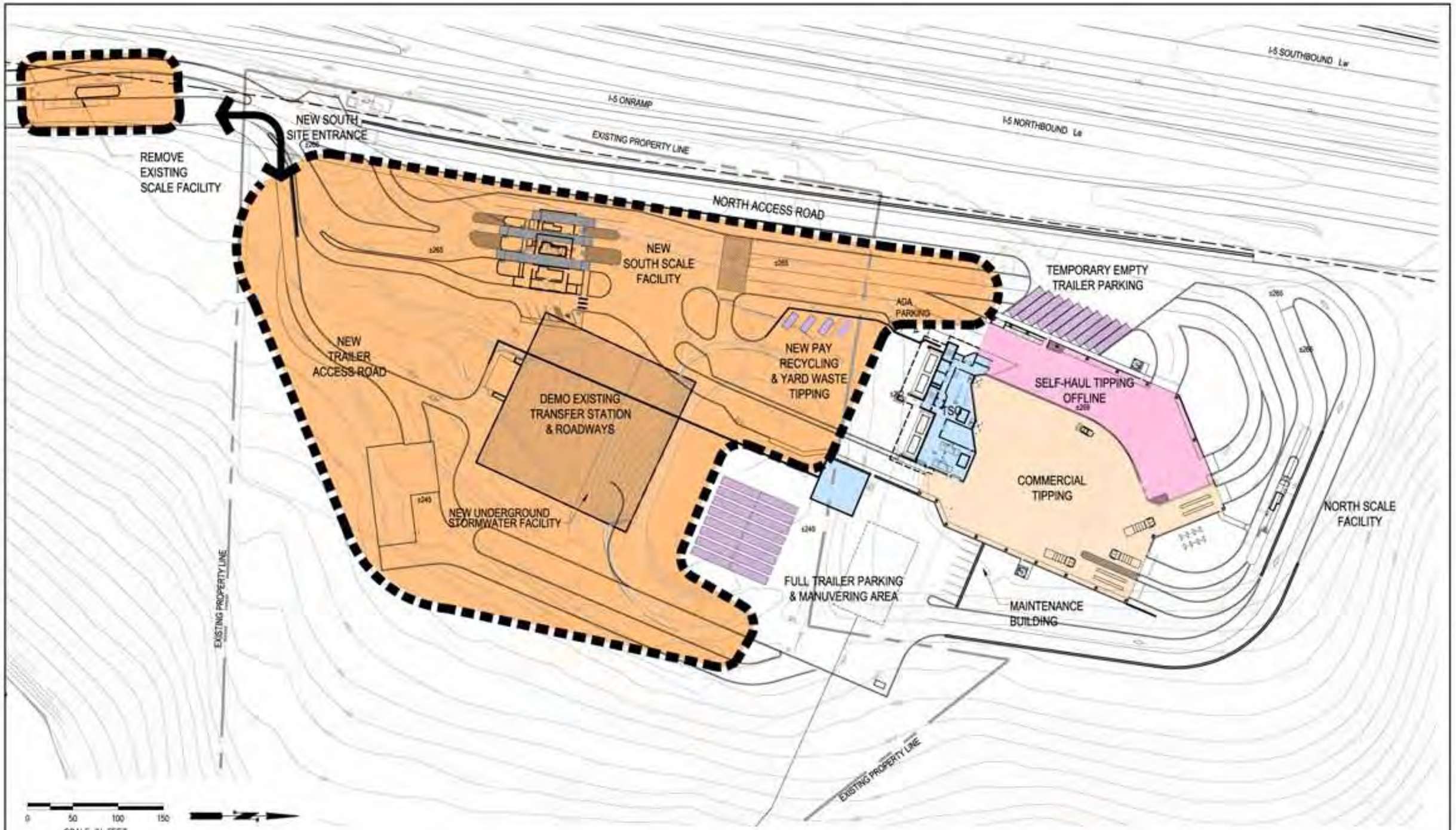
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 30

JULY 2006



KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Construction Site Plan Phase 2

Scale 1"=100'

