Attachment A

12134

2005-192

Analysis of System Needs and Capacity

Using the Transfer System Level of Service Evaluation Criteria and Standards

March 2005

Prepared by:

King County Solid Waste Division

in collaboration with the

Interjurisdictional Technical Staff Group

Metropolitan Solid Waste Management Advisory Committee

Solid Waste Advisory Committee

and

King County Council Staff

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Solid Waste Division

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12134

Analysis of Transfer System Needs and Capacity

Using the Level of Service Evaluation Criteria and Standards

Executive Summary

This report is the second in a series of reports to evaluate the existing regional solid waste system and prepare for the future of solid waste transfer and disposal, including the transition to waste export. The report was prepared by the Solid Waste Division in collaboration with the Interjurisdictional Technical Staff Group (ITSG), the Metropolitan Solid Waste Management Advisory Committee (MSWMAC) and the Solid Waste Advisory Committee (SWAC). This effort is undertaken in accordance with King County Ordinance 14971 (Appendix A).

Generally, the application of the criteria resulted in a yes/no finding, i.e. the station does or does not meet the criteria. Although this report concludes that the stations do not meet many of the criteria, the facilities do meet all local and state health and safety requirements.

Ordinance 14971 established the process and timeline for developing a waste export system plan. It created MSWMAC and formalized the working relationship of the division, cities and county council staff (ITSG). The ordinance also required that four milestone reports be submitted to the King County Council and the Solid Waste Interlocal Forum prior to completion of the waste export system plan. The four milestone reports are:

1. Transfer System Level of Service Evaluation Criteria and Standards
2. Analysis of Transfer System Needs and Capacity
3. Public/Private Options for Ownership/Operation of Transfer and Intermodal Facilities
4. Preliminary Transfer and Waste Export Facility Recommendations

The first milestone report – Transfer System Level of Service Evaluation Criteria and Standards – was adopted by the King County Council on December 6, 2004. The report established evaluation criteria and standards by which the Solid Waste Division's existing transfer facilities would be assessed.

This report - The Analysis of Transfer System Needs and Capacity - presents the results of applying the transfer station criteria to each of the stations being evaluated. It does not contain alternatives and recommendations for the transfer system, which will be included in the fourth milestone report.

While nineteen evaluation criteria were developed, this report addresses criteria one through sixteen. Criterion 17 – Other Local and Regional Considerations – will be added at a later date as an addendum to this report after MSWMAC has had the opportunity for in-depth discussion of this criterion.

Criteria 18 and 19 address cost and rate considerations and will be part of the development of system alternatives, which will be contained in the fourth milestone report.

Three of the county's eight urban transfer stations were not evaluated for this report. The First Northeast Transfer Station in Shoreline is not included because it is scheduled to be rebuilt in 2005. The Vashon and Enumclaw transfer stations were also excluded from the evaluation because they are relatively new stations, constructed in 1999 and 1993, respectively. Theses three stations were, or will be, built to meet all the standards established for evaluation the older transfer stations.

As stated in the first report on the Transfer System Level of Service Evaluation Criteria and Standards, evaluation of the transfer system is an iterative process. Refinements to each report will be made based on input and ongoing data collection and analysis.

Criteria 1 – 16 are organized into four general categories. At this time the criteria have not been ranked; however, both SWAC and MSWMAC are interested in ranking the criteria at a later date.

1. Level of Service to Users – Criteria 1 through 4
2. Station Capacity and Characteristics for Solid waste and Recycling – Criteria 5 through 12
3. Local and Regional Effects of Facility – Criteria 13 through 17
4. Cost and Rate Impacts – Criteria 18 and 19

Two more milestone reports will be submitted to the Council in preparation for the Solid Waste Export System Plan:

- Analysis of Options for Public and Private Ownership and Operation
- Preliminary Transfer and Waste Export Facility Recommendations (with estimated system costs, rate impacts, and financial policy assumptions)

As required by Ordinance 14971, each report shall include the due date for submittal of the subsequent report and be approved by the Council by motion.

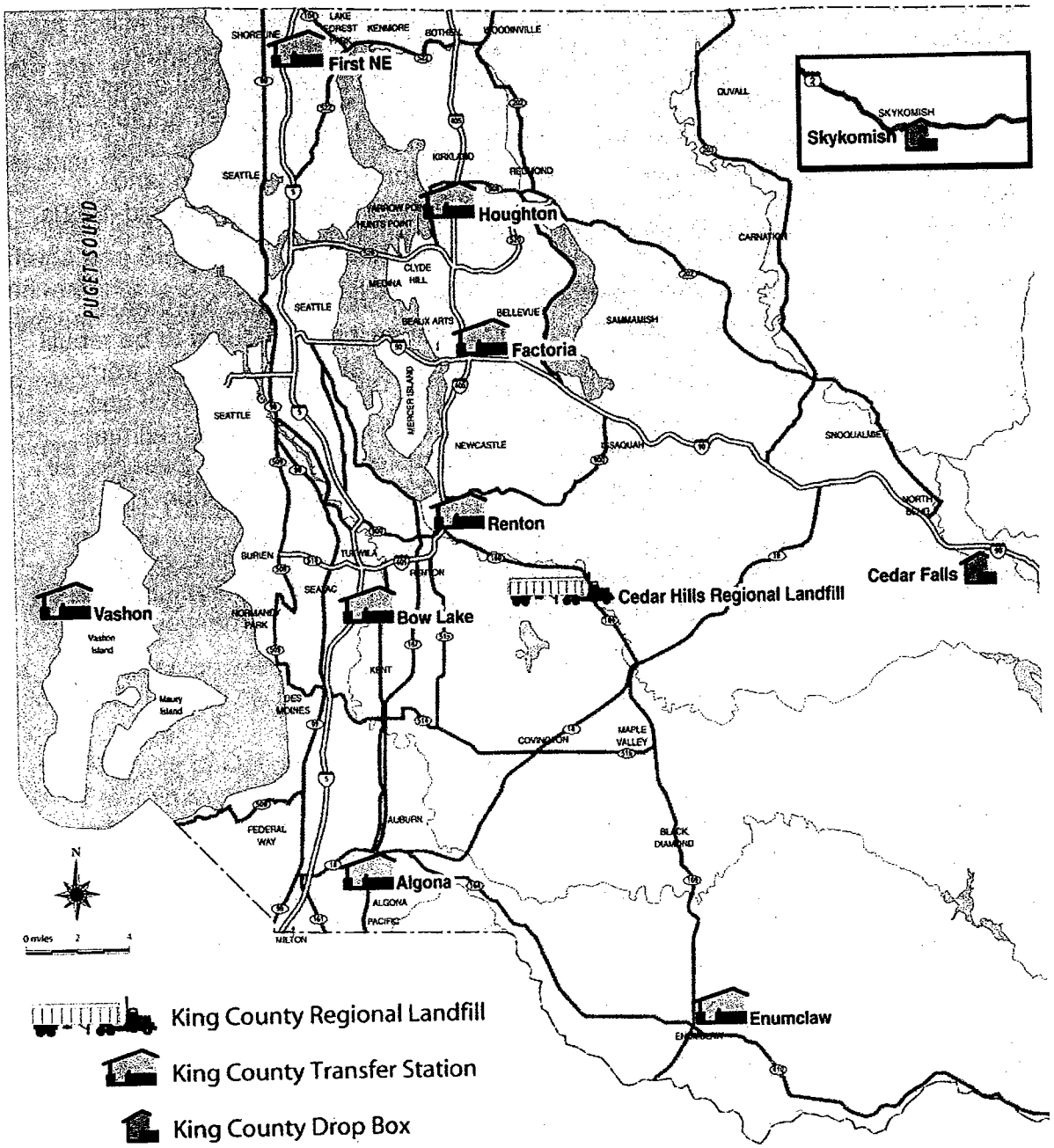
Introduction

The Solid Waste Division operates eight solid waste transfer stations and two rural drop boxes across King County (see Figure 1). These facilities serve 37 of the 39 cities in King County and the unincorporated areas. Seattle and Milton are not part of the King County solid waste system. The facilities are situated throughout the county to provide service in the major urban and rural areas for both commercial collection trucks, and residential and business self haulers. The transfer system has both older and newer transfer stations. Six of the eight stations – the Algona, Bow Lake, Factoria, First Northeast, Houghton, and Renton transfer stations – were originally built between 1958 and the mid-1960s (although certain upgrades have been made since that time).

Three transfer stations are not evaluated for this report. The First Northeast Transfer Station in Shoreline is not included because it is scheduled to be rebuilt in 2005. The Vashon and Enumclaw transfer stations also are excluded from evaluation because they are relatively new stations, constructed in 1999 and 1993, respectively. These three stations were, or will be, built to meet all the standards established for evaluating the older transfer stations. For example, all three stations are or will be equipped with waste compactors (Criterion 11).

Although the remaining five older stations are the focus of evaluation in this report, evaluations of the First Northeast, Vashon and Enumclaw stations may be conducted as part of the discussion of waste export system alternatives.

Figure 1: Transfer Stations in King County



The table below summarizes the application of Criteria 1-16 to the five urban transfer stations being evaluated. Following the table is a detailed description of each evaluation criterion and standard, including what it is intended to measure, how it was applied and what limitations, if any, are associated with the data.

Table 1: Summary Results of Applying Criteria

		Algona	Bow Lake	Factoria	Houghton	Renton
1. Estimated time to a transfer facility within the service area for 90% of users.	< 30 min=yes	YES	YES	YES	YES	YES
2. Time on site meets standard for 90% of trips						
a. commercial vehicles	< 16 min=yes	NO	YES	NO	NO	NO
b. business self haulers	< 30 min=yes	YES	NO*	NO*	NO*	YES
c. residential self haulers	< 30 min=yes	YES	NO*	YES	YES	YES
3. Facility hours meet user demand	YES/NO	YES	YES	YES	YES	YES
4. Recycling services ... meet policies in SW Comp Plan						
a. business self haulers	YES/NO	NO	NO	NO	NO	NO
b. residential self haulers	YES/NO	NO	NO	NO	NO	NO
5. Vehicle capacity						
a. meets current needs	YES/NO	NO	YES	NO	NO	YES
b. meets 20 year forecast needs	YES/NO	NO	NO	NO	NO	NO
6. Average daily handling capacity (tons)						
a. meets current needs	YES/NO	NO	NO	YES	NO	YES
b. meets 20 year forecast needs	YES/NO	NO	NO	NO	NO	YES
7. Space for 3 days' storage						
a. meets current needs	YES/NO	NO	NO	NO	NO	NO
b. meets 20 year forecast needs	YES/NO	NO	NO	NO	NO	NO
8. Space exists for station expansion						
a. inside the property line	YES/NO	NO	YES	YES	YES	YES
b. on available adjacent lands through expansion	YES/NO	YES	YES	YES	NO	NO
9. Minimum roof clearance of 25 feet	YES/NO	YES	YES	NO	NO	YES
10. Meets facility safety goals	YES/NO	NO*	NO*	NO*	NO*	NO*

**Meets criterion weekdays, but not weekend days*

** The presence of these physical challenges does not mean that the stations operate in an unsafe manner. It does mean that it takes extra effort by staff and management, which reduces system efficiency, to ensure the facilities are operated safely.*

		Algona	Bow Lake	Factoria	Houghton	Renton
11. Ability to compact waste	**YES/NO**	**NO**	**NO**	**NO**	**NO**	**NO**
12. a. Meets goals for structural integrity	**YES/NO**	**YES**	**YES**	**YES**	**YES**	**YES**
b. Meets FEMA immediate occupancy standards	**YES/NO**	**YES**	**NO**	**NO**	**NO**	**YES**
13. Meets applicable local noise ordinance levels	**YES/NO**	**YES**	**YES**	**YES**	**YES**	**YES**
14. Meets PSCAA standards for odors	**YES/NO**	**YES**	**YES**	**YES**	**NO***	**YES**

One complaint on Houghton was verified within the previous 2 years. No citation was issued.

15. Meets goals for traffic on local streets						
a. Meets LOS standard	**YES/NO**	**YES**	**NO**	**YES**	**YES**	**YES**
b. Traffic does not extend onto local streets 95% of time	**YES/NO**	**NO***	**NO***	**NO***	**YES**	**YES**

Meets criterion weekdays, but not weekend days. Yes or No rating based on evaluating all days w/in study period.

16. 100 foot buffer between active area & nearest residence	**YES/NO**	**YES**	**YES**	**YES***	**NO**	**YES**

Meets 100 ft from residence criterion, but business within 100 ft.

Description and Application of Evaluation Criteria and Standards

The process for evaluating existing transfer stations is unique. While there are well-established processes for determining whether, or how, to site a new transfer station, there are not established processes for evaluating existing stations. The stations being evaluated have been in operation for more than 40 years. Therefore, the standards and criteria identified in this report are simply a means of synthesizing data related to certain aspects of transfer station operation.

The division's existing facilities have been upgraded over time to meet health, safety, and environmental codes.

The 16 evaluation criteria and standards summarized in Table 1 are evaluation tools developed by the ITSG to support the analyses required by King County Ordinance 14971, which are designed to establish –

> ... when a transfer station needs to be upgraded in place, relocated to a more appropriate location, or additional transfer stations need to be built to adequately serve the region's growing population.

During iterative assessments, the group refined the evaluation criteria and standards and the way in which they would be applied to each station. A brief

description of each criterion and the associated standard is provided below, followed by a more detailed discussion of their application to the five transfer stations – Algona, Bow Lake (Tukwila/SeaTac), Factoria (Bellevue), Houghton (Kirkland), and Renton.

1. Estimated Travel Time to a Transfer Facility

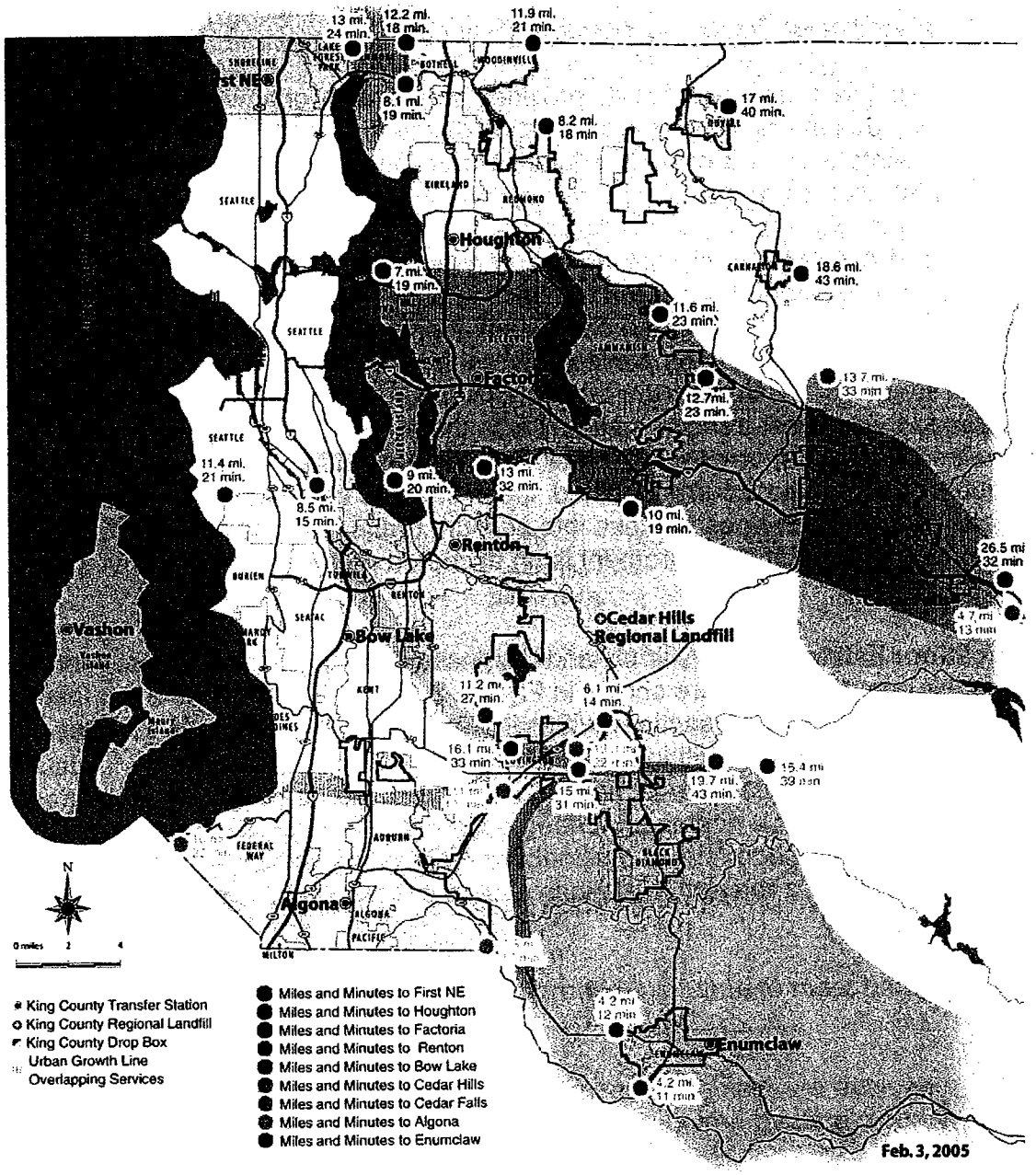
Description: Travel time to a facility provides an indicator of how well dispersed the transfer stations are, given the population distribution and service needs of county residents and businesses. Estimated travel time for 90% of the traffic should be 30 minutes or less.

To measure the estimated travel time to a transfer station, the area served by each station was mapped based on transaction data from the stations and information gathered during waste characterization surveys. These data include both commercial collection companies and residential and business self haulers. The next step was to establish the farthest distance and most likely route within that area to the nearest transfer station. Once the routes and distances were determined, Mapquest® was used to estimate the travel time to each station. Mapquest uses the most current posted speed limits to estimate travel time between points, which does not take into account traffic patterns or other road conditions. This type of measurement is an accepted methodology for arriving at travel times.

Application: Estimated travel times and distances from the edge of the service area to the transfer station are shown in **Figure 2**. All transfer stations meet this standard for 90% of all transactions within the service area. Standards are met for 99% of all transactions within the contiguous urban growth boundary.[1]

[1] The Solid Waste Division's 2001 Comprehensive Solid Waste Management Plan recognizes that rural areas may receive reduced levels of service compared to urban areas.

Figure 2: Estimated Travel Times



Approximate Travel Times and Distances to King County Disposal Facilities.

King County
Department of
Natural Resources and Parks
Solid Waste Division

2. *Time On Site Meets the Standard for 90 Percent of Total Trips*

Description: Time on site is one indicator of whether a transfer station can efficiently handle customers in a timely manner. It is determined by measuring the time from when a customer crosses the in-bound scale to when a customer crosses the outbound scale. It is an indicator of whether the facility is over-capacity. The standard is different for commercial collection companies and self haulers because of the difference in the way the two types of customers use the site. The goal is to meet the specified standard for 90 percent of the total transactions at a station.

The standard time on site for commercial collection companies is 16 minutes. This standard was proposed by one of the commercial collection companies as a viable amount of time to complete their business. For residential and business self haulers, the standard is 30 minutes. The division's transaction data confirm that it takes self haulers longer to manually unload their vehicles than it takes for the commercial trucks, which are automated. It is worth noting that collection vehicles average five tons per load while self haulers average half a ton per load.

The time on site was measured using transaction data that is recorded by the cashiering system at the transfer stations. Transaction times are recorded when a vehicle enters and leaves the station at the in- and outbound scales. The data were graphed by type of customer for weekdays and weekend days. The transaction time data were averaged over a one year period.

Application: The results (summarized below) indicate that only one station -- Bow Lake -- meets the 16 minute standard for commercial collection companies. For business self haulers, all stations meet the 30 minute standard on weekdays, however Bow Lake, Factoria and Houghton do not meet the standard on weekends. In addition, all stations meet the 30 minute standard for residential self haulers on weekdays and weekends, with the exception of Bow Lake, which does not meet the standard on weekends (See Appendix B).

Table 2: Summary of Results for Criteria #2 - Time on Site

Station	Meets commercial vehicle standard	Meets business self-hauler standard[1]	Meets residential self-hauler standard[2]
Algona	No	Yes	Yes
Bow Lake	Yes	No	No
Factoria	No	No	Yes
Houghton	No	No	Yes
Renton	No	Yes	Yes

[1] All stations meet standard weekdays, but those with "no" do not meet it on weekend days.

[2] All stations meet standard weekdays, but those with "no" do not meet it on weekend days.

3. *Facility Hours Meet User Demand*

Description: A primary component of providing quality service at the transfer stations is providing sufficient hours to meet customer demands. The Solid Waste Division has the flexibility to adjust operating hours to fit actual needs. Most of the changes in hours undertaken in the last year have been in response to requests from the commercial collection companies. The commercial collection companies bring most of the waste to facilities. The latest request to extend hours at the Factoria and Bow Lake transfer stations will take effect on May 9, 2005. All sites are closed on three holidays per year (Thanksgiving, Christmas, and New Year).

Table 3: Criteria #3 - Transfer Station Hours (Effective May 9, 2005)

TRANSFER STATION	MON – FRI	SAT & SUN
ALGONA	6:15 a.m. – 5:00 p.m.	8:30 a.m. – 5:30 p.m.
BOW LAKE (Tukwila/SeaTac)	Open 24 hours beginning Monday at 12:01 a.m.	8:30 a.m. – 5:30 p.m.
FACTORIA (Bellevue)	6:15 a.m. – 11:30 p.m.	8:30 a.m. – 5:30 p.m.
HOUGHTON (Kirkland)	8:00 a.m. – 5:00 p.m.	8:30 a.m. – 5:30 p.m.
RENTON	6:30 a.m. – 4:00 p.m.	8:30 a.m. – 5:30 p.m.

To determine the optimum hours that transfer stations should be open, the division looks at monthly usage data by hour of day and day of week, hourly staffing and operational costs, and requests for services from commercial and self haulers.

To measure whether station hours are meeting user demands, four factors were considered:

- The numbers of tons and transactions per hour for commercial and self haulers
- Observations from the Operations staff at the stations, particularly at the beginning and end of each day; for example, long lines at the end of the day could indicate the need to remain open longer
- Requests from the commercial collection companies for hours required to coincide with their hauling routes and times
- Customer comments regarding hours

These four factors give the division a clear indication of whether station hours are meeting customer demand.

Application: Based on the four factors, all stations will meet customer demand. If customer patterns change, hours can be adjusted.

4. *Recycling Services Provided at the Transfer Stations Meet the Waste Reduction and Recycling Policies in the Comprehensive Solid Waste Management Plan*

Description: The cities and the county have become leaders in the promotion of waste reduction and recycling by working cooperatively on a number of region-wide programs. Waste reduction and recycling have become one of the division's highest priorities, but one that is met primarily through partnering with cities, agencies and businesses, through promotion, collection and education programs. The vast majority of recycling is handled through the private sector and never reaches County transfer stations.

While primary recyclables are collected at most stations, space constraints do not allow for expanding the number and types of commodities accepted. For example, bins for collecting primary recyclables were removed from the Factoria Transfer Station in 2004 to expand the collection area for household hazardous waste (HHW). The HHW collection service began as a pilot project and became such a successful and popular service in the community that it was made permanent.

Table 4: Recyclable Materials Collected at Transfer Stations

Transfer Stations	Recyclables Accepted for Free							Fee Recyclables and Other Materials					
	Glass	Aluminum	Mixed Waste Paper	Newspaper	Tin Cans	Cardboard	Plastic Bottles #1 & #2	Yard Waste	Appliances **with** CFCs	Appliances **without** CFCs	Clean Wood	Household Hazardous Waste (HHW)	Reusable Items (textiles)
Algona													
Bow Lake	X	X	X	X	X	X	X		X	X			
Factoria												X	
Houghton	X	X	X	X	X	X	X						X
Renton	X	X	X	X	X	X	X						

The evaluation criterion for recycling is to compare the policies for transfer stations set forth in the adopted *Final 2001 Comprehensive Solid Waste Management Plan* with the services currently offered at each station. The policies in the solid waste plan are as follows:

- WRR-2 – The county should enhance existing waste reduction and recycling programs, add more recycling opportunities at county transfer stations.
- WRR-24 – The cities and county should provide for collection of primary recyclables including glass, tin and aluminum cans, mixed waste paper, newspaper, #1 and #2 plastic bottles, and yard waste (YW in chart below) and evaluate adding other materials as either primary or secondary recyclables by targeting specific commodities.
- WRR-37 – Where feasible, the county should provide areas for source-separated yard waste collection at all existing, new or upgraded transfer stations and drop boxes.

Application: When county policies WRR-2, WRR-24, and WRR-37 are applied to the stations, all five stations fail to meet the standard.

Table 5: Application of Criterion #4

STATION	WRR-2	WRR-24	WRR-37	Meeting WRR Goals
ALGONA	No service	No service	Not feasible*	**No**
BOW LAKE	Primary service. Limited secondary	Primary service. No YW	Not feasible*	**No**
FACTORIA	No service	No primary	Not feasible*	**No**
HOUGHTON	No enhanced service now	Primary service. No YW	Not feasible*	**No**
RENTON	No enhanced service now	Primary service. No YW	Not feasible*	**No**

*Due to space constraints in the current configuration of the transfer stations.

5. *Vehicle Capacity a) Meets Current Needs, b) Meets 20-Year Forecast Needs*

Description: Vehicle capacity is the measure of a station's ability to accommodate the flow of both commercial and self-haul vehicles. There is very little existing literature on how to quantify the capacity of a solid waste facility. The standard used here was developed using transportation industry standards of measurement for capacity of roadways and intersections – called a level of service or LOS measurement. An LOS measurement is a qualitative measure based on quantitative data. Consultants were retained to refine this methodology and to apply them to the transfer stations. The methodology for rating actual vehicle and tonnage capacity was developed by determining each station's maximum sustainable operating capacity. Optimal operating capacity is defined as the maximum optimal number of vehicles or tonnage that can be processed through the station each hour based on the station design and customer mix.

The standard chosen for vehicle capacity is an LOS score of C (on a scale of A to F), which is defined as a steady flow of vehicles except during occasional peak periods. The LOS measurements, which apply to this criterion and the next criterion for tonnage capacity, are defined as follows:

- LOS A - Can easily accommodate vehicle and tonnage throughput at all times of the day (optimal operating capacity exceeded <0.5% of operating hours)

- LOS B - Able to accommodate vehicle and tonnage throughput at most times of the day. (optimal operating capacity exceeded between 0.5% - 5% of operating hours)

- LOS C - Able to accommodate vehicle and tonnage throughput all times of the day, except for occasional peak hour times. (optimal operating capacity exceeded 5% - 10% of operating hours)

- LOS D - Beginning to have difficulty accommodating all vehicle and tonnage throughput during peak hours. (optimal operating capacity exceeded 10%-20% of operating hours)

- LOS E - Cannot accommodate vehicle <u>OR</u> tonnage (one or the other) throughput without off-site impacts or overloading on-site resources. (optimal operating capacity exceeded 20 - 50% of operating hours)

- LOS F - Cannot accommodate vehicle and tonnage throughput without off-site impacts and overloading of on-site resources. Throughput capacity exceeded most hours (optimal operating capacity exceeded >50% of operating hours).

In the case of transfer stations, the best case scenario is not LOS A. For example, a station built to accommodate tonnage and traffic for 20 years typically has an LOS A when it first opens, and is considered to be under capacity. However as population grows, the station will eventually grow to a LOS C which is considered ideal. Measurements of vehicle capacity within the King County system focus primarily on weekend days since that is when most transactions occur.

Application: Vehicle capacity (criterion #5) – for 2004 and 2025

Results of the LOS analysis for vehicle capacity appear in Tables 6 and 7, below, and are described in detail in Appendix C. The LOS rating was based on the percentage of total operating hours that the optimal operating capacity was exceeded. Weekends and weekdays are shown separately; the final "Combined LOS" includes weekdays and weekends. A LOS of C or better meets the criteria.

Table 6: 2004 Vehicle Capacity LOS

Facility	Weekday LOS	Weekend LOS	Combined LOS	Meets Criteria?
Algona	E	C	E	No
Bow Lake	B	D	C	Yes
Factoria	D	C	D	No
Houghton	E	D	E	No
Renton	B	A	B	Yes

Table 7: 2025 Estimated Vehicle Capacity LOS

Facility	Weekday LOS	Weekend LOS	Combined LOS	Meets Criteria?
Algona	F	F	F	No
Bow Lake	E	F	E	No
Factoria	E	F	E	No
Houghton	F	F	F	No
Renton	D	D	D	No

The results show that vehicle capacity standards are currently being met only at the Bow Lake and Renton transfer stations. By 2025, none of the five stations will meet this criterion.

6. *Average Daily Handling Capacity (Tons) a) Meets Current Needs, b) Meets 20-Year Forecast Needs*

Description: Tonnage capacity is the ability of a station to accommodate the flow of both commercial and self-haul garbage tons during the hours of operation. It is measured using the same rating system discussed for vehicle capacity (#5).

The County's goal for tonnage capacity at a division transfer station is LOS C or above.

Application: Tonnage capacity (criterion #6) – for 2004 and 2025

Results of the LOS analysis for tonnage appear in Tables 8 and 9, below, and are described in detail in Appendix D. The LOS rating was based on the percentage of total operating hours that the optimal operating capacity was exceeded. Weekends and weekdays are shown separately; the final "Combined LOS" includes weekdays and weekends. A LOS of C or better meets the criterion.

Table 8: 2004 Tonnage Capacity LOS

Facility	Weekday LOS	Weekend LOS	Combined LOS	Meets Criteria?
Algona	D	A	D	No
Bow Lake	D	A	D	No
Factoria	C	A	C	Yes
Houghton	E	B	E	No
Renton	B	A	A	Yes

Table 9: 2025 Estimated Tonnage Capacity LOS

Facility	Weekday LOS	Weekend LOS	Combined LOS	Meets Criteria?
Algona	E	A	E	No
Bow Lake	E	B	E	No
Factoria	E	A	E	No
Houghton	F	B	F	No
Renton	C	A	C	Yes

The results for tonnage capacity are generally similar to the results for vehicle capacity. Currently, only Factoria and Renton have sufficient capacity to meet existing tonnage requirements. Assuming a similar pattern of demand, in 2025 only Renton will have sufficient tonnage capacity.

The overall assessment of whether or not this criterion was met was based on the LOS for the combined days (weekend days and weekdays). However, the difference between weekday and weekend LOS results is worth noting. All five stations meet tonnage capacity goal on the weekends, while only Renton meets this goal on the weekdays. This is because self-hauler activity is much greater on weekends resulting in much higher vehicle traffic. So while much more tonnage is received from commercial collection companies on weekdays, the larger number of vehicle/self haul traffic occurs on the weekends.

7. Space for 3 Days' Storage of Average Daily Solid Waste Tonnage During an Emergency a) Meets Current Needs, b) Meets 20-Year Forecast Needs

Description: This criterion establishes whether a transfer station can continue to operate, or accept garbage, for at least three days in the event of a major regional disaster. Three days is the value used by FEMA (Federal Emergency Management Agency) to account for the average time needed to ensure that more immediate needs are being met such as victim search/rescue, clearing of transportation lifelines to hospitals, etc.

The Algona, Factoria, Houghton, and Renton transfer stations are two-trailer, direct load facilities, meaning, the tipping floor is flat with two chutes under which transfer trailers are parked. Garbage is unloaded directly from the vehicle into the transfer trailers. Therefore, capacity at these stations is defined as the number of empty trailers available at the site. Since there is no way to predict how many empty transfer trailers may be available at a site at any given time, the criterion was measured based on how much space is available for garbage storage on the facility tipping floor.

Bow Lake is the only urban transfer station evaluated with a storage pit. At Bow Lake, garbage is unloaded from the vehicle to the pit and then bulldozed into a transfer trailer chute at the far end of the pit. Storage space at this station is a combination of available empty trailers and space in the pit.

Application: All five of the transfer stations fail to meet the criterion for three days of garbage storage in the event of a major regional disaster, both currently and in the future. The four direct load facilities have little storage space within the transfer station building itself, i.e., on the tipping floor. Because of its push-pit design, the Bow Lake station has nearly one days' storage in the pit.

8. *Space Exists for Station Expansion a) Inside the Property Line, b) On Available Adjacent Lands Through Acquisition*

Description: Space for expansion at a station is a criterion that measures the ability of a station to expand to accommodate regional population and employment growth, the addition of services, and the area needed for a waste compactor. If there is unused space inside the property line, the active area of the station could be expanded. If the transfer station activity is already expanded to the property line, the division could look at the feasibility of acquiring adjacent property.

To evaluate the feasibility of expansion, the division reviewed the footprint of the active area of the site in relation to the property borders to determine if there are undeveloped areas of the site available for use. Aerial maps were used to show where the active area and property lines are located at each station. If expansion within the property line is not feasible, the division would need to look at adjoining property and its zoning and land use to determine possibilities for acquisition.

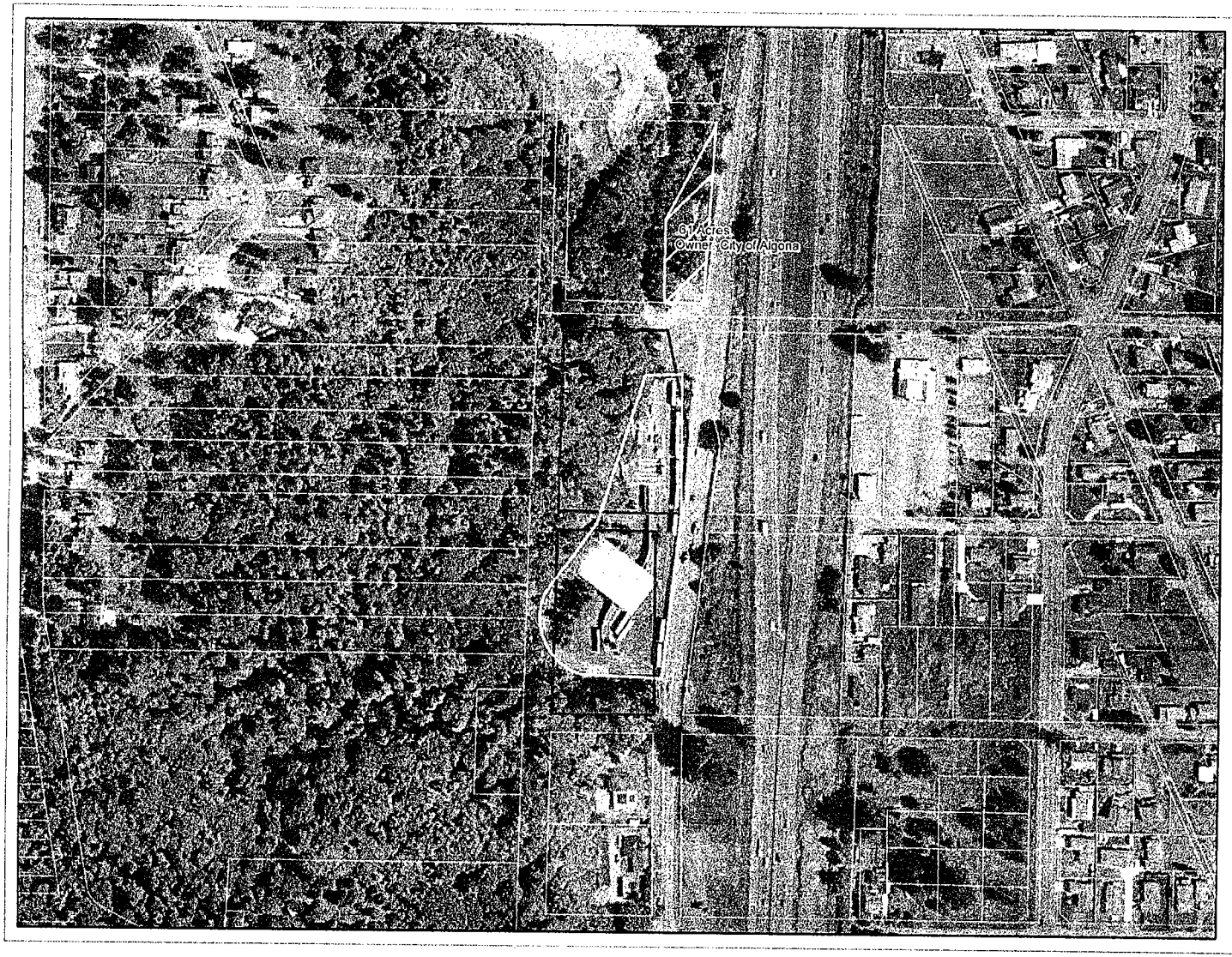
Application: The following pages contain maps for each of the five urban transfer stations, showing the room for expansion inside the property line and on available adjacent lands. Tables 10 and 11 below summarize the assessment of this criterion for each transfer station, based on a review of these maps. Note: this is a preliminary assessment based on mapping analysis only; it does not examine other criteria affecting the feasibility of expansion, such as zoning, site characteristics, permitting and costs.

Table 10: Available Expansion Inside the Property Line

Transfer Station	Yes/No	Comments
Algona	N	No available space for expansion within existing property lines.
Bow Lake	Y	Approximate potential expansion area 0.6 acres south of transfer building, 0.8 acres west of transfer building.
Factoria	Y	14 acres of land adjacent to existing transfer station property purchased by the Solid Waste Division for replacement of existing station.
Houghton	Y	1.2 acres of land northeast of station not currently used. Area is part of Houghton Custodial Landfill. Excavation of this landfilled material would be necessary if area is to be made usable.
Renton	Y	0.2 acre available for expansion within existing property lines.

Table 11: Potential Expansion On Adjacent Lands Through Acquisition

Transfer Station	Yes/No	Comments
Algona	Y	Potential to acquire 0.6 acres north of station. Currently have Street Use Permit from City of Algona for use. If not needed for private development, City may consider selling.
Bow Lake	Y	Potential to acquire part of 10 acre parcel from Washington State Department of Transportation to the north of station, 0.7 acre privately owned parcel south of station. 400+ acre high tech/business park/mixed use development planned around station. Potential for new access road into this development constructed between station and I-5.
Factoria	N	Adjacent properties are currently developed and house existing businesses.
Houghton	N	Adjacent property is in recreational or residential use.
Renton	Y	0.9 acres located northwest of station, currently owned by KCDOT, possible expansion area. However, this area is 100 feet away from existing transfer station property and would be separated by overhead high voltage power lines.