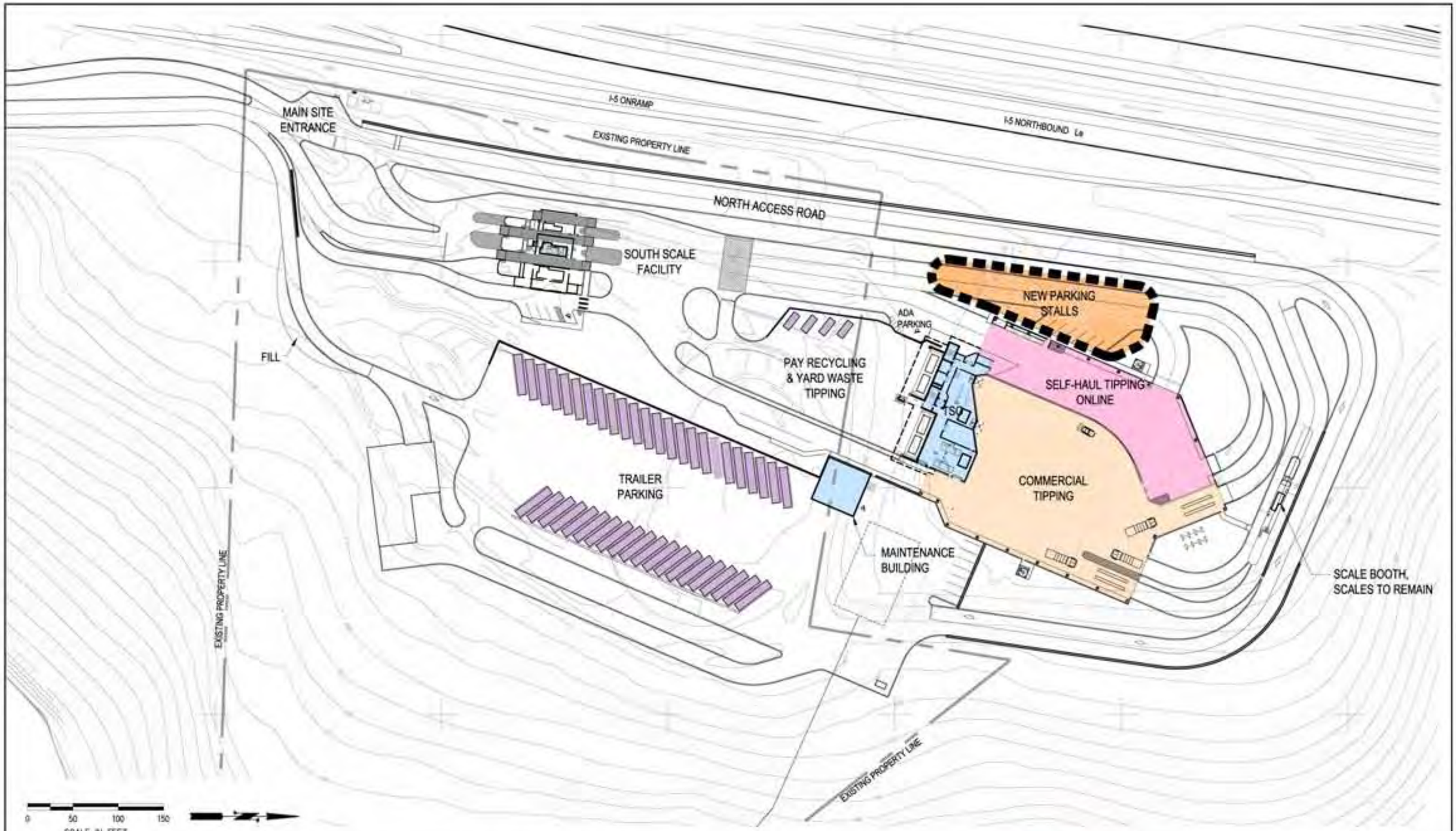
KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 31

JULY 2006



KING COUNTY
DEPARTMENT OF NATURAL RESOURCES & PARKS
SOLID WASTE DIVISION

Construction Site Plan Phase 3

Scale 1"=100'

KPG
R·W·BECK

BOW LAKE TRANSFER/RECYCLING STATION

FACILITIES MASTER PLAN

FIGURE 32

JULY 2006