Transfer System Level of Service Criteria - 8a, 8b Station Expansion

Draft

Algona Station

Some Potential Expansion Areas

Active Area Boundary

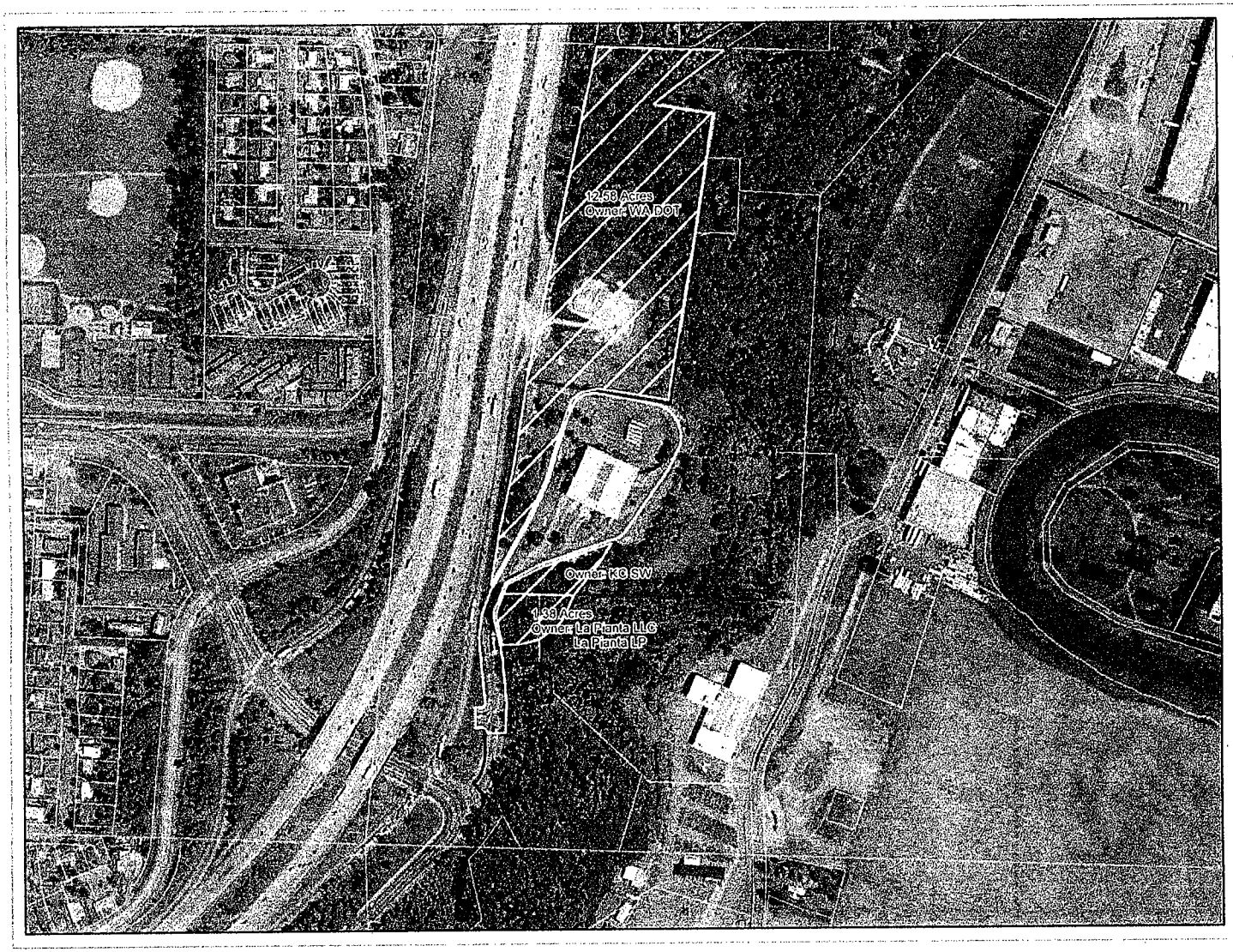
Station Property Line

Parcel

King County
Department of
Natural Resources and Parks
Solid Waste Division

January 12, 2005

200 100 0 200
Feet



Transfer System Level of Service Criteria - 8a, 8b Station Expansion

Draft

Bow Lake Station

Some Potential Expansion Areas

Active Area Boundary

Station Property Line

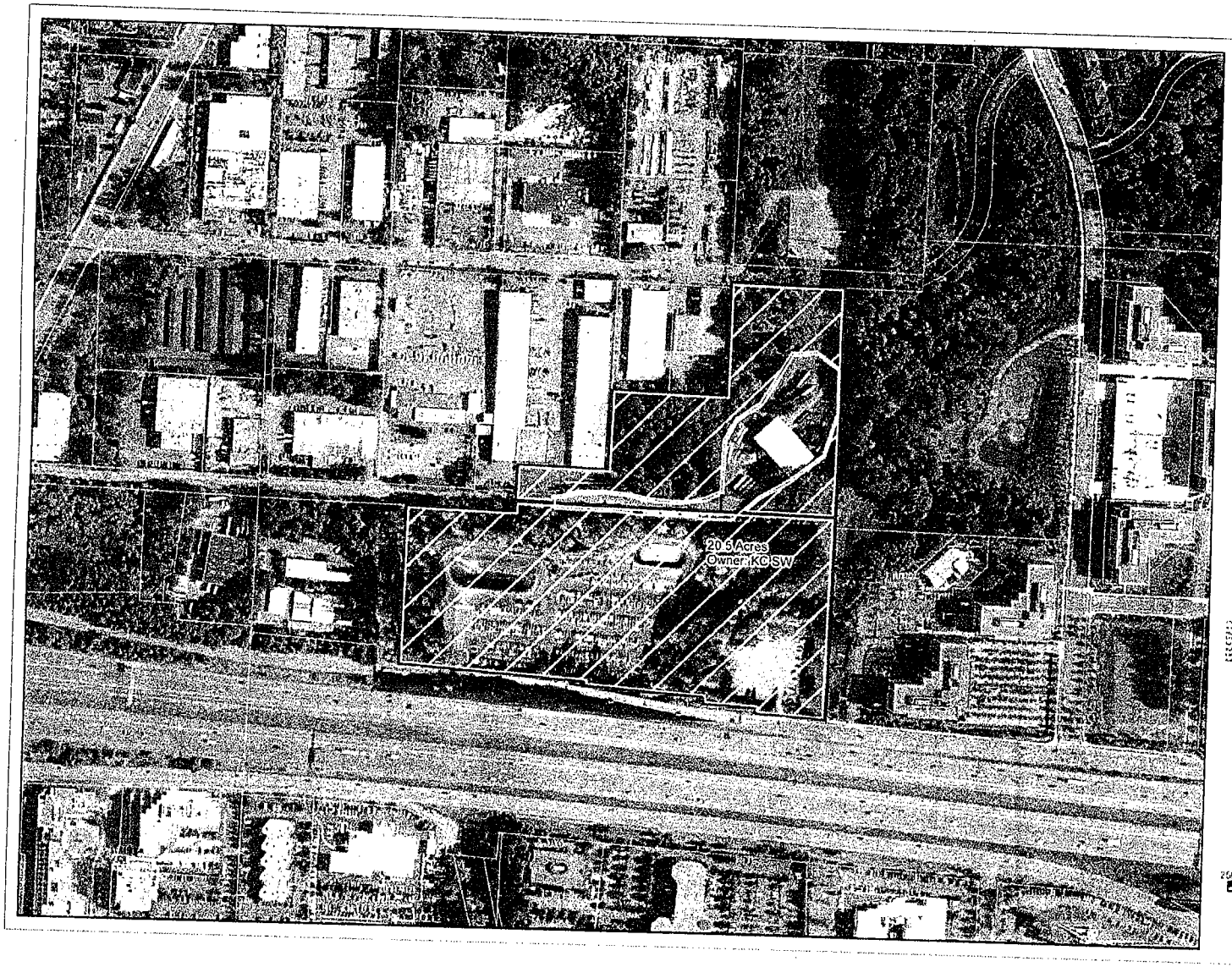
Parcel

N

King County
Department of
Natural Resources and Parks
Solid Waste Division

January 12, 2005

300 150 0 300
Feet



Transfer System Level of Service Criteria - 8a, 8b Station Expansion

Draft

Factoria Station

Some Potential Expansion Areas

Active Area Boundary

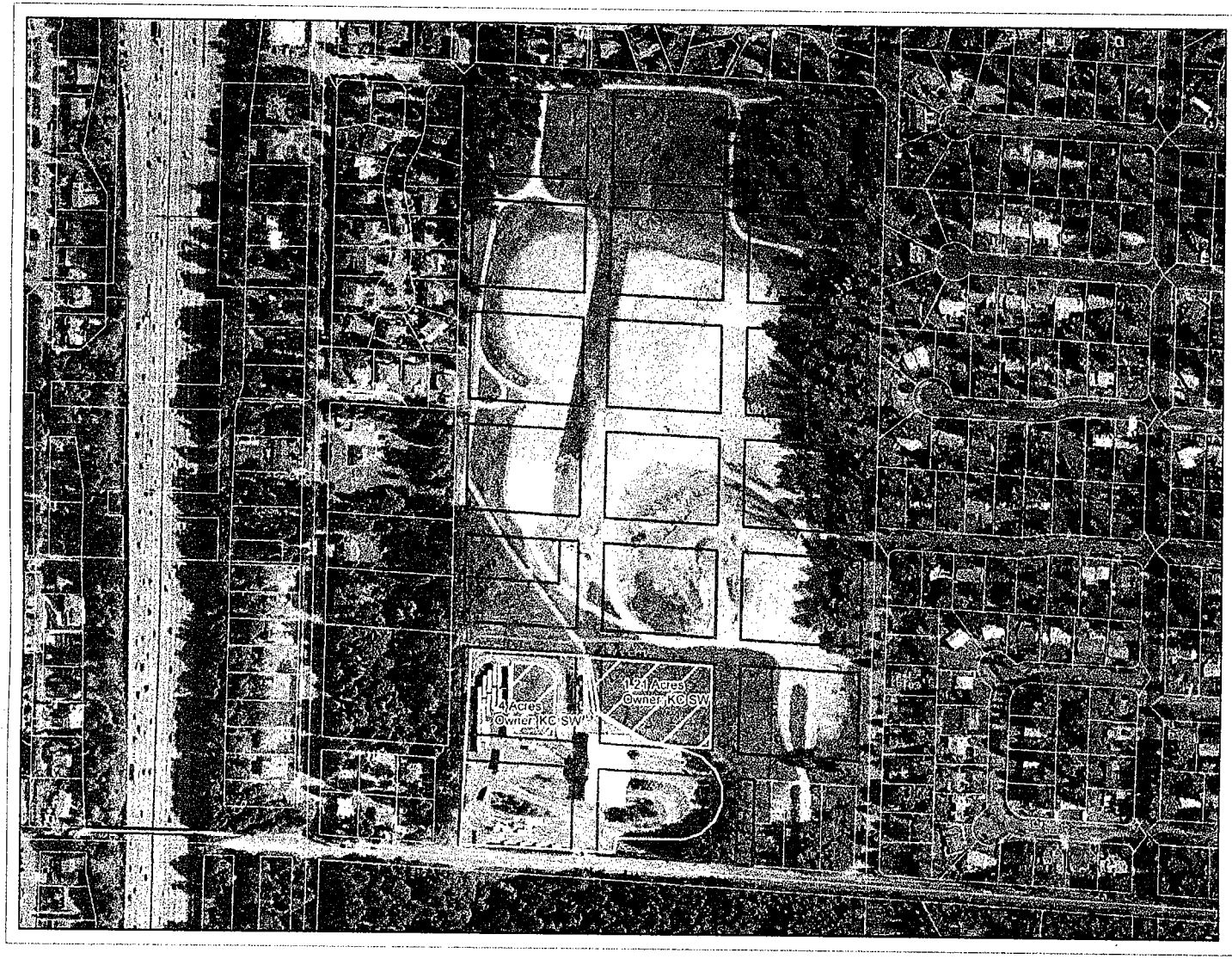
Station Property Line

Parcel

King County
Department of Natural Resources and Parks
Solid Waste Division

January 12, 2005

250 125 0 250 Feet



Transfer System Level of Service Criteria - 8a, 8b Station Expansion

Draft

Houghton Station

Some Potential Expansion Areas

Active Area Boundary

Station Property Line

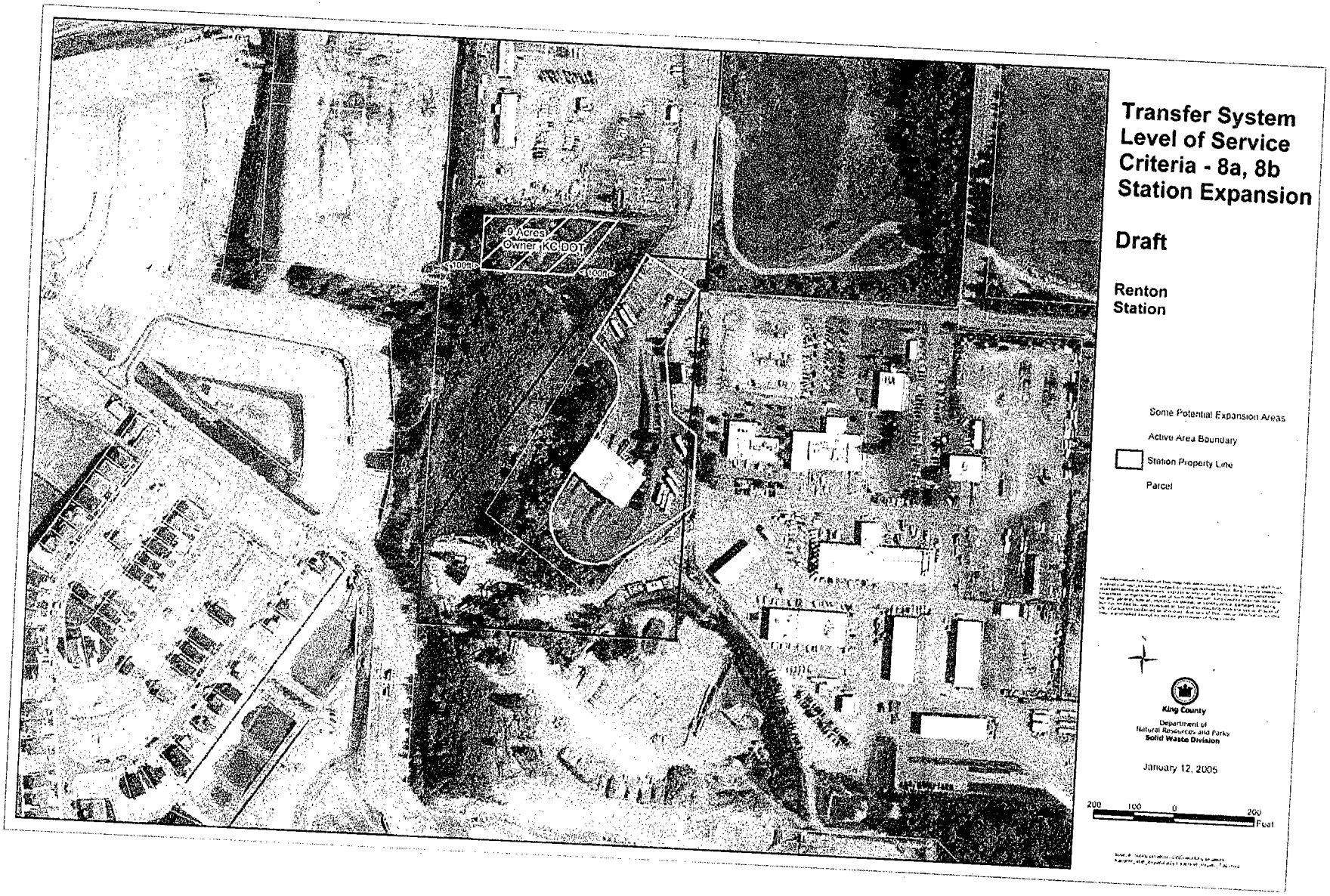
Parcel

N

King County
Department of
Natural Resources and Parks
Solid Waste Division

January 12, 2005

200 100 0 200
Feet


Transfer System
Level of Service
Criteria - 8a, 8b
Station Expansion
Draft
Renton
Station
9 Acres
Owner KC DOT
100ft
100ft
Some Potential Expansion Areas
Active Area Boundary
Station Property Line
Parcel
King County
Department of
Natural Resources and Parks
Solid Waste Division
January 12, 2005
200 100 0 200
Feet

9. Minimum Roof Clearance of 25 Feet

Description: The purpose of this measure is to evaluate roof clearance. According to the commercial collection companies, their collection vehicles require a roof clearance of 25 feet to unload efficiently.

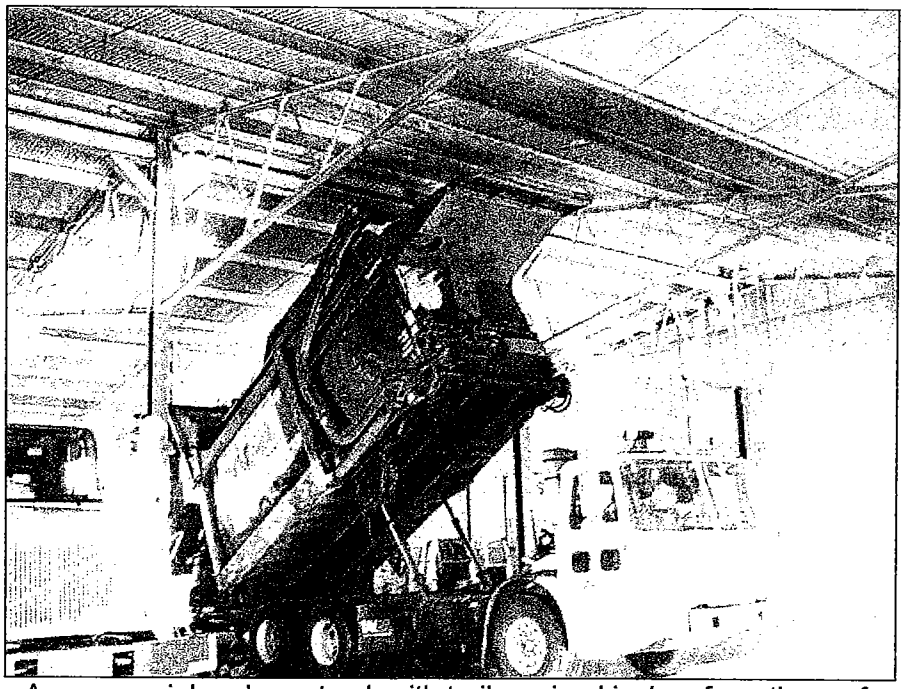
Over the last 30 years, the collection vehicles have become larger to accommodate more garbage in fewer trips. Due to the added length, the collection vehicles with automated lifts that allow the garbage to slide out the back of the trailer rise higher than they did in the past. As a result, at the older transfer stations with roofs lower than 25 feet from the tipping floor, the collection vehicles are hitting and damaging the roofs, supporting structures, or hanging lights.

Application: New roofs, higher than 25 feet, were put on the Algona and Renton transfer stations in 2002 and 2003, respectively. A new roof with more than 25 feet of clearance was constructed at Bow Lake in 1977. Both the Factoria and Houghton stations have roof clearances of less than 25 feet. The roof at Houghton is expected to be raised in 2006.

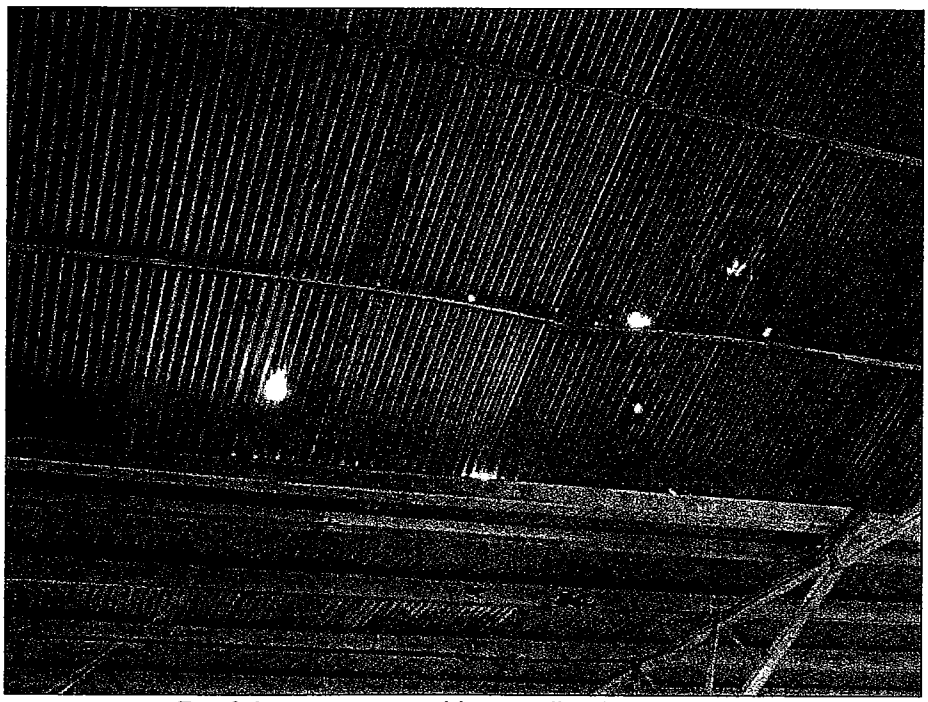
Table 12: Roof Clearances at the Transfer Stations

Station	Year Roof Built	Clearance (lowest)	Clearance (highest)	Meets Criterion?
Algona	2002	27 ft. 8 in.	31 ft. 3 in.	Yes
Bow Lake	1977	32 ft.	40 ft.	Yes
Factoria	1964	20 ft. 2.4 in.	22 ft. 4.8 in.	No
Houghton	mid-1960s	21 ft.	22 ft. 6.6 in.	No
Renton	2003	27 ft. 8 in.	31 ft. 3 in.	Yes

Figure 3: Criteria 9 - Roof Height



A commercial garbage truck with trailer raised inches from the roof.



Roof damage caused by a collection vehicle.

10. Meets Goals for Customer and Employee Safety

Description: Customer and employee safety at the transfer stations is one of the division's number one priorities. All transfer stations hold current permits from the Department of Health and meet health and safety regulations.

All transfer stations met applicable building codes at the time of construction and have been grandfathered with respect to building code updates; however, all are old and inefficient. The division has comprehensive reporting and prevention mechanisms in place to minimize any potential safety hazards, as well as hazard response equipment and procedures.

The more congested the station and constricted the operations become, the higher the concern for safety. The presence of these physical challenges does not mean that the stations operate in an unsafe manner. It does mean that it takes extra effort by staff and management, which reduces system efficiency, to ensure the facilities are operated safely.

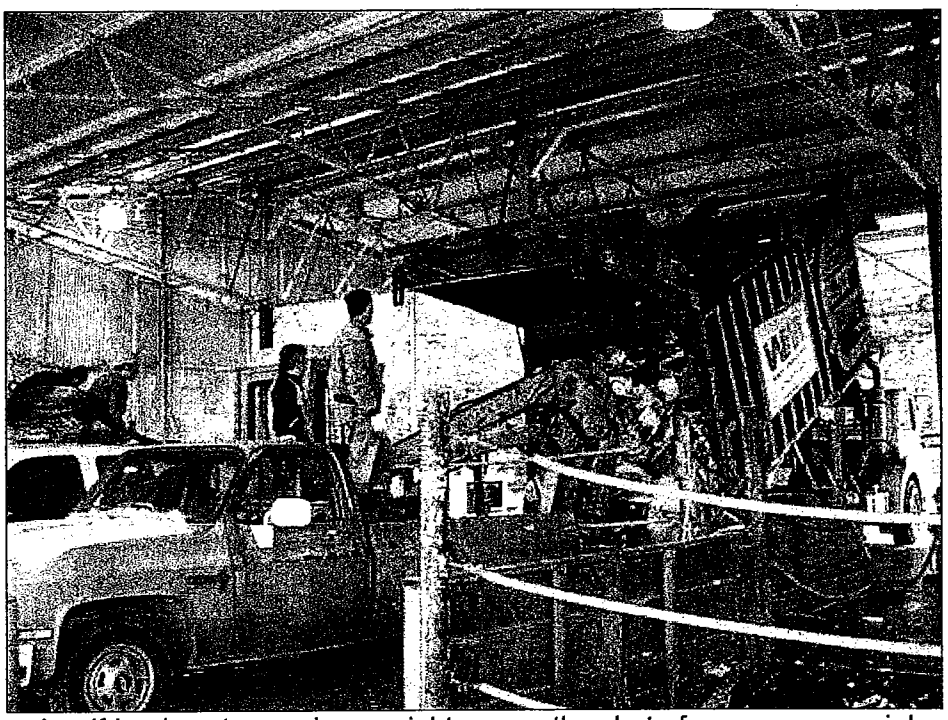
The division developed three measures of safety to monitor stations for potential areas of concern. First, the division assessed customer and employee accident/injury reports to determine whether there are operational procedures or areas that require investigation. Second, the division looked at customer vehicle damage reported at the stations. Customer vehicle damage could occur as a result of traffic congestion on the tipping floor; station design, such as the presence of supporting pillars and other impediments near the tipping area; and other factors. Third, the division evaluated incidents of facility damage that may be the result of facility layout or operation.

Application: The division identified 12 safety goals above and beyond required safety standards that each station should ideally meet. These safety goals were applied to the five urban transfer stations.

Table 13: Summary of Application of Criteria #10 – Safety

#	GOALS	Algona	Bow Lake	Factoria	Houghton	Renton
1	Segregation of commercial & self-haul unloading area	No	Yes	No	No	No
2	No crossing traffic pattern	No	No	No	No	No
3	Vehicle maneuvering on tipping floor without structural obstructions	No	Yes	No	No	No
4	Segregate traffic lanes - customers from operational traffic	No	No	No	No	No
5	Stationary compactor boom isolated from customer activity area	No	Yes	No	No	No
6	One-way traffic pattern	No	Yes	No	Yes	Yes
7	15 foot stall width and 65 foot tipping floor width	No	No	No	No	No
8	Clearance of at least one foot for trailer maneuvering	No	No	No	No	No
9	Employee walkway space of at least five feet on tipping floor	No	Yes	No	No	No
10	Back-up power available	Yes	Yes	No	Yes	Yes
11	Enclosed transfer station building	No	No	No	No	No
12	Sensitive area set-backs at least 50 feet	No	Yes	No	Yes	Yes
	Overall rating	No	No	No	No	No

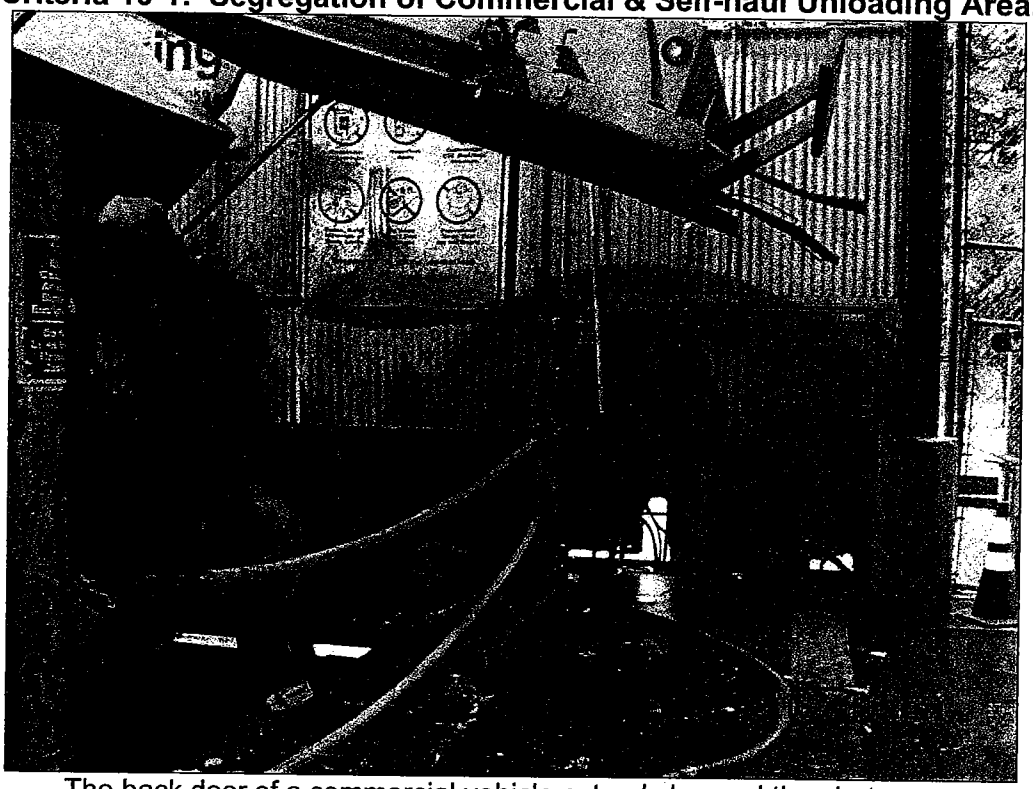
Criteria 10-1: Segregation of Commercial & Self-haul Unloading Area.



A self-haul customer dumps right across the chute from a commercial hauler who dumps into the same chute.

Garbage can overflow and fall onto the area across the dumping chute.

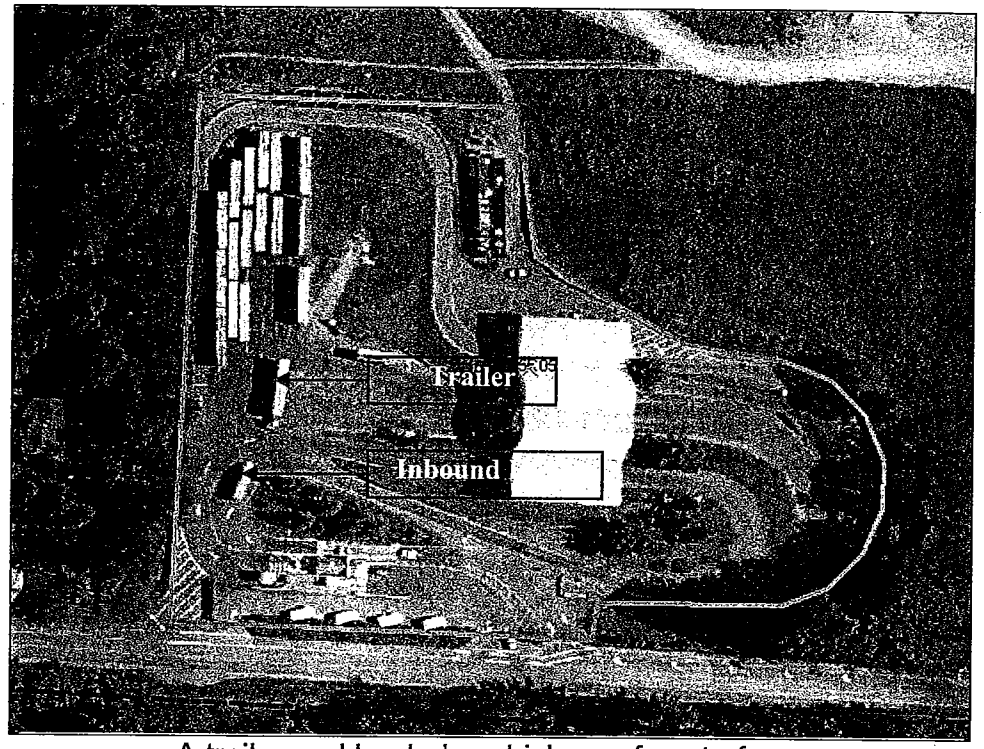
Criteria 10-1: Segregation of Commercial & Self-haul Unloading Area.



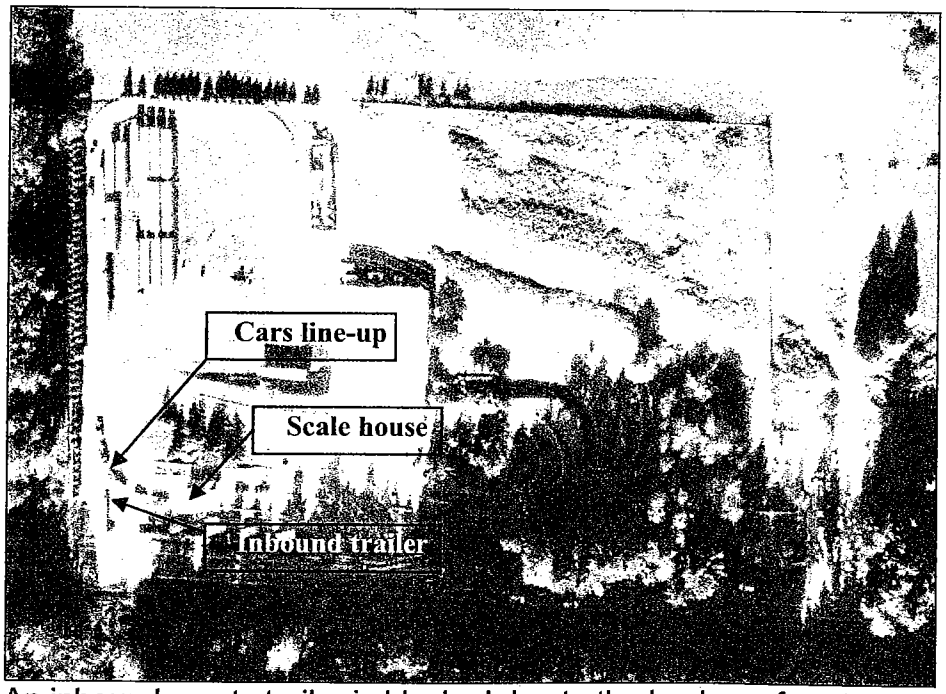
The back door of a commercial vehicle extends beyond the chute over the tipping floor on the other side of the chute.

The back door of a commercial vehicle opens over a self-haul vehicle while dumping garbage into the same chute.

Criteria 10-2: No Crossing Traffic Pattern.



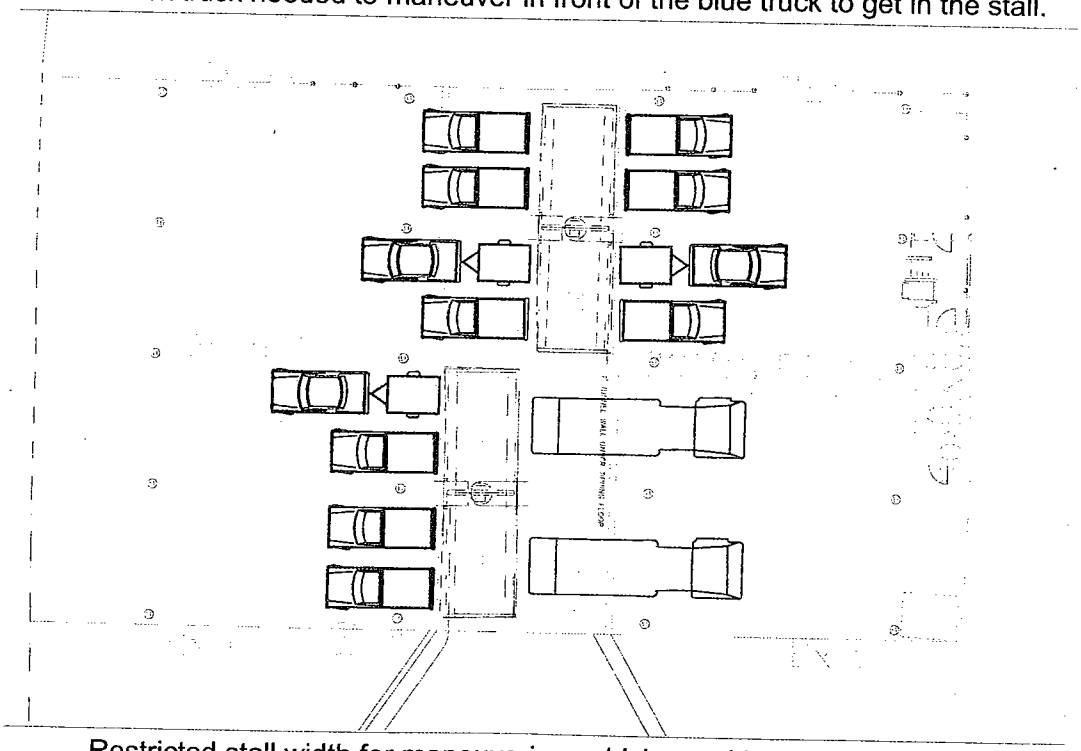
A trailer and hauler's vehicle are face to face.



An inbound empty trailer is blocked due to the backup of customers in line at the outbound scale.

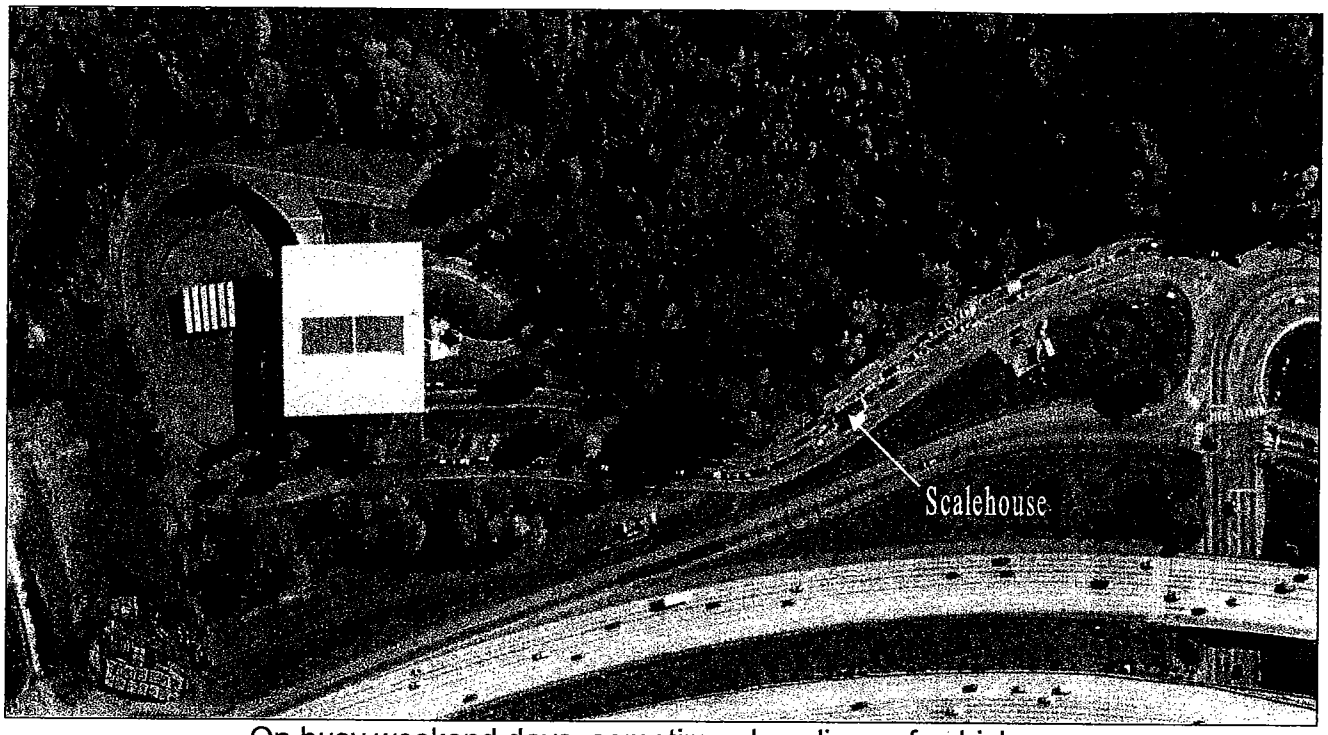
Criteria 10-3: Vehicle Maneuvering on Tipping Floor without Structural Obstructions.

Self-haul vehicles fill the dump slots in between the roof support pillars. The black truck needed to maneuver in front of the blue truck to get in the stall.



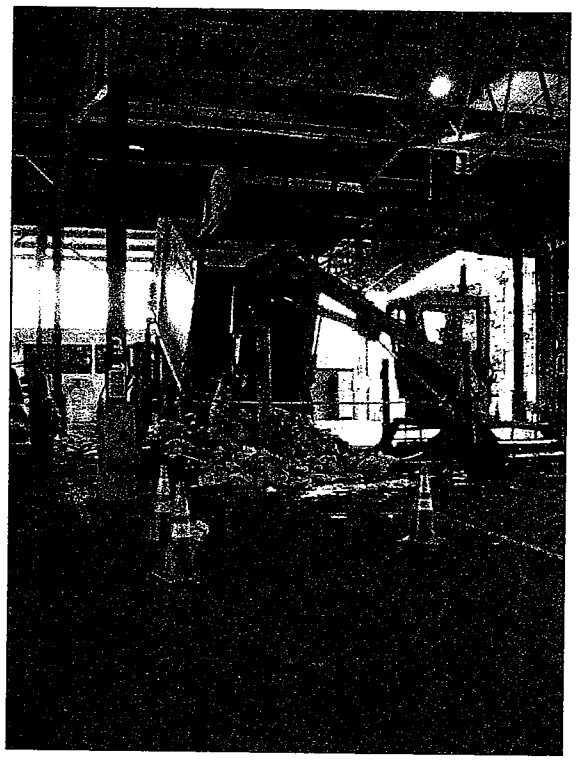
Restricted stall width for maneuvering vehicles and inadequate tipping floor depth (space from chute to wall).

Criteria 10-4: Segregate Traffic Lanes – Customers from Operational Traffic.

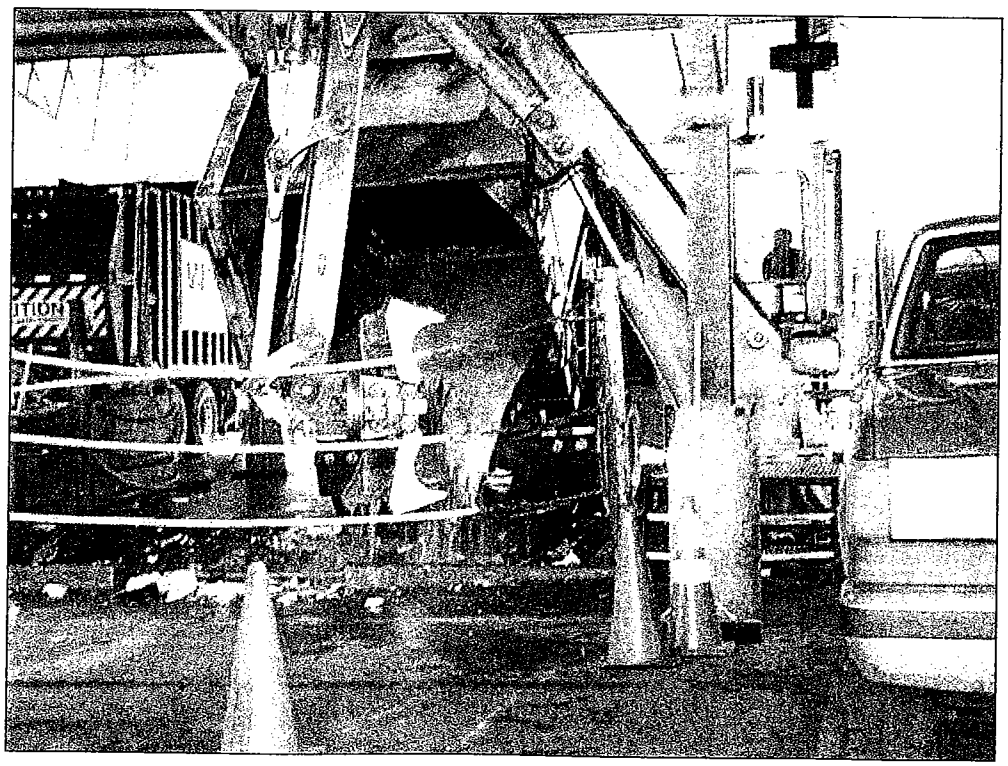


On busy weekend days, sometimes long lines of vehicles wait to get in and out of the station.

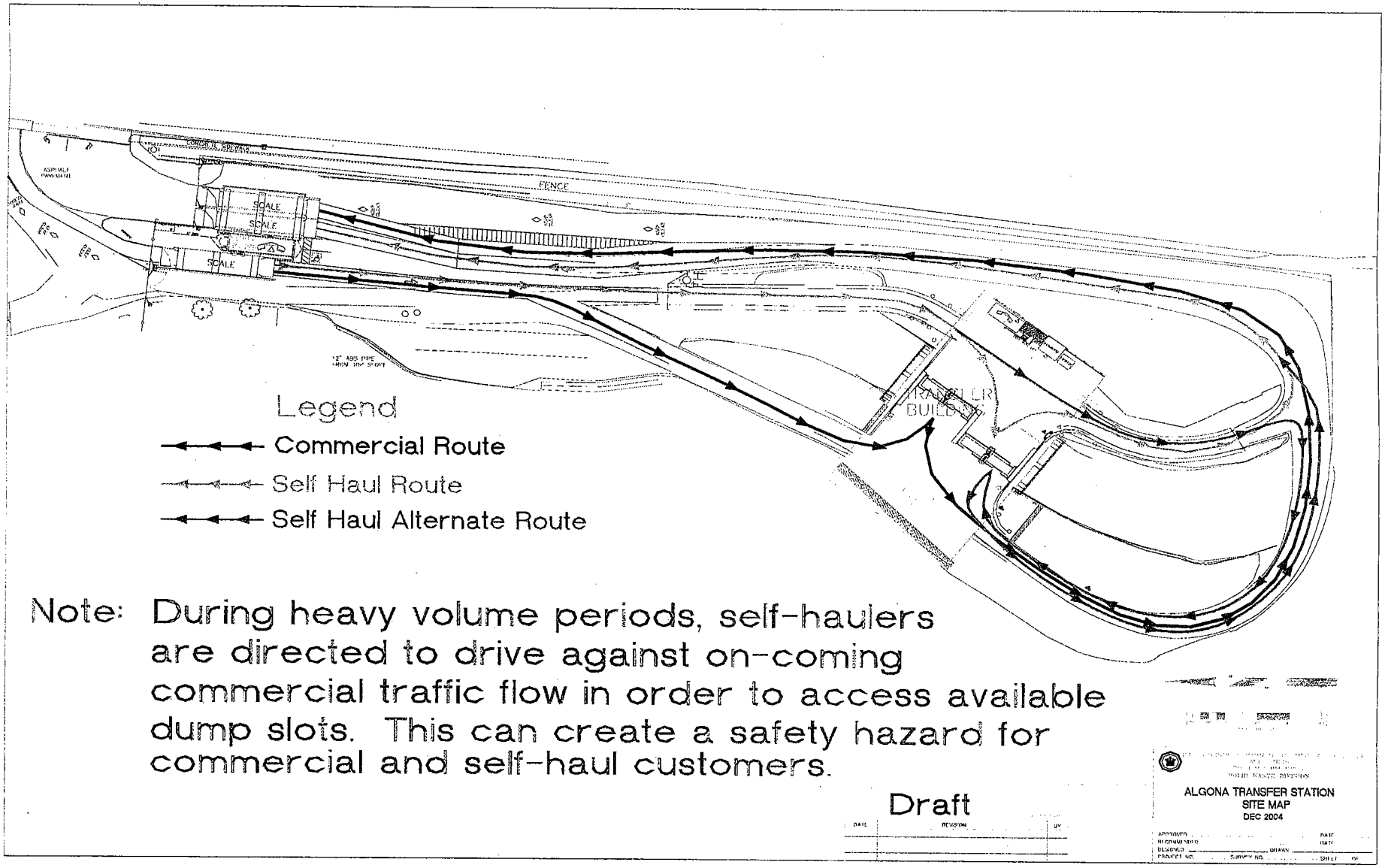
Criteria 10-5: Stationary Compactor Boom Isolated from Customer Activity Area.



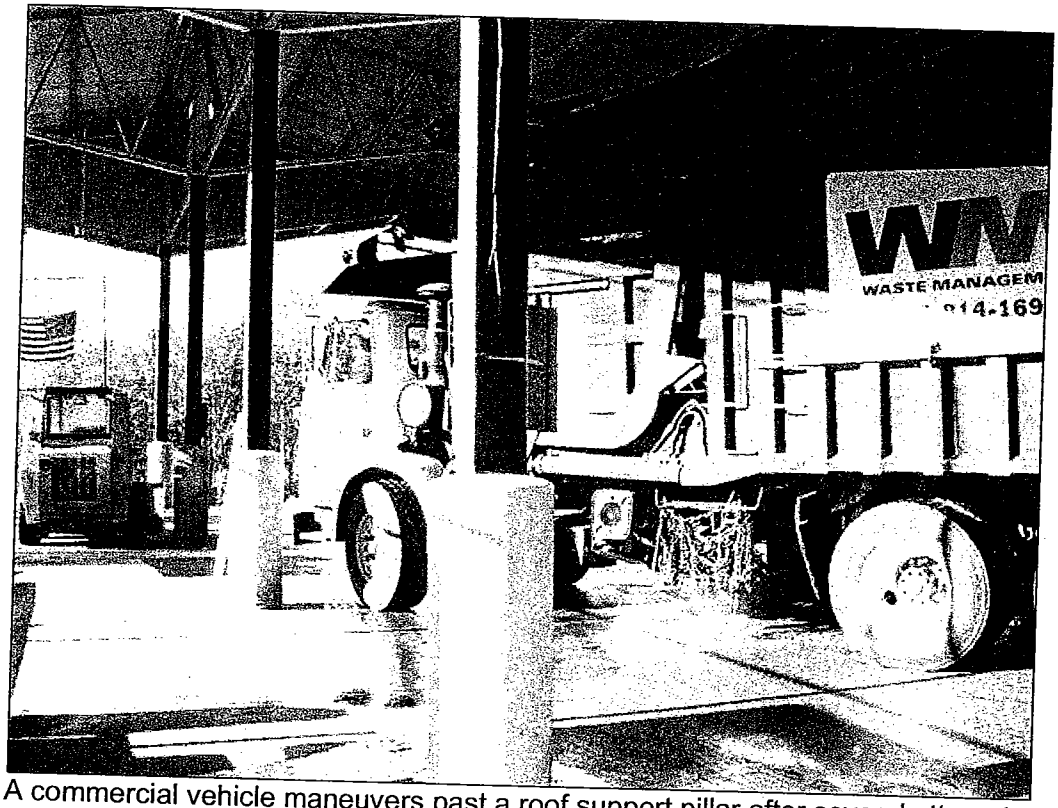
The arm of the compactor boom is used to block the garbage
that is being dumped into the chute.



Criteria 10-6: One-Way Traffic Pattern.

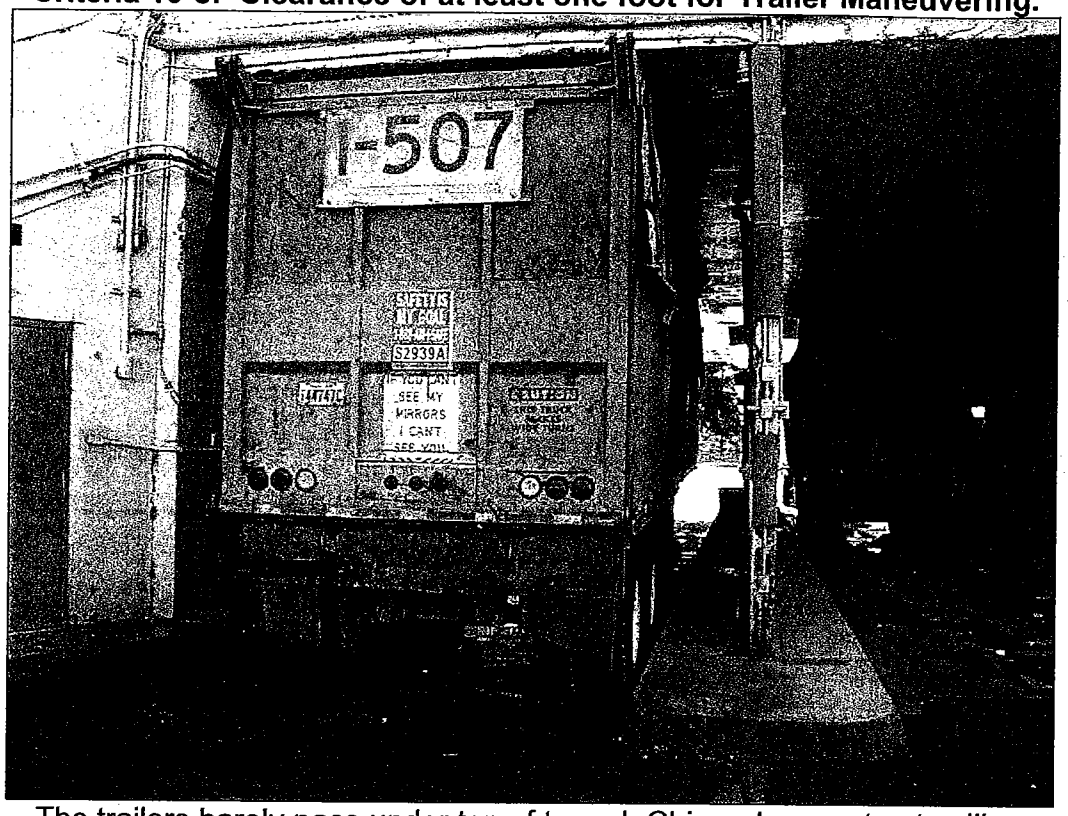


Criteria 10-7: 15 Foot Stall Width & 65 Foot Tipping Floor Width.

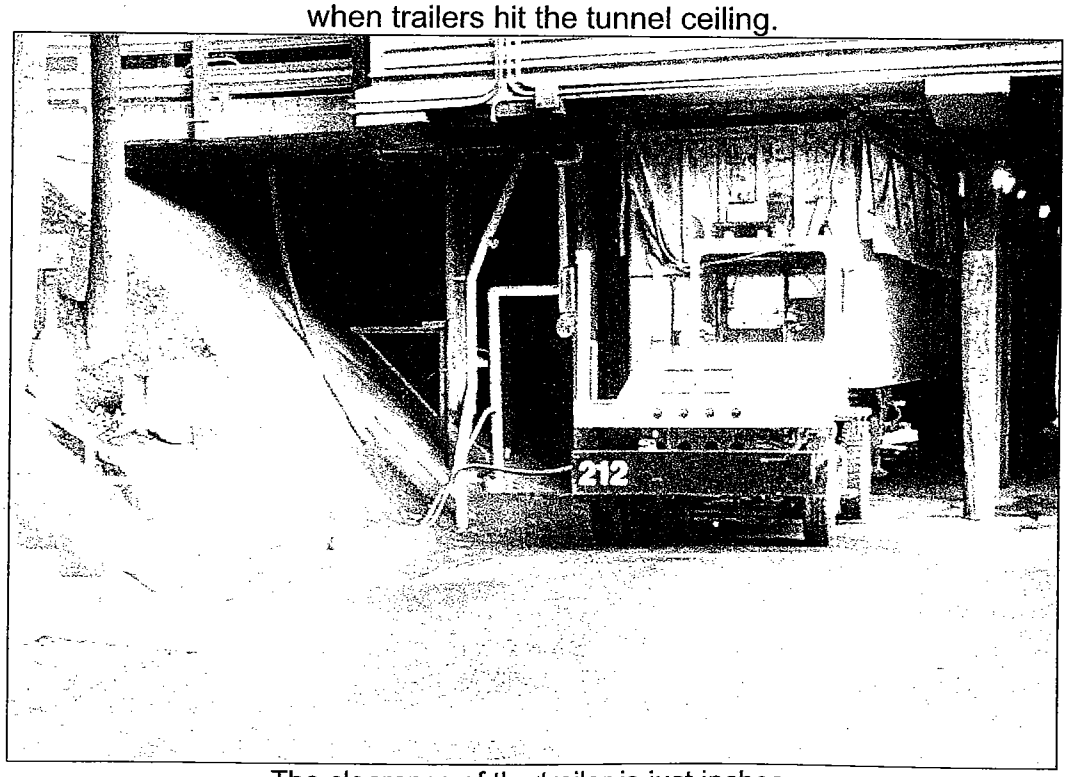


A commercial vehicle maneuvers past a roof support pillar after several attempts.

Criteria 10-8: Clearance of at least one foot for Trailer Maneuvering.

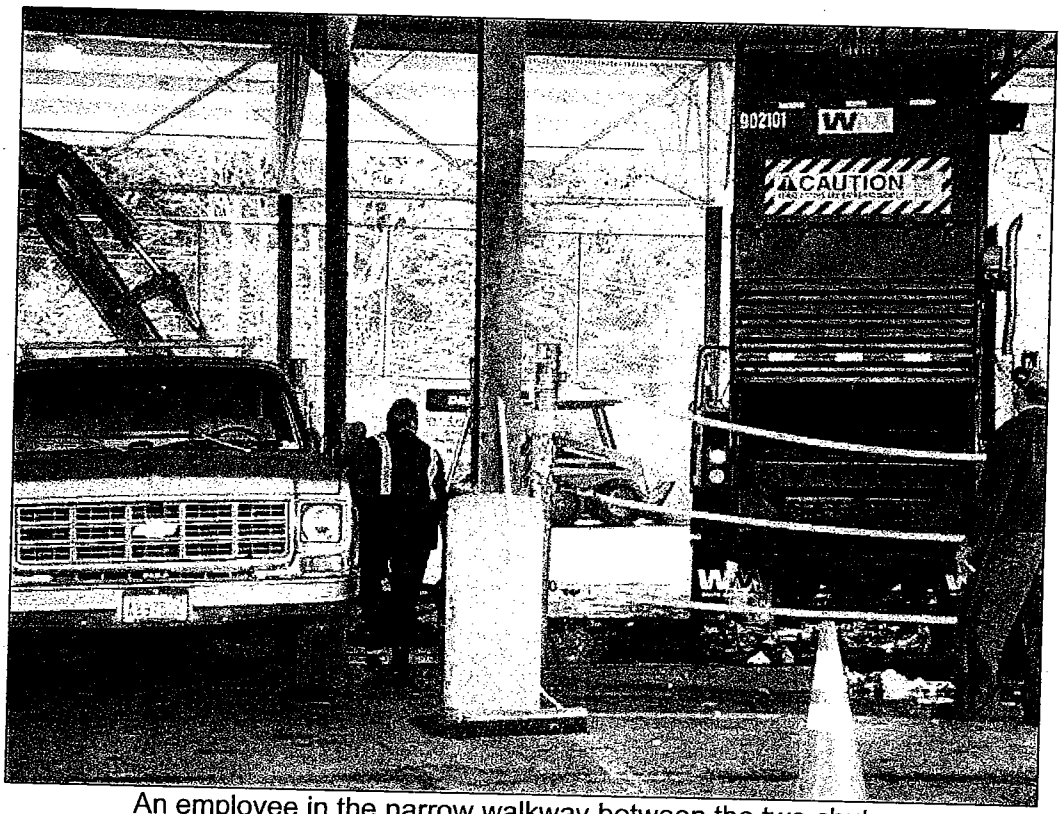


The trailers barely pass under top of tunnel. Chipped concrete at ceiling and scratches on the ceiling inside the right tunnel can be seen caused when trailers hit the tunnel ceiling.



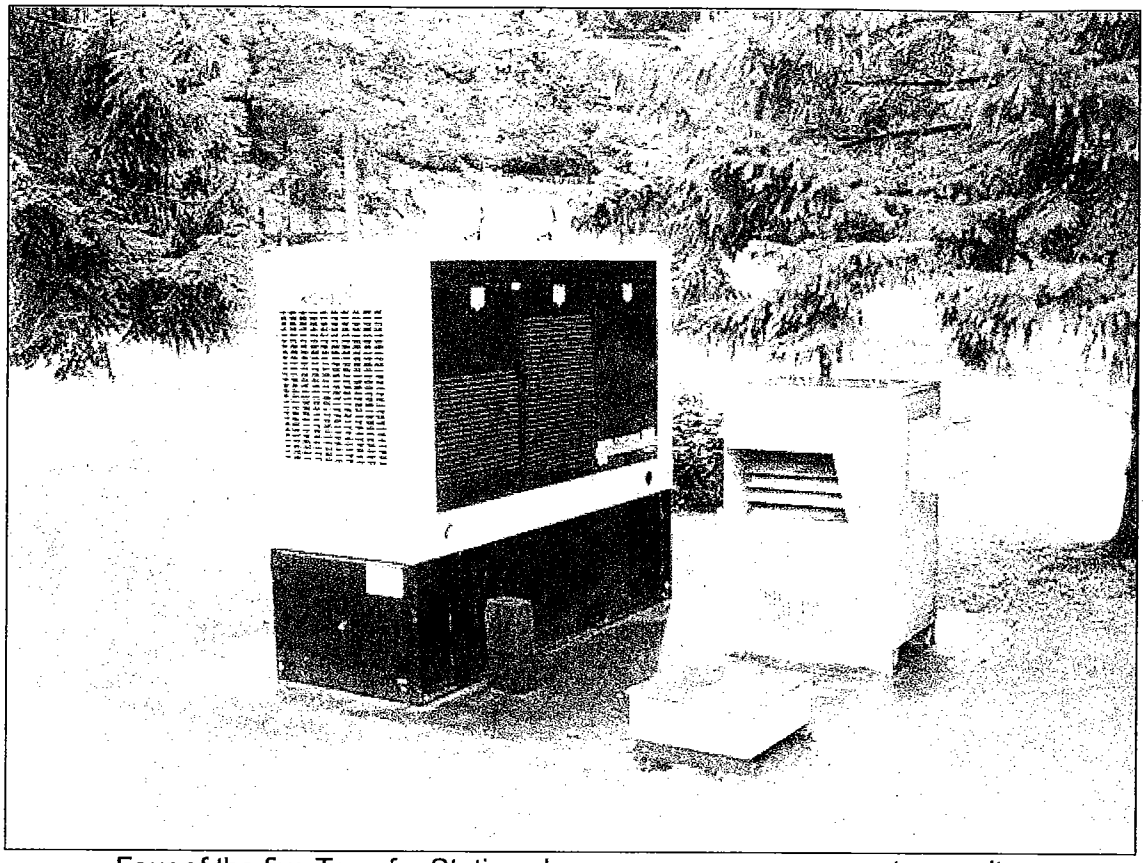
The clearance of the trailer is just inches.

Criteria 10-9: Employee Walkway Space of at Least Five Feet on Tipping Floor.



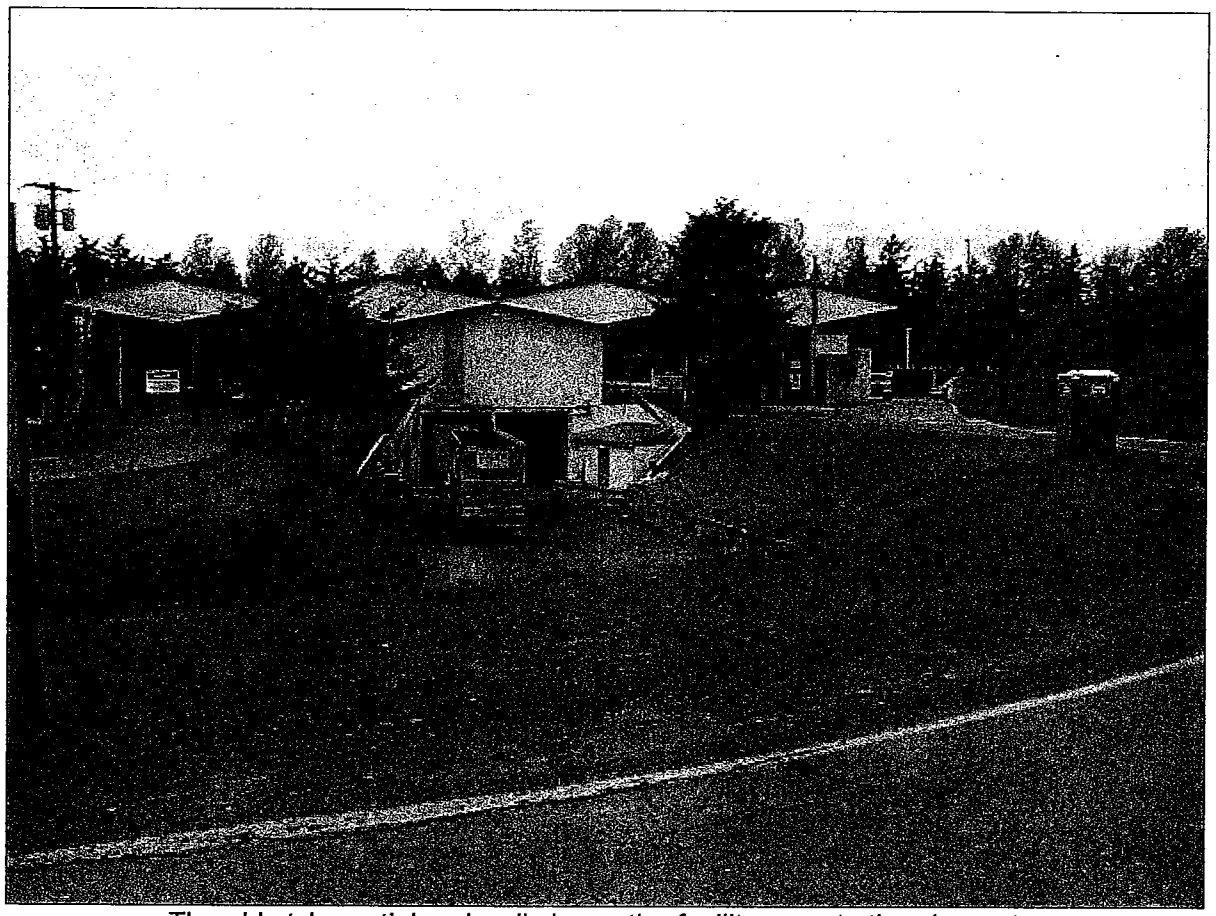
An employee in the narrow walkway between the two chutes.
The two yellow lines on the floor show width.

Criteria 10-10: Back-up Power Available



Four of the five Transfer Stations have an emergency generator on site.

Criteria 10-11: Enclosed Transfer Station Building.



The old style partial end walls leave the facility open to the elements.

11. Ability to Compact Waste

Description: The ability to compact waste is an efficiency measure for transfer stations. Waste compaction at the transfer station enhances overall system efficiency and reduces costs by reducing the number of trips required to transport the same amount of waste to the Cedar Hills Regional Landfill. This also means fewer trips through host city neighborhoods and less impact on local roads.

Cedar Hills is the only remaining landfill in King County. It is expected to reach its permitted capacity and close within 10 years. At that time, the division will transition to waste export as a means of disposal. While the details of the waste export process are the topic of this and other concurrent studies, the division anticipates that waste will be exported to an out-of-county landfill.

Similar to the economies noted above, compacted waste creates fewer waste containers which can significantly reduce the operating and capital costs of transport and intermodal activity. The overall ability of transfer stations to accommodate waste export will need to be made as part of the overall discussion of waste export.

Application: None of the five urban transfer stations currently has compaction capability.

12. Meets the Goals for Level of Structural Integrity

Description: The purpose of this criterion is to ensure that the facility meets code requirements for seismic, wind and snow events. All facilities were constructed in compliance with the applicable building standards at the time and were grandfathered in their current condition. All were in compliance with applicable standards at the time of construction.

The Federal Emergency Management Agency (FEMA) has developed standards and a methodology for assessing existing buildings with regard to seismic performance. The King County Emergency Management Plan identifies transfer stations as mission critical facilities. The appropriate FEMA standard that would apply is the Immediate Occupancy standard. This standard means the facility could be expected to perform during a seismic event in such a way that it can be occupied immediately after the event.

To evaluate the structural integrity of the stations, the division hired consultants ABKJ and R.W. Beck to determine their compliance with Immediate Occupancy Requirements as established by FEMA. The stations were also evaluated under the 2003 International Building Code (IBC) which applies to the construction of new buildings.

Application: Of the five transfer stations evaluated, only the Algona and Renton transfer stations meet both the current IBC and FEMA standards. Bow Lake, Factoria, and Houghton do not meet either standard.

Table 14: Application of criterion #12 – Structural Integrity

Transfer Station	In Compliance with Applicable Building Standards	Meets FEMA Immediate Occupancy Standards and IBC
Algona	Yes	Yes
Bow Lake	Yes	No
Factoria	Yes	No
Houghton	Yes	No
Renton	Yes	Yes

13. Meets Applicable Local Noise Ordinance Levels

Description: The purpose of this criterion is to ensure that the facility does not violate applicable noise ordinances. There are both State and local (city) standards for acceptable noise levels impacting neighboring property based on zoning, land use, time of day and other factors. Noise levels are measured in decibels (dBA). For there to be a violation, noise regulations require that not only is the level exceeded, but that someone is bothered by it.[1] For example, a residential decibel limit would be applicable only if the limit was exceeded and a residence was adjacent to the station. There have been no citations for violations of noise ordinances at any of the five transfer stations.

The Division's consultant Clayton Group Services, measured noise levels at three points: (1) the perimeter of the transfer station, (2) 100 feet from the transfer building, and (3) at the site fenceline (which surrounds the active area of the site). Clayton also calculated the rate at which sound diminishes over distance to estimate the noise level caused by the transfer station activity at the property line in an effort to screen out background noise.

Application: Table 15 below illustrates the results of applying this criterion to the five transfer stations. Note the final determination of whether a station met this criterion (yes.no) was based on (1) whether or not the noise level met the most restrictive standard; and (2) whether someone could be impacted by the noise level. Specifically, Bow Lake transfer station was determined to meet this criterion despite the fact that the measured and calculated decibel level exceeded the commercial standard, since the surrounding land is either freeway or vacant. The potential exists for the criterion to not be met at the Houghton station, as the measured and calculated decibel levels both exceed the residential standard, and adjacent properties include residences. Although Factoria exceeds the noise level standard, there are no indications that the surrounding properties are impacted by noise from the transfer station, therefore no violation occurs.

[1] For example, Tukwila's relevant code defines public disturbance noises as "a sound that unreasonably disturbs or interferes with the peace, comfort and repose of owners or possessors of real property without regard to sound level measurement."

Table 15: Application of Criterion #13 – Noise

Transfer Station	Most restrictive adjacent land use	Measured value at property boundary	Calculated value at property boundary	Meets Criterion?
Algona	Residential limit of 65 dBA	~ 64 dBA	~61 dBA	Yes
Bow Lake	Commercial limit of 65 dBA	~ 63 dBA west – ~ 64 dBA NW corner -	~66 dBA	Yes
Factoria	Commercial limit of 65 dBA	~68 dBA west – ~64 dBA gate –	~59 – dBA	Yes
Houghton	Residential limit of 60 dBA	~67 dBA west – ~ 55 dBA east -	~61 dBA west– ~54 dBA east –	Yes
Renton	Commercial limit of 65 dBA	~ 57 dBA -	~51 dBA-	Yes

14. Meets Puget Sound Clean Air Agency Standards for Odors

Description: Measuring odors is a relatively subjective process. Complaints from the public or employees are the primary measure of whether odors are a problem at a transfer station. Odor complaints are typically reported either to the Puget Sound Clean Air Agency (PSCAA) or to the division.

According to PSCAA, the standard for a detrimental odor is considered to be:

> ... any air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.

If an odor complaint is reported to PSCAA, an inspector is sent to the reported site to verify the complaint. The inspector ranks the odor from a Level 0 – no odor detected – to Level 4 – odor is so strong that a person does not want to remain present. If an odor is verified at Level 2 or above, PSCAA issues a citation to the generator of the odor.

In addition to reviewing division records for any PSCAA citations, complaint logs from the public were reviewed for any reports of odors received directly by the division.

Application: Four urban transfer stations (Algona, Bow Lake, Factoria and Renton) meet this criterion. No citations have been issued by PSCAA for any of the sites. There have been very few complaints about transfer station odors to the Solid Waste Division. One complaint was verified within the last two years at the Houghton Transfer Station but, again, no citation was issued.

15. *Meets Criteria for Acceptable Traffic Impacts on Local Streets*

a) ***Additional traffic meets the local traffic level of service standard as defined in the* American Association of State Transportation Officials Manual**

b) ***Traffic does not extend onto local streets during more than 5% of the operating hours***

Description: This criterion is intended to measure the impacts on local streets and neighborhoods from vehicle traffic and queuing near the transfer stations.[1] The measure of impacts extends from the station entrance to the surrounding streets that may be affected by self haulers' and commercial collection trucks that use the site. HDR Engineering, Inc. was hired by the Division to develop a methodology for these criteria. A detailed description of the methodology for applying these criteria is described in Appendix F.

Application: In 2004, Bow Lake transfer station was the only facility that did not meet current intersection LOS standards (Criteria 15a) due to congestion at the Orillia entry road intersection.

In 2004, only the Renton transfer station met Criteria 15b, where traffic queues entering the transfer station do not spillover onto or impede local streets during 95 percent of the operating hours. However, if only the latter half of the year were analyzed (which would represent new operating hours and functional changes made at all the transfer stations), Houghton meets Criteria 15b, as well. It is also important to note that in 2004, all of the sites met Criteria 15b on a weekday, while none of them met the criterion on a weekend.

16. *100-foot Buffer Exists Between Facility Active Area and Nearest Residence*

Description: The goal of this criterion is to have a 100-foot buffer between the active area of the transfer station and the nearest residence. This distance has been used by the division as an internal standard for mitigating any adverse effects that might come from the transfer stations.

Application: Appendix F contains maps that show the outline of the 100-foot buffer at each of the five transfer stations. The maps indicate that Algona, Bow Lake, and Factoria meet this criterion,[2] and that Houghton and Renton do not meet this criterion.

---

[1] The 2001 Comprehensive Solid Waste Management Plan recognizes that the Solid Waste Division will discuss road impacts and their mitigation with the cities as necessary.

[2] A business (not a residence) is within 100 feet of the Factoria station.

Next Steps

This report is an interim step in the development of the waste export system plan. An addendum to this report will address Criterion 17 after MSWMAC has had the opportunity to discuss it further and make a recommendation.

The next step will be to begin work on the third report identified in Ordinance 14971: "Analysis of Options for Public and Private Ownership and Operation." This third report will include a discussion of the current roles of public and private parties in handling solid waste in the region, as well as a discussion and evaluation of various options for public and private ownership and operation of transfer and intermodal facilities.

Subsequent to the third report the division will work with stakeholders to develop transfer system alternatives that will meet system needs. This analysis will be contained in the fourth report: "Preliminary Transfer and Waste Export System Recommendations (with estimated system costs, rate impacts, and financial policy assumptions)."

Several additional steps must be taken to lay the analytical groundwork for the fourth report, including:

- Developing a priority ranking for the criteria;
- Conducting site-specific design and analysis work to:
  - Explore the need, technical feasibility, and cost of installing waste compaction at transfer stations; and
  - Review the opportunity for expansion and/or renovation of different stations.
- Clarifying the need for intermodal activities (including re-load capability); and
- Identifying a set of transfer *system* alternatives that can be analyzed for cost and rate impacts.[1] The fourth report will include an evaluation of Criteria 18 and 19.

The division will continue to work with the SWAC, ITSG, and MSWMAC in developing this report, as well as with representatives from commercial garbage companies and labor.

[1] It may be useful to think in terms of developing transfer *system* alternatives. Service levels at individual stations may differ but the transfer system will need to be considered as a whole.

List of Appendices (to be provided with final)

A. Ordinance 14971

B. Analysis for Criteria #2: Time on Site

C. Analysis for Criteria #3: Facility Hours meet User Demand

D. Capacity Evaluation for King County Transfer Stations (HDR Engineering, Inc.).

E. Methodology for Reviewing Traffic Impacts (Criterion #15); HDR Engineering, Inc.

F. Maps Showing Application of Criterion #16

Supplemental Technical Reports (Available by request from the Solid Waste Division)

1. Transfer Station Noise Surveys: A Comparison to Applicable Noise Ordinance Levels, Criteria 13
   Clayton Group Services, Inc; February 4, 2005

2. Preliminary Seismic Evaluation of Bow Lake Transfer Station
   MLA Engineering, plc. In conjunction with R.W. Beck, Inc.

3. Factoria and Houghton Transfer Stations Technical Report
   ABKJ Engineers; December 2004

Appendix A

Ordinance 14971

KING COUNTY

1200 King County Courthouse
516 Third Avenue
Seattle, WA 98104

Signature Report

July 27, 2004

Ordinance 14971

Proposed No. 2004-0125.2

Sponsors Ferguson, Edmonds, Lambert, Patterson and Irons

AN ORDINANCE relating to the timing for planning for waste export and annually reporting the solid waste division's progress toward objectives identified in the comprehensive solid waste management plan; amending Ordinance 7737, Section 2, as amended, and K.C.C.10.24.020 and adding a new section to K.C.C. chapter 10.25.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. **Findings.**

A. In Ordinance 14236 and the 2001 Final Comprehensive Solid Waste Management Plan, the council made the policy determination to export the county's solid waste to one or more landfills after the county's Cedar Hills regional landfill reaches capacity and must close. The council rejected alternatives to waste export, including development of a new landfill in King County or incinerating the county's waste.

17 B. In Ordinance 14236, the council directed the county executive to begin to
18 implement the policy to export the county's waste by developing a waste export
19 coordination and implementation plan ("the waste export system plan").
20 C. The 2001 Final Comprehensive Solid Waste Management Plan also included
21 policies on transfer stations and the future transfer station system. The majority of the
22 current transfer stations were planned for and developed in the 1960s. The most-recent
23 review of the transfer station system was conducted for the 2001 Comprehensive Solid
24 Waste Management Plan update. The future transfer station system must be planned and
25 developed as an integral part of the waste export system plan.
26 D. Waste export may require the county to secure intermodal capacity to transfer
27 sealed containers of solid waste from trucks to rail cars.
28 E. The 2001 Final Solid Waste Comprehensive Management Plan Policy DSW-8
29 directs the county executive to undertake a siting study process for any necessary
30 intermodal facilities that involves all affected jurisdictions and interested parties in the
31 siting study and in the development of site evaluation criteria regarding environmental,
32 technical, financial and community needs.
33 F. An environmental review process for the siting analysis portion of the waste
34 export coordination and implementation plan is required by chapter 197-11 WAC.
35 G. The solid waste division became aware of the Fisher Flour Mill property as a
36 potential site for an intermodal facility, and upon King County council approval,
37 purchased the property in 2003. Ordinance 14710, authorizing the purchase of the Fisher
38 Flour Mill property, requires an independent third-party review of competitive
39 alternatives to the Fisher Flour Mill property as a potential site for an intermodal facility.

40 H. To develop the waste export system plan, the county shall:

41 1. conduct a comprehensive evaluation of:

42 a. transfer system capacity;

43 b. public and private alternatives for transfer capacity;

44 c. public and private alternatives for waste export;

45 d. site evaluation criteria; and

46 e. siting as needed;

47 2. Perform environmental review for any siting analysis; and

48 3. Obtain independent third-party review of competitive alternatives to the

49 Fisher Flour Mill property as a potential site for an intermodal facility.

50 I. The waste export system plan must be developed with processes that provide

51 for input from all stakeholders and interested parties.

52 J. King County intends to establish an advisory committee for city input into the

53 development of the waste export system plan, to improve the communication of

54 information between King County and cities and to facilitate the resolution of solid waste

55 management issues with city partners and customers. The advisory committee will

56 consist of representatives from each city with a signed solid waste interlocal agreement

57 participating in the county solid waste management system.

58 NEW SECTION. SECTION 2. There is hereby added to K.C.C. chapter 10.25 a

59 new section to read as follows:

60 **Metropolitan solid waste management advisory committee.**

61 A. A metropolitan solid waste management advisory committee is established.

62 Each component city with a signed interlocal agreement participating in the county solid

63 waste management system shall identify representatives and alternates to the solid waste
64 division for appointment to the advisory committee. The committee shall conduct its first
65 meeting on or after January 2, 2005. The solid waste division shall notify each
66 component city with a signed interlocal agreement participating in the county solid waste
67 management system of committee meeting times and locations. At the first meeting, the
68 committee shall elect a chair. The members of the committee shall serve at the pleasure
69 of the appointing bodies and shall receive no compensation from King County other than
70 reimbursement for reasonable expenses actually incurred in the performance of their
71 duties.

72 B. The metropolitan solid waste management advisory committee shall advise the
73 executive, the solid waste interlocal forum established in the solid waste service contracts
74 between the county and cities, and the King County council in all matters relating to solid
75 waste management and participate in the development of the solid waste management
76 system and waste export system plan.

77 C. The metropolitan solid waste management advisory committee shall review
78 and make recommendations on the waste export system plan before transmittal of the
79 plan from the King County executive to the King County council.

80 D.1. Until the metropolitan solid waste management advisory committee first
81 convenes, an interjurisdictional technical staff group presently assembled shall serve in
82 lieu of the metropolitan solid waste management advisory committee. The
83 interjurisdictional technical staff group shall advise the metropolitan solid waste
84 management advisory committee through December 31, 2005, to assist the committee
85 during its first year of work. Each city with a solid waste interlocal agreement with King

86 County may participate in the interjurisdictional technical staff group. The group shall
87 provide a report of its findings and recommendations by December 31, 2004, to all cities
88 participating in the county solid waste management system, the King County executive,
89 King County council, the solid waste advisory committee and the solid waste interlocal
90 forum, or its successor, on the structure, function and responsibilities of the metropolitan
91 solid waste management advisory committee. The staff group shall provide a report of
92 its findings and recommendations by December 31, 2005, to all cities participating in the
93 county solid waste management system, the metropolitan solid waste management
94 advisory committee, the King County executive, King County council, the solid waste
95 advisory committee and the solid waste interlocal forum, or its successor.
96 2. The interjurisdictional technical staff group report shall address at least the
97 following issues:
98 a. potential modification or replacement of the solid waste interlocal forum, to
99 identify membership, decision-making responsibilities and scope of duties;
100 b. identification of dispute resolution options;
101 c. development of a framework for financial policies and host city mitigation,
102 including compensation agreements;
103 d. evaluation of the impact of the proposed waste export system plan on each
104 of the provisions of the solid waste interlocal agreement between King County and cities;
105 and
106 e. identification of potential amendments to the solid waste interlocal
107 agreement.

3. The solid waste interlocal forum, or its successor, shall make a recommendation to the King County executive and King County council on or before December 31, 2005, on the efficacy of the continuing role of the interjurisdictional technical staff group.

E. The solid waste division shall provide staff support to the metropolitan solid waste management advisory committee and the interjurisdictional technical staff group. The King County council shall provide staff support in the development of solid waste planning legislation.

SECTION 3. King County and any city exercising its right under Section 5.1 of its solid waste interlocal agreement with the county may engage in informal discussions regarding potential changes to any of the provisions of the interlocal agreement. A city's decision to engage or not to engage in such informal discussions shall not constitute a waiver of the city's exercise of its rights under Section 5.1 to either review or renegotiate, or both, the solid waste interlocal agreement. This authorization to engage in informal discussions does not constitute consent to negotiate any provision under Section 5.2 of the agreement nor constitute a waiver of the requirement of mutual consent for the negotiation of any provision under Section 5.2 of the agreement. Any informal discussions shall not be binding on any party in any future negotiations and shall not be relied upon by any party, unless the discussions or agreements have been formalized in a properly executed agreement.

SECTION 4. Ordinance 7737, Section 2, as amended, and K.C.C.10.24.020 are each hereby amended to read as follows:

Responsibilities.

131 A. The division shall maintain the plan in a current condition and shall propose
132 necessary plan revisions to the council at least once every three years.
133 B. The King County solid waste advisory committee shall review and comment
134 upon the proposed plan prior to its submittal to the council for adoption.
135 C. The designated interlocal forum, or its successor, shall have the following
136 responsibilities:
137 1. Advise the King County council and executive and other jurisdictions as
138 appropriate on all policy aspects of solid waste management and planning and consult
139 with and advise the King County solid waste division on technical issues;
140 2. Review and comment on alternatives and recommendations for the county
141 comprehensive solid waste management plan and facilitate approval of the plan by each
142 jurisdiction;
143 3. Review proposed interlocal agreements between King County and cities for
144 planning, recycling and waste stream control;
145 4. Review disposal rate proposals;
146 5. Review status reports on waste stream reduction, recycling, energy and
147 resource recovery; and solid waste operations with interjurisdictional impact;
148 6. Promote information exchange and interaction between waste generators,
149 local governments with collection authority, recyclers and county-planned and operated
150 disposal system;
151 7. Provide coordination opportunities between the King County solid waste
152 division, local governments, private operators and recyclers; and

153 8. Aid cities in recognizing municipal solid waste responsibilities, including
154 collection and recycling, and effectively carrying out those responsibilities.
155 ((~~E.~~)) D. The council shall hold a public hearing on the draft plan and another
156 public hearing on the final plan before adoption of the plan. Any city using county
157 disposal sites shall be notified of these public hearings and shall be requested to comment
158 on the plan.
159 ((~~F.~~)) E. The division shall submit to the council by ((~~September~~)) April 1 of each
160 year an annual report of its progress toward objectives identified in the plan.
161 ((~~G.~~)) F. Interlocal agreements between the county and cities wishing to plan
162 jointly with the county or to authorize the county to plan for it shall identify which party
163 is responsible for city solid waste operational plans, tonnage forecasts((,)) and recycling
164 goals.
165 G. The division shall provide staff support to the metropolitan solid waste
166 management advisory committee and the interjurisdictional technical staff group.
167 SECTION 5. **Solid waste system planning.** The development of the waste
168 export system plan, including comprehensive analysis of public and private transfer
169 station and system capacity, transfer system efficiency and waste export for the next
170 comprehensive solid waste management plan update, shall include, but not be limited to,
171 the following:
172 A. The process for developing the waste export system plan shall be guided by
173 the adopted 2001 Comprehensive Solid Waste Management Plan that directs the county
174 to involve all affected jurisdictions and interested parties in siting process decisions, and
175 by Ordinance 14710. The interjurisdictional technical staff group and the metropolitan

solid waste management advisory committee shall work with the solid waste division to develop the waste export system plan, including development of the business plan, future transfer station system alternatives and waste export system alternatives;

B. Preparing a business plan, which should at a minimum address:

1. Emergency capacity;

2. System reliability;

3. Efforts to coordinate planning and operations with other jurisdictions;

4. Possible impacts of future system choices on employees;

5. Strategies to encourage competition;

6. Preserving service levels and value for customers;

7. Integration of waste export activities with the transfer network;

8. Environmental protection; and

9. The potential benefits of a federated system; and

C. Scope of work and analysis of technical issues for development of a waste export system plan shall consider the solid waste handling system as a whole. Major technical elements shall include, but not be limited to:

1. Development of transfer system level of service standards and criteria, such as evaluation of traffic flow impacts and queuing, that provide objective measures for when a transfer station needs to be upgraded in place, relocated to a more appropriate location, or additional transfer stations need to be built to adequately serve the region's growing population;

197 2. Identification of needed transfer system improvements, replacements or
198 additions, or any combination thereof, and their respective estimated costs based on level
199 of service standards;
200 3. Analysis of both public and private transfer station ownership and operational
201 options;
202 4. Development of level of service standards and criteria that provide objective
203 measures for a solid waste intermodal capacity needs analysis;
204 5. Analysis of both public and private intermodal facility ownership and
205 operational options;
206 6. Analysis of waste transport cost and feasibility;
207 7. Analysis of landfill capacity; and
208 8. Independent evaluation of waste export system plan. Consistent with
209 Ordinance 14710, the county shall provide for an independent evaluation of the transfer
210 and waste export system alternatives and recommendations to inform the county's
211 decision-making on the waste export system plan, by convening an expert independent
212 review panel. The council, after consultation with the solid waste interlocal forum, or its
213 successor, shall define the scope of the evaluation to be conducted and guide the selection
214 of independent review panel experts.
215 SECTION 6. **Reporting.**
216 A. The solid waste division shall submit a waste export system plan to the
217 council and solid waste interlocal forum or its successor by December 15, 2005. The
218 division shall also regularly report back to the council and solid waste interlocal forum,
219 or its successor, throughout the system plan development process.

220 B. Major milestones for reports to be submitted by the solid waste division to the
221 council and solid waste interlocal forum, or its successor, for review and council approval
222 by motion shall include, but are not limited to:
223 1. Transfer system level of service standards and criteria;
224 2. Analysis of system needs and capacity;
225 3. Analysis of options for public and private ownership and operation;
226 4. Preliminary transfer and waste export facility recommendations, and
227 estimated system costs, rate impacts and financial policy assumptions.
228 C. The council shall, if approving submitted solid waste division reports for
229 major milestones, make the approval by motion. Each motion shall also include a
230 timeline for submittal of future milestone reports still pending. The first milestone report
231 pertaining to level of service standards and criteria for future system needs shall be
232 submitted to the council and solid waste interlocal forum on or before October 15, 2004.
233 D. In accordance with K.C.C. 10.24.020.A, the solid waste division shall begin
234 updating the adopted 2001 Comprehensive Solid Waste Management Plan by December
235 1, 2005, with completion of the update process anticipated by December 2007. The
236 waste export system plan shall be used as the basis for formulating recommendations for

solid waste transfer and disposal for the update of the 2001 Comprehensive Solid Waste Management Plan.

Ordinance 14971 was introduced on 3/15/2004 and passed by the Metropolitan King County Council on 7/26/2004, by the following vote:

Yes: 13 - Mr. Phillips, Ms. Edmonds, Mr. von Reichbauer, Ms. Lambert, Mr. Pelz, Mr. McKenna, Mr. Ferguson, Mr. Hammond, Mr. Gossett, Ms. Hague, Mr. Irons, Ms. Patterson and Mr. Constantine
No: 0
Excused: 0

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

Larry Phillips, Chair

ATTEST:

Anne Noris, Clerk of the Council

APPROVED this 2 day of August, 2004.

Ron Sims, County Executive

RECEIVED
2004 AUG -6 PM 3:48
KING COUNTY
CLERK
COUNCIL

Attachments None

Appendix B

Transfer System Level of Service Criteria
Criterion 2: Time On Site

Transfer System Level of Service Criteria
Criterion 2: Time On - Site

This criterion measures the time a vehicle spends on-site at a transfer station, from when it crosses the inbound scale until it crosses the outbound scale. It does not include waiting time before the scale house.

The following charts graphed a one year period for each station evaluated for commercial vehicles (mostly trucks from garbage haulers), business self-haulers who have a charge account with the Solid Waste Division and residential self haulers (who pay by cash, check, credit or debit card).

The standard applied for commercial vehicles: The time on site should not exceed 16 minutes for 90% of all transactions.

The standard applied for business self haulers and residential self haulers: The time on site should not exceed 30 minutes for 90% of all transactions.

The data used to evaluate each of the five transfer stations is the transaction data that records every transaction for the County (RICS data). Data from November 2003 through October 2004 was used for this evaluation.

Transfer System Level of Service Criteria
Criterion 2: Time On Site

2-Dec-04

Commercial Haulers
(% Of Transactions Within 16 Minutes)

Site	Weekdays	Weekend Days
Factoria	73%	77%
Houghton	61%	74%
Renton	78%	79%
Algona	81%	70%
Bow Lake	93%	91%

Commercial Haulers
(Minutes On Site For 90% of All Transactions)

Weekdays	Weekend Days
23	25
25	23
20	19
20	23
15	16

Commercial Haulers
Average Time On Site

Weekdays	Weekend Days
14:01	14:34
16:11	14:00
13:07	12:40
12:25	13:39
09:17	09:36

Business Self - Haulers
(% Of Transactions Within 30 Minutes)

Site	Weekdays	Weekend Days
Factoria	98%	88%
Houghton	96%	87%
Renton	99%	100%
Algona	98%	97%
Bow Lake	97%	84%

Business Self - Haulers
(Minutes On Site For 90% Of All Transactions)

Weekdays	Weekend Days
21	39
25	34
18	21
20	26
21	35

Business Self - Haulers
Average Time On Site

Weekdays	Weekend Days
12:17	19:39
14:29	19:37
10:22	13:14
11:47	13:59
11:48	20:22

Residential Self-Haulers
(% Of Transactions Within 30 Minutes)

Site	Weekdays	Weekend Days
Factoria	93%	94%
Houghton	93%	90%
Renton	97%	98%
Algona	96%	94%
Bow Lake	96%	86%

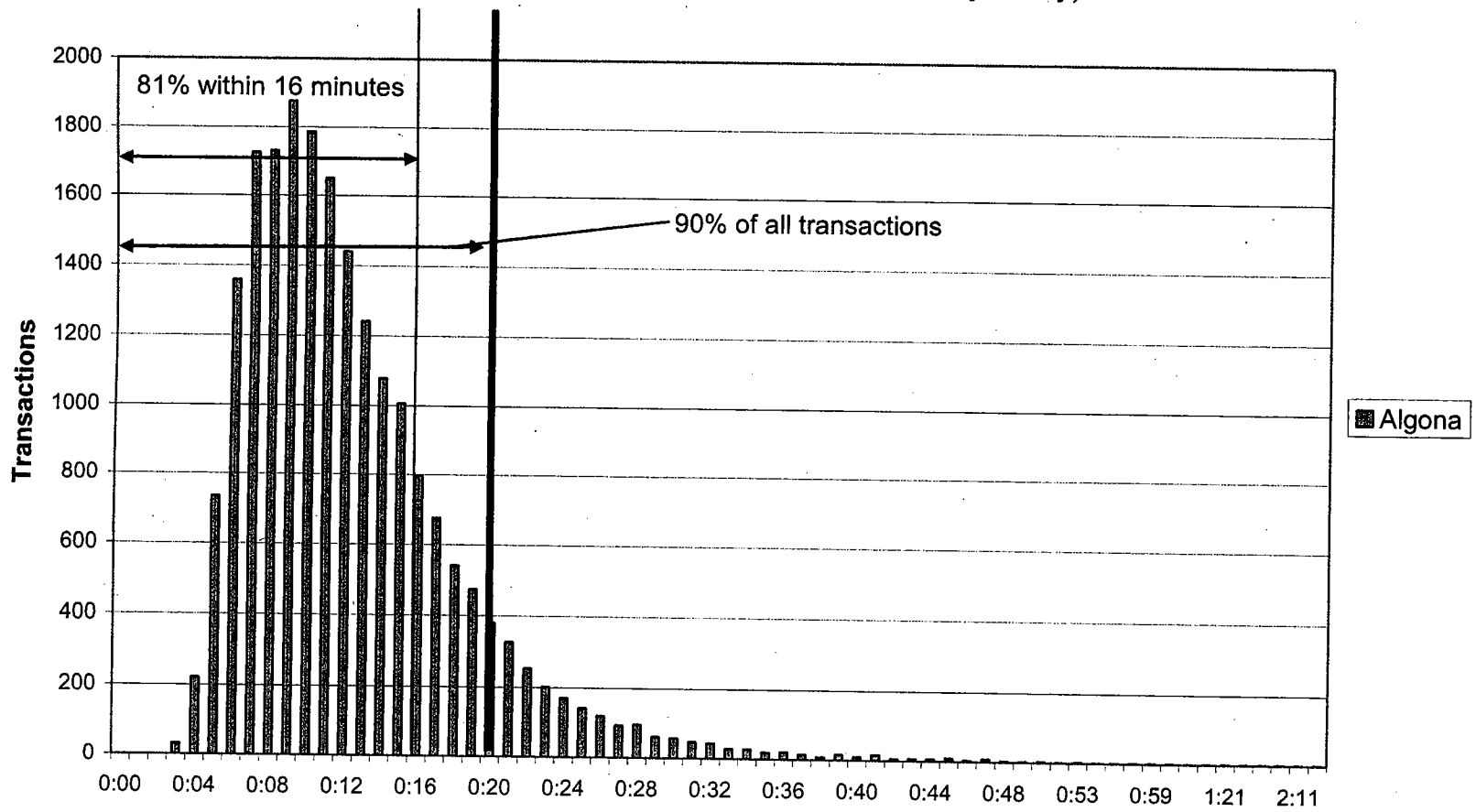
Residential Self - Haulers
(Minutes On Site For 90% Of All Transactions)

Weekdays	Weekend Days
27	26
28	30
22	21
25	28
24	33

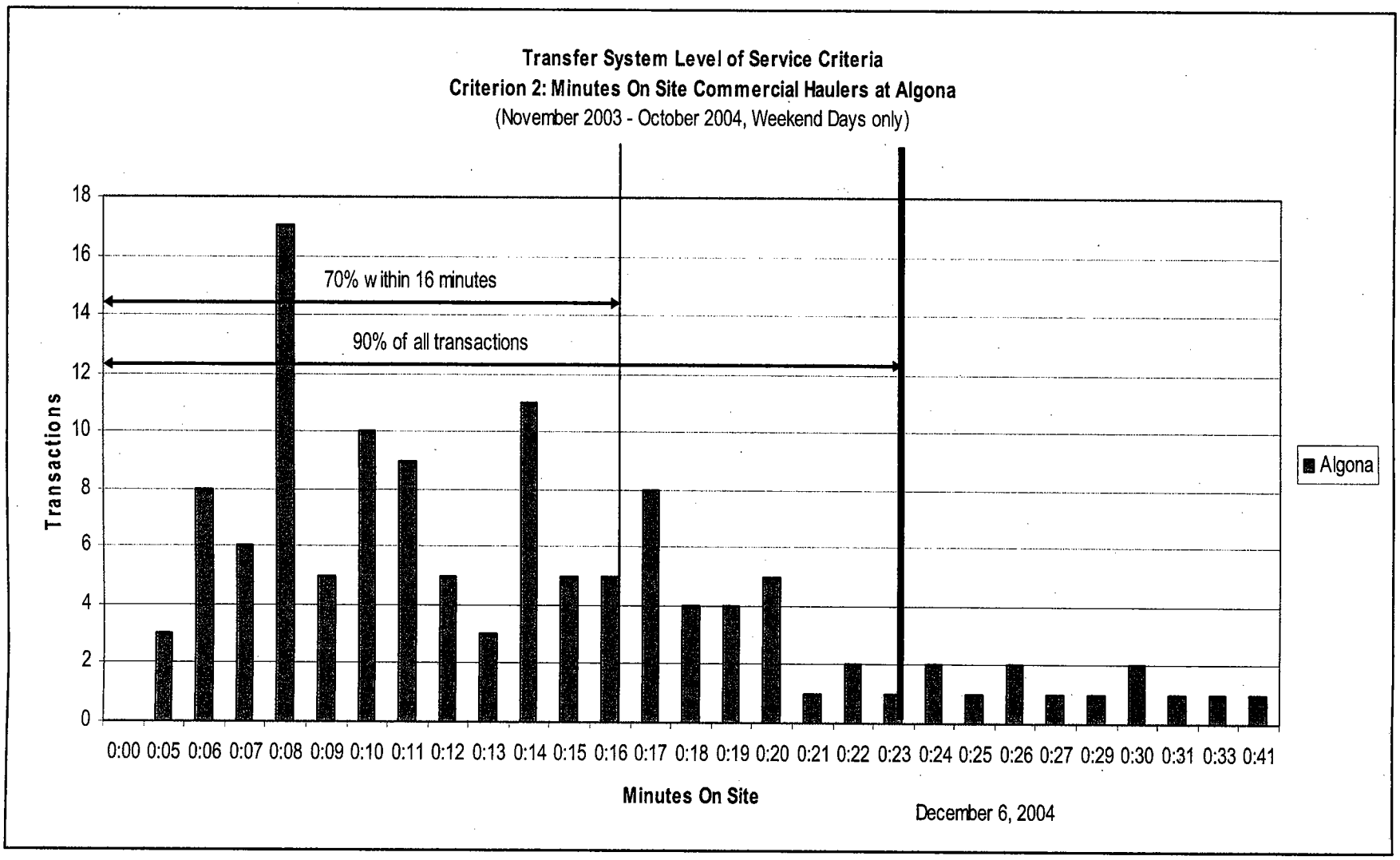
Residential Self - Haulers
Average Time On Site

Weekdays	Weekend Days
15:49	15:31
16:26	16:57
12:45	12:49
14:51	16:19
13:42	18:29

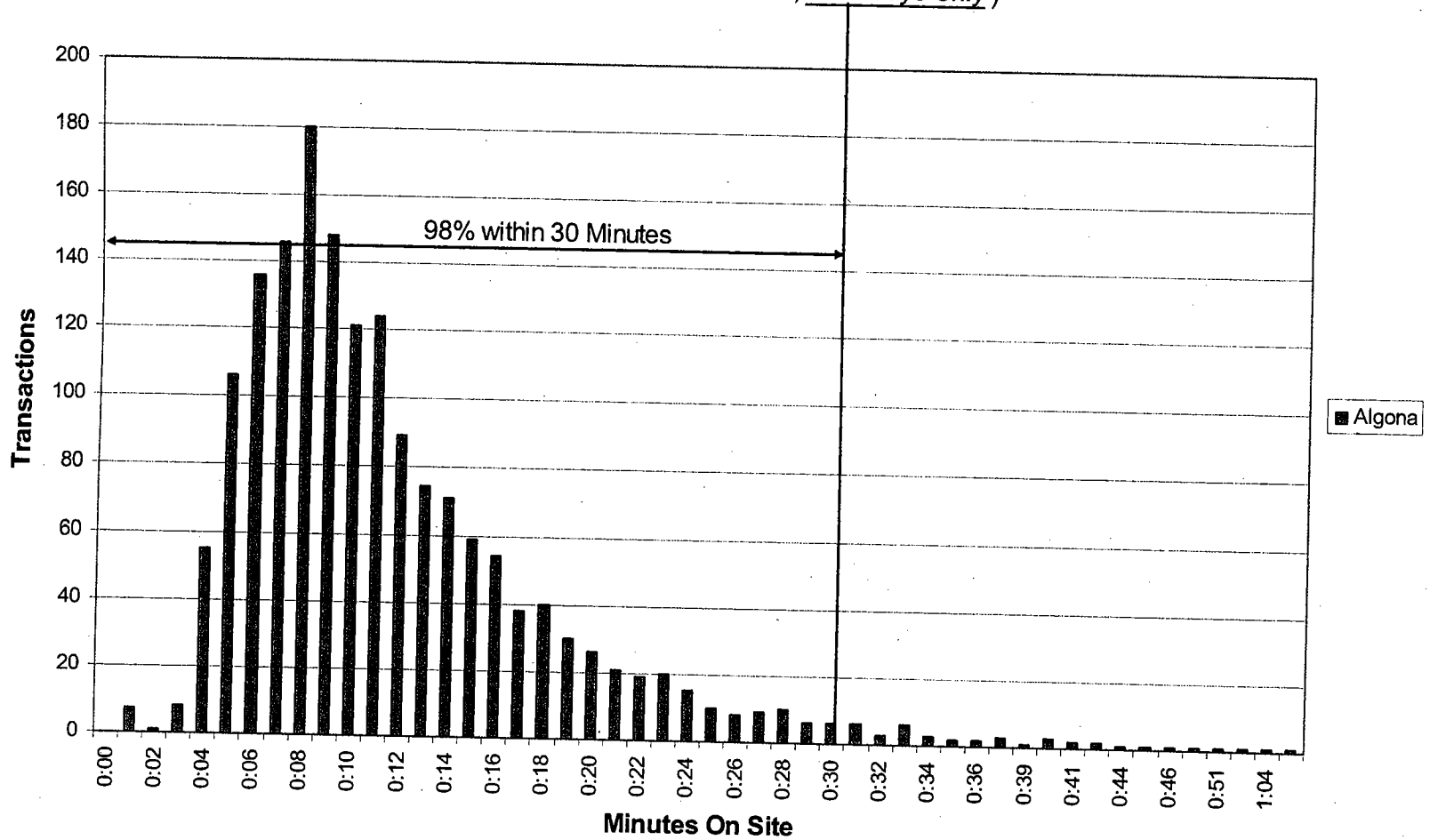
Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Commercial Haulers at Algona
(November 2003 - October 2004, Weekdays Only)



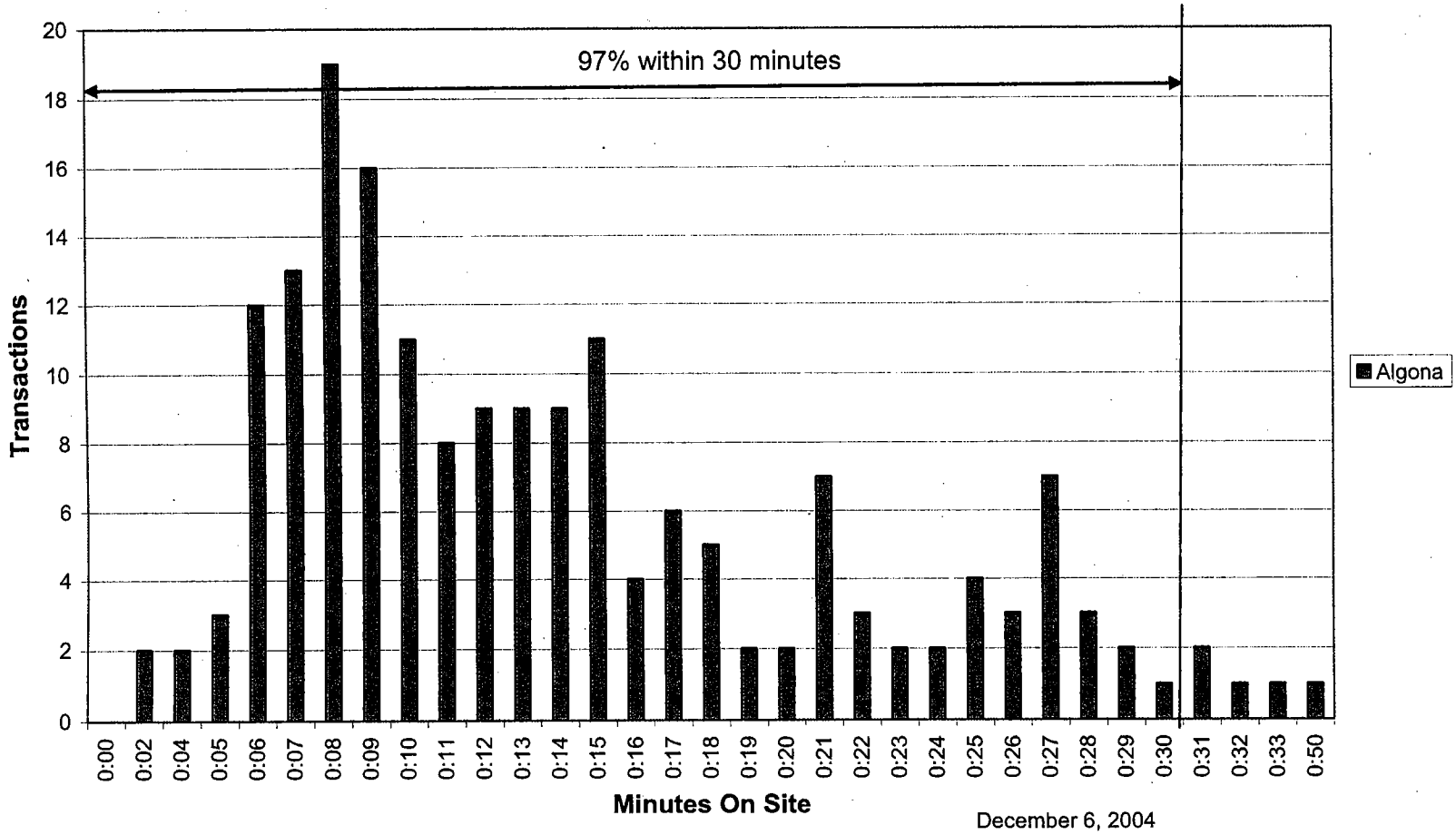
December 2, 2004


Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Commercial Haulers at Algona
(November 2003 - October 2004, Weekend Days only)
70% within 16 minutes
90% of all transactions
Transactions
0
2
4
6
8
10
12
14
16
18
0:00 0:05 0:06 0:07 0:08 0:09 0:10 0:11 0:12 0:13 0:14 0:15 0:16 0:17 0:18 0:19 0:20 0:21 0:22 0:23 0:24 0:25 0:26 0:27 0:29 0:30 0:31 0:33 0:41
Minutes On Site
Algona
December 6, 2004

Transfer System Level of Service Criteria
Criteria 2: Minutes On Site Self - Haul Business at Algona
(November 2003 - October 2004, *Weekdays Only*)

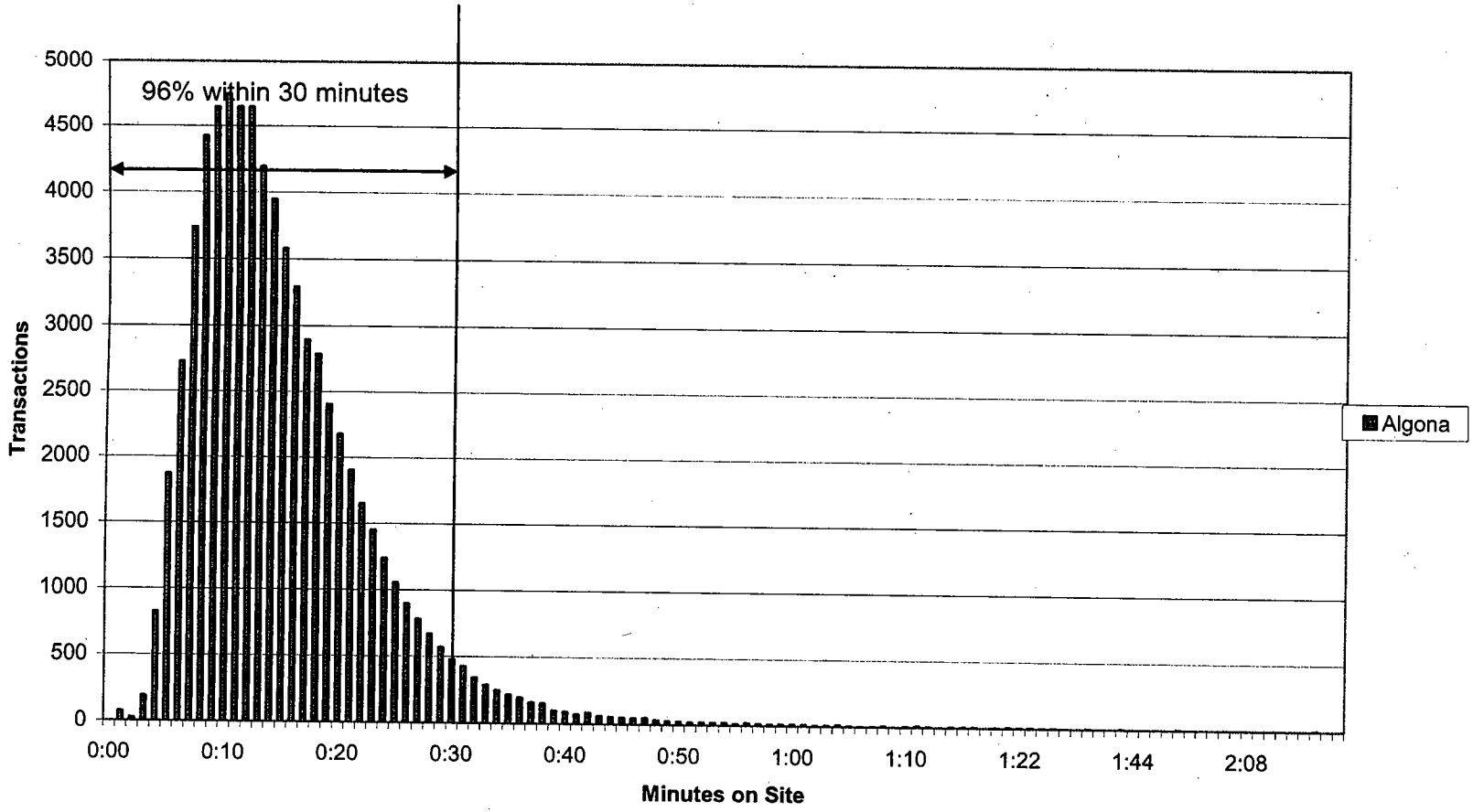


Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Algona
(November 2003 - October 2004, Weekend Days only)



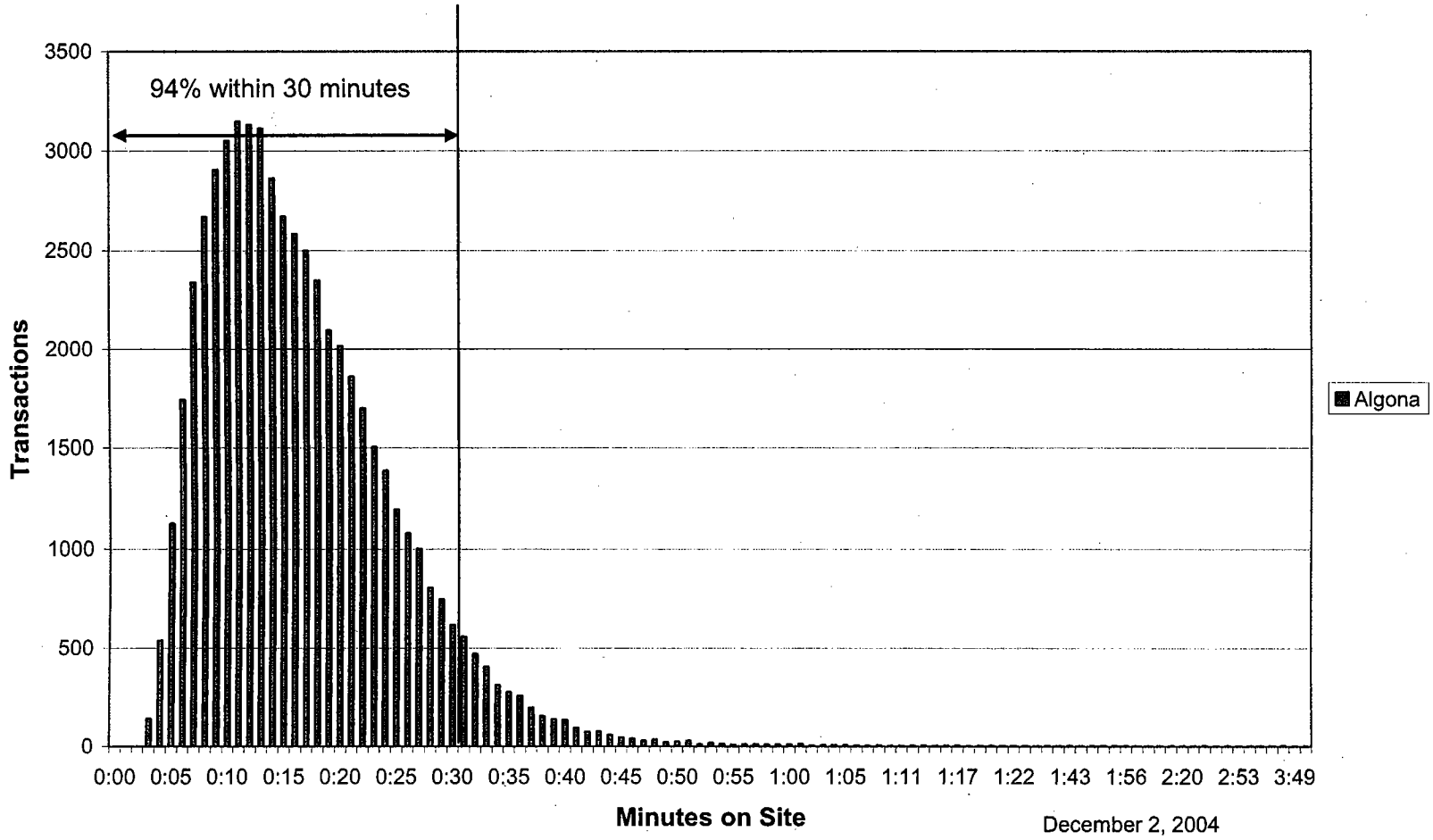
December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Algona
(November 2003 - October 2004, Weekdays only)

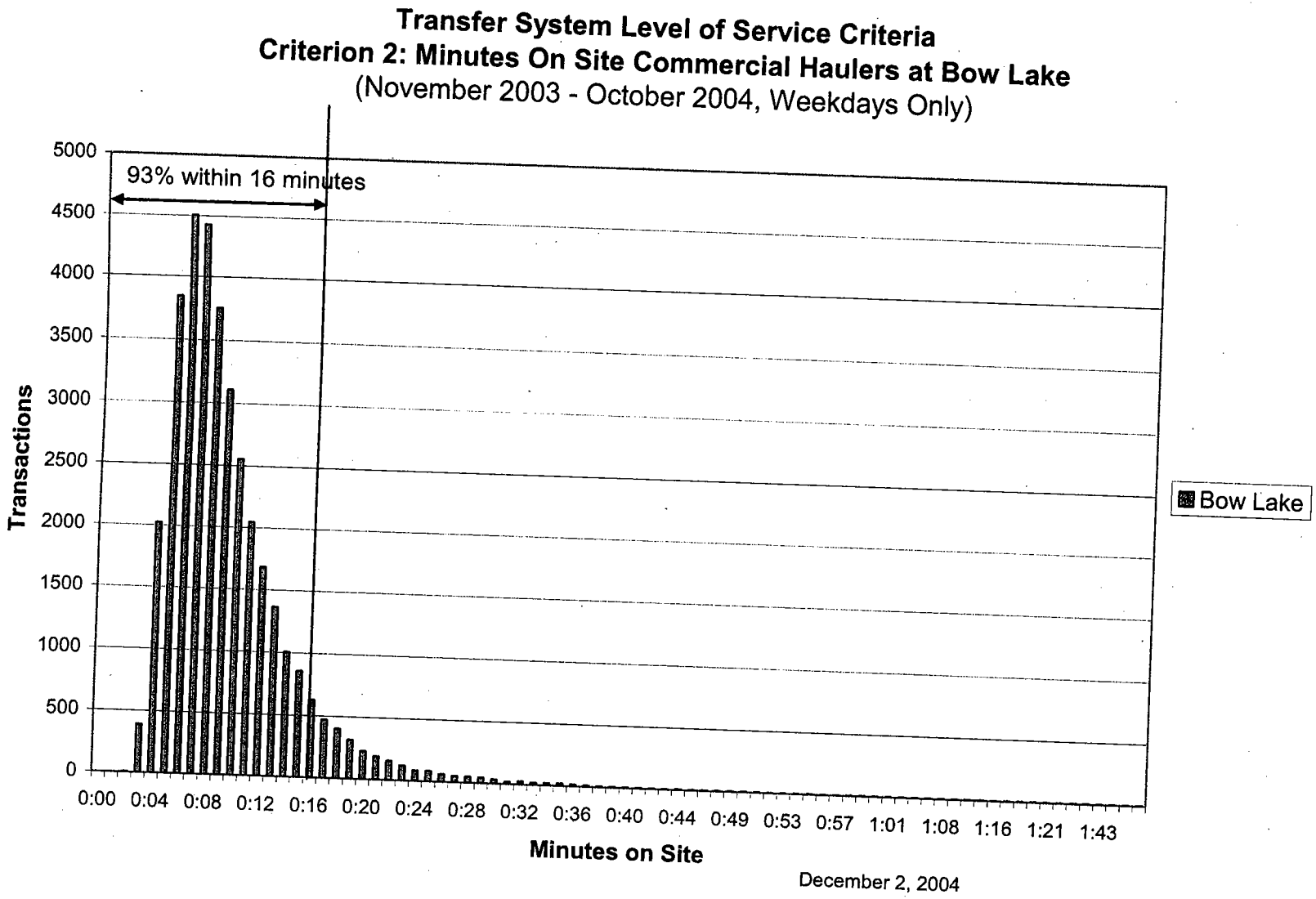


December 6, 2004

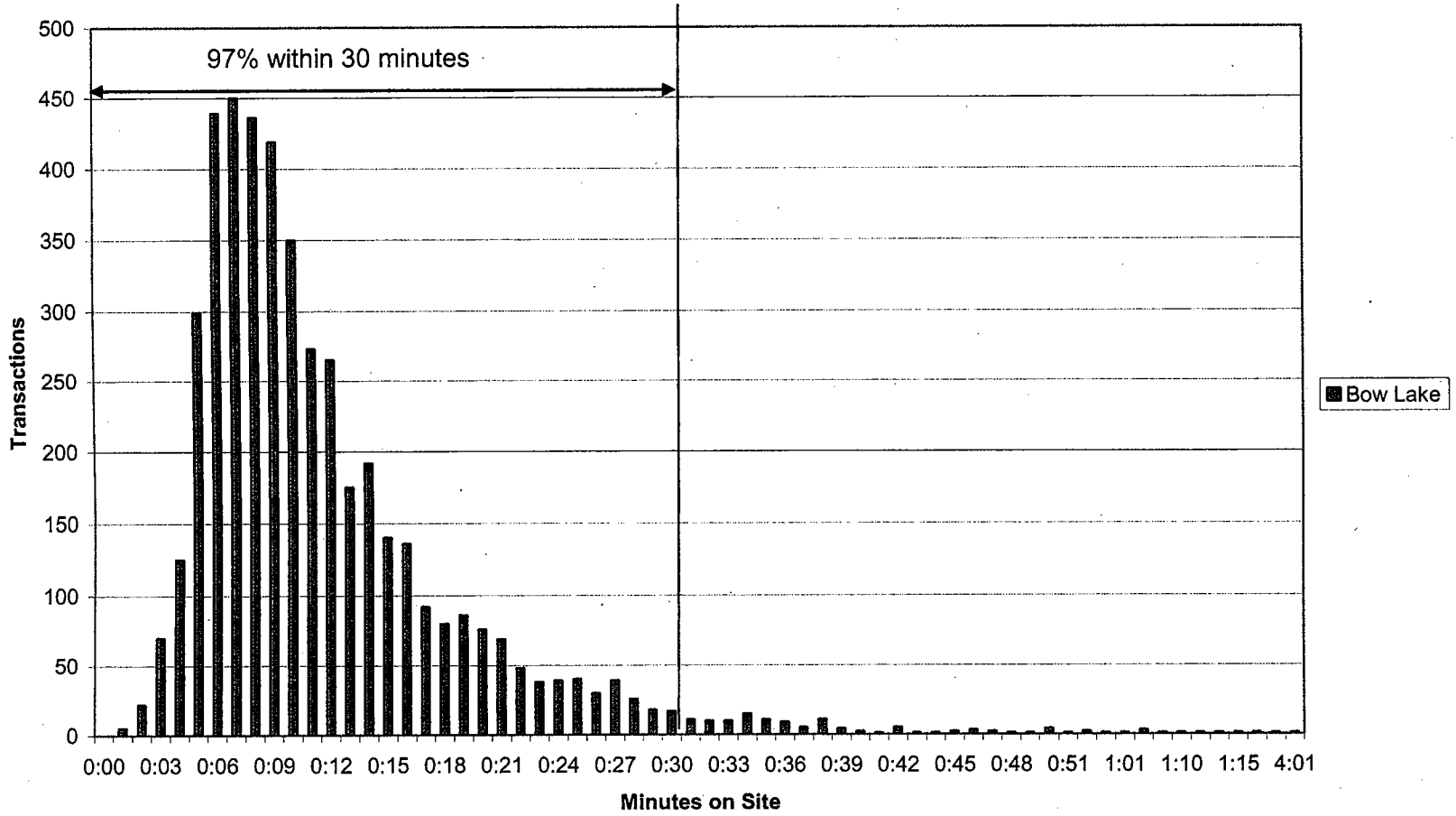
Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers
(November 2003 - October 2004, Weekend Days only)



December 2, 2004

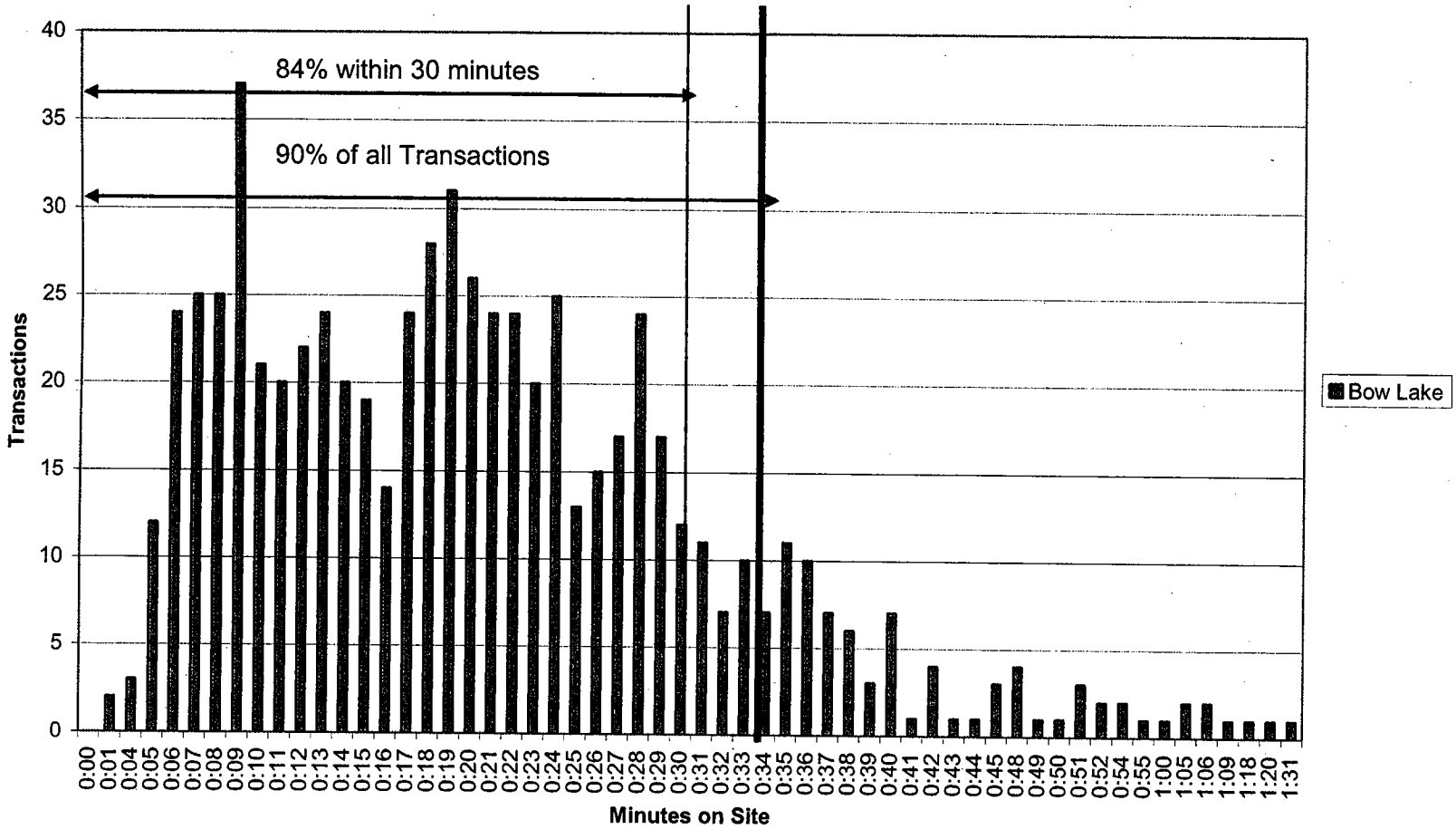

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Commercial Haulers at Bow Lake
(November 2003 - October 2004, Weekdays Only)
93% within 16 minutes
Transactions
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0:00 0:04 0:08 0:12 0:16 0:20 0:24 0:28 0:32 0:36 0:40 0:44 0:49 0:53 0:57 1:01 1:08 1:16 1:21 1:43
Minutes on Site
Bow Lake
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Bow Lake
(November 2003 - October 2004, Weekdays only)



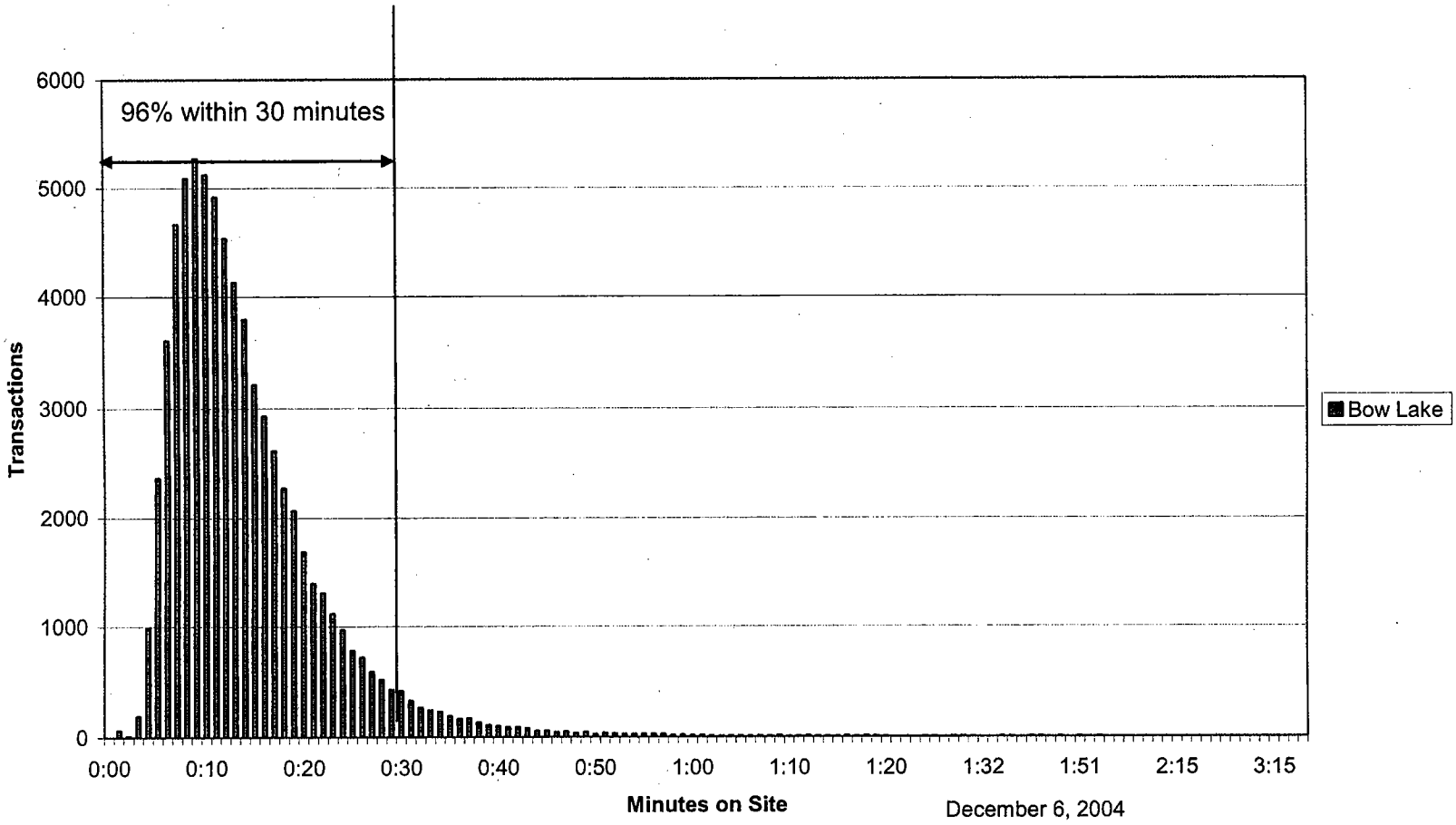
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Bow Lake
(November 2003 - October 2004, Weekend Days only)



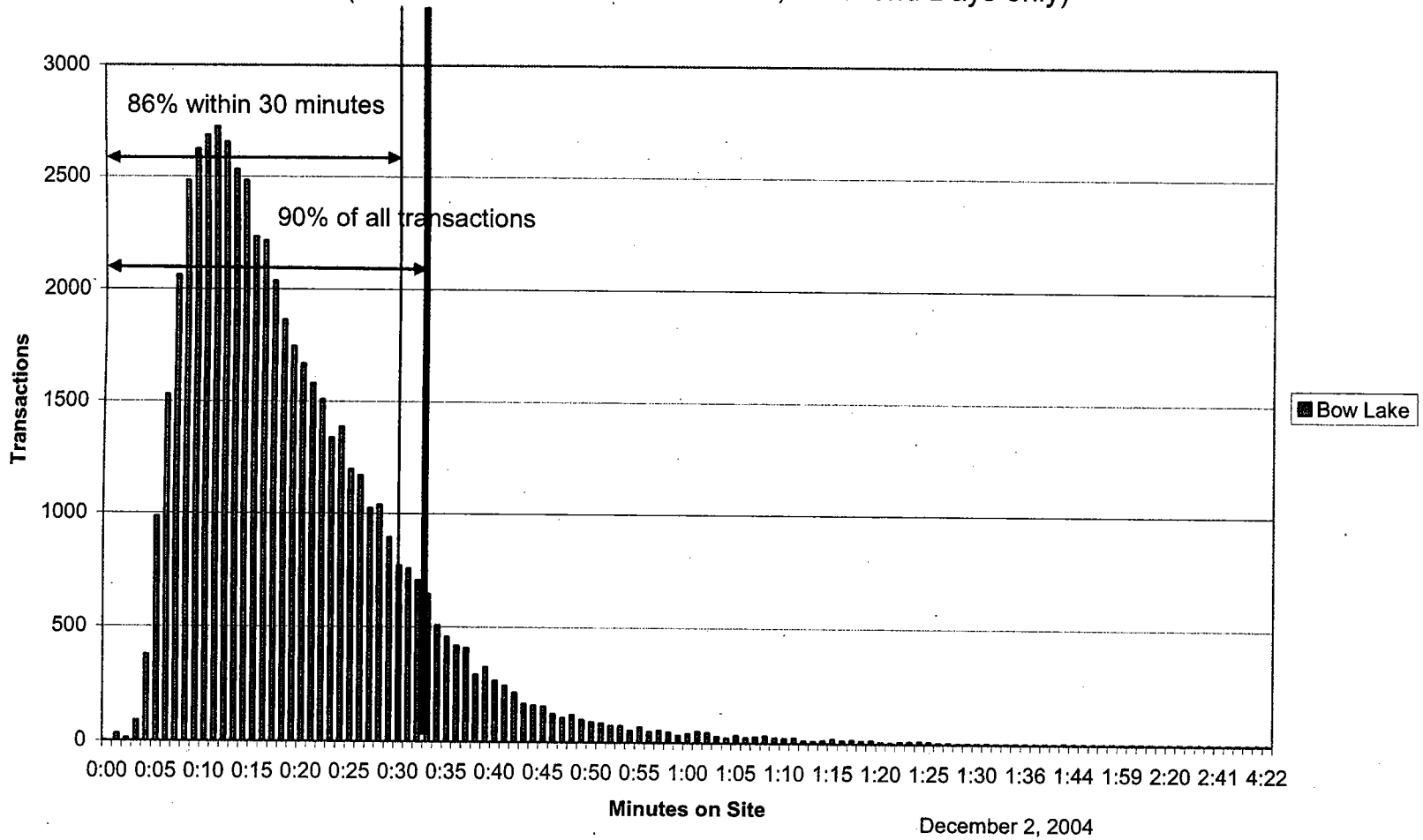
December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Bow Lake
(November 2003 - October 2004, Weekdays only)



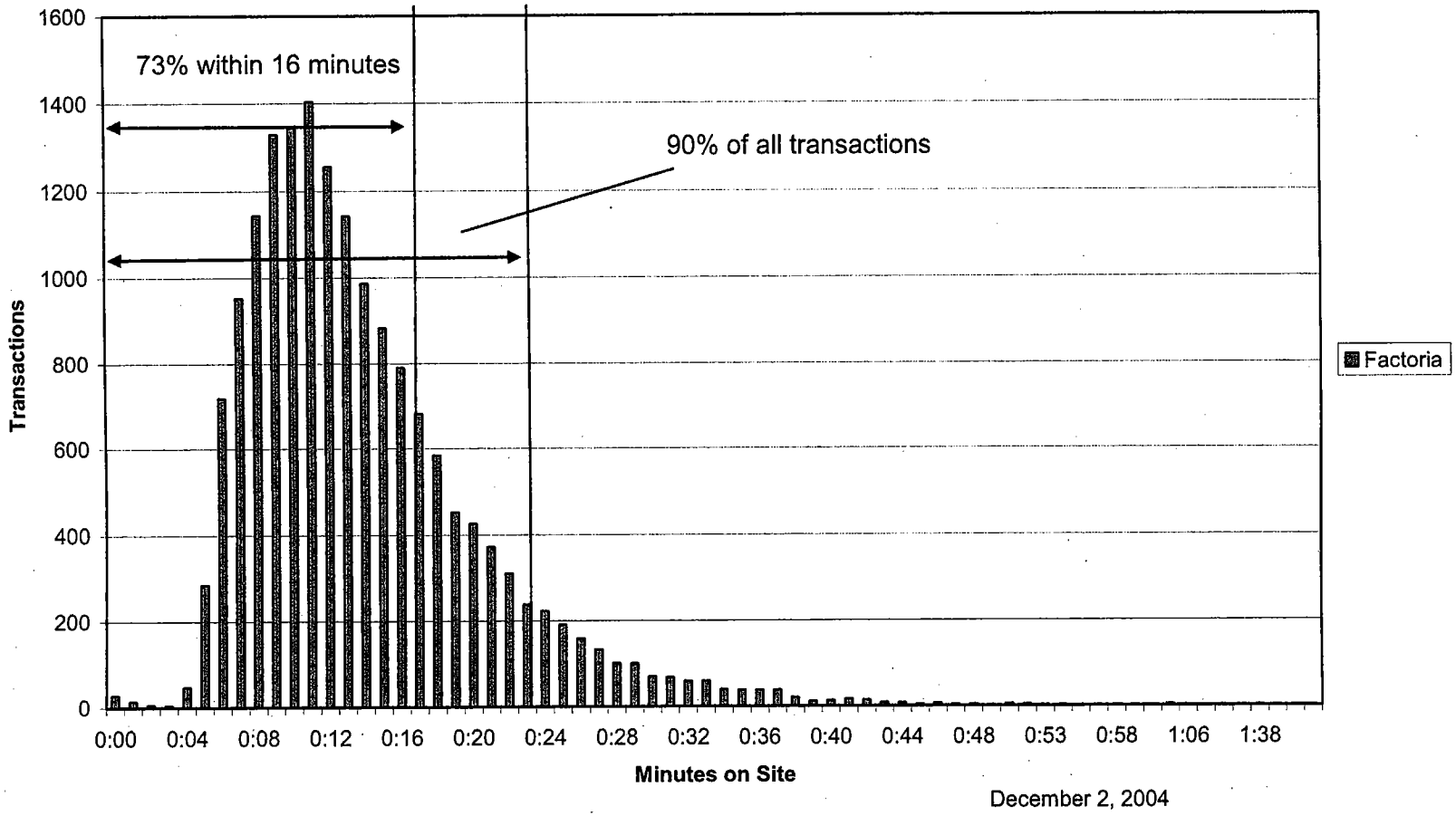
December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Bow Lake
(November 2003 - October 2004, Weekend Days only)

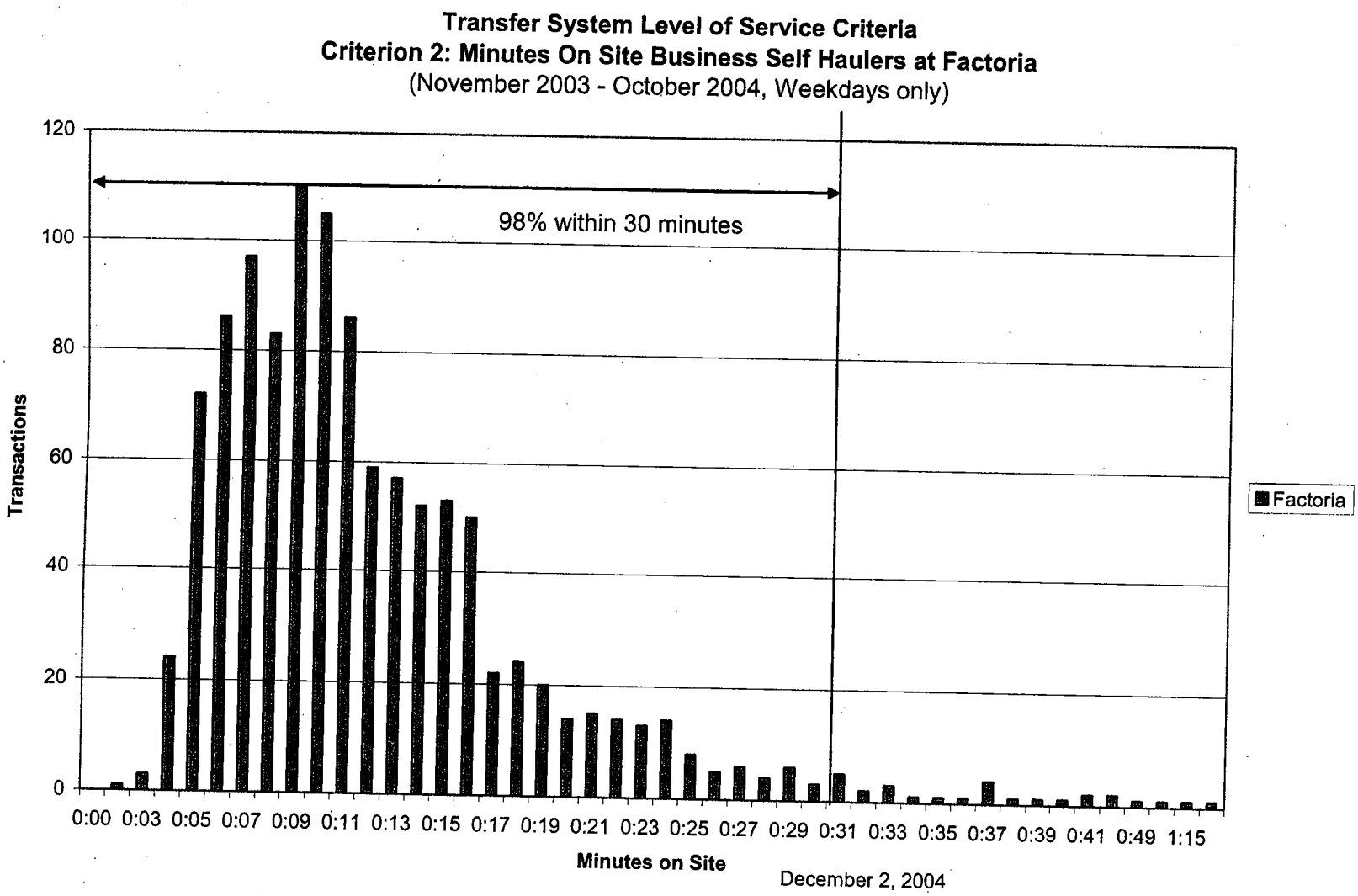


December 2, 2004

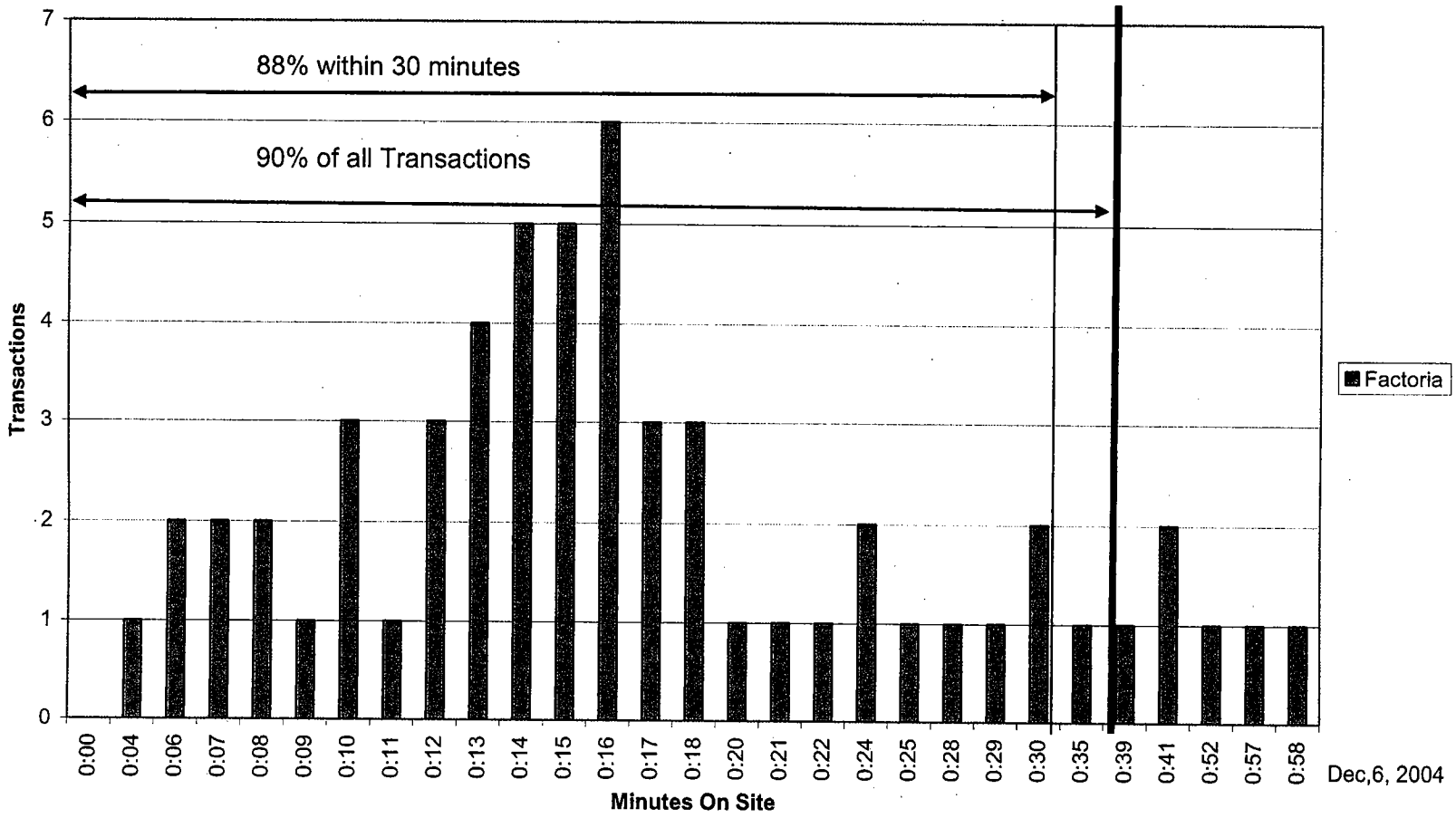
Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Commercial Haulers at Factoria
(November 2003 - October 2004, Weekdays Only)



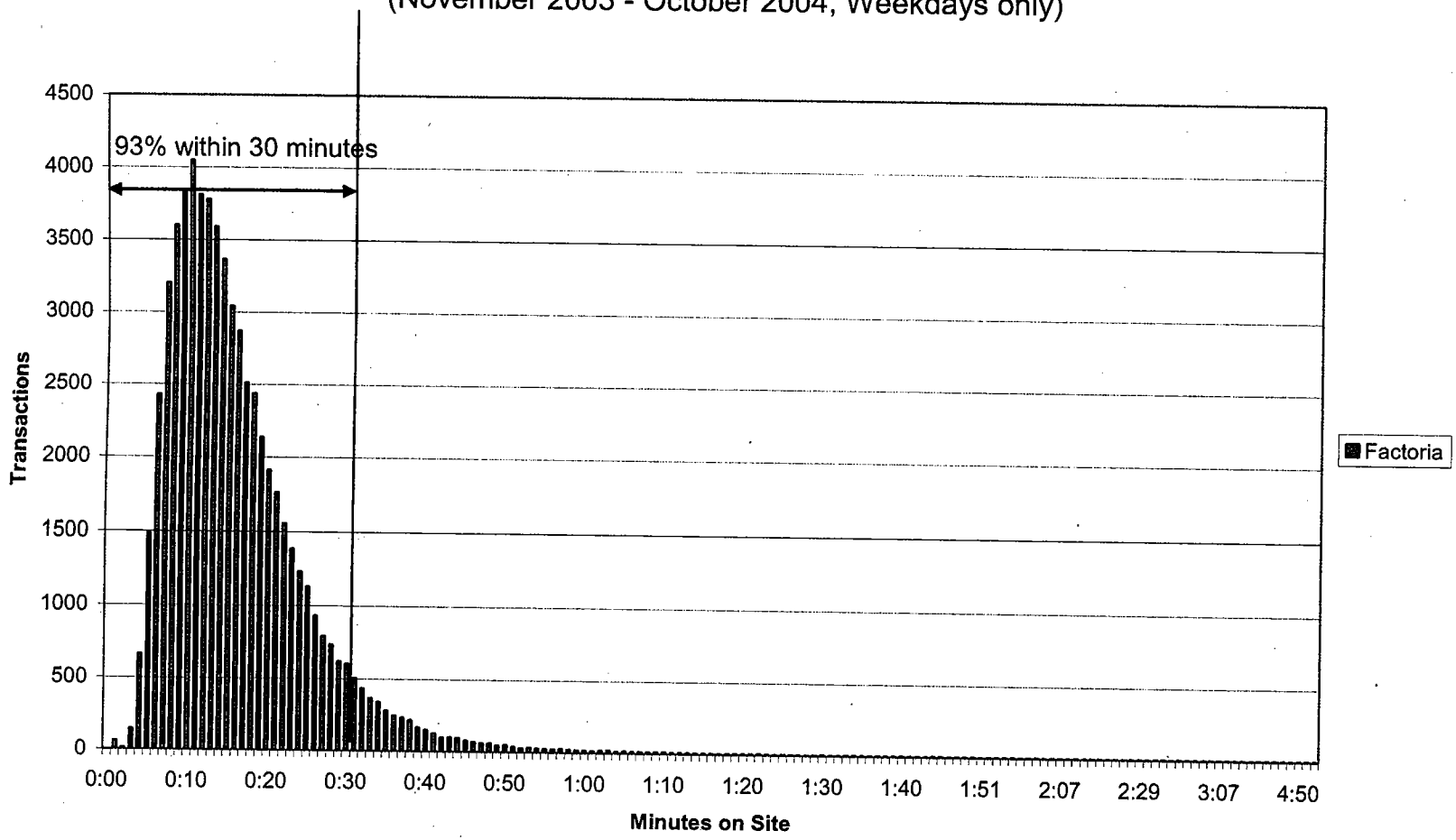
December 2, 2004


Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Factoria
(November 2003 - October 2004, Weekdays only)
98% within 30 minutes
Transactions
120
100
80
60
40
20
0
0:00 0:03 0:05 0:07 0:09 0:11 0:13 0:15 0:17 0:19 0:21 0:23 0:25 0:27 0:29 0:31 0:33 0:35 0:37 0:39 0:41 0:49 1:15
Minutes on Site
Factoria
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Factoria
(November 2003 - October 2004, Weekend Days only)

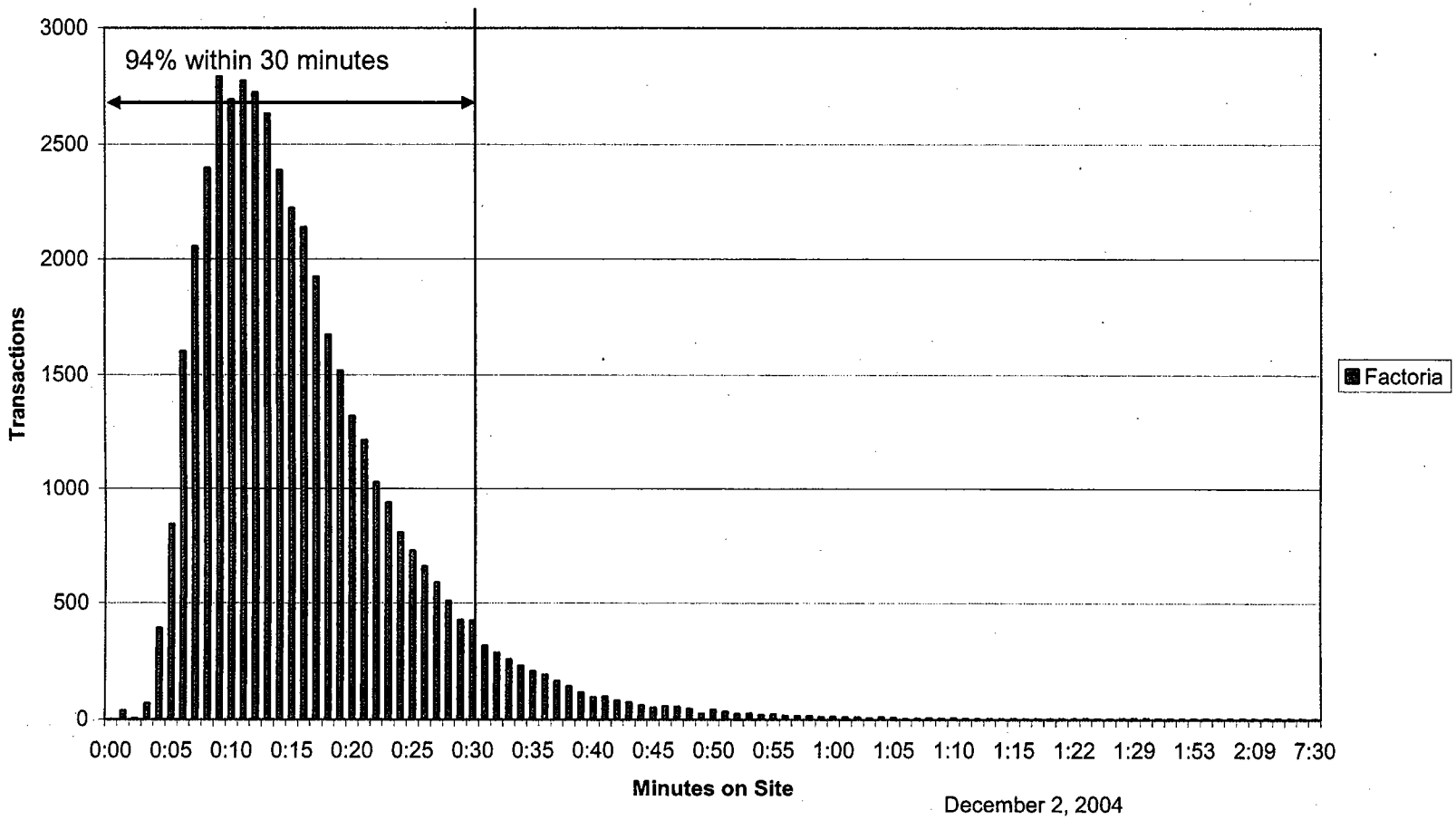


Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Factoria
(November 2003 - October 2004, Weekdays only)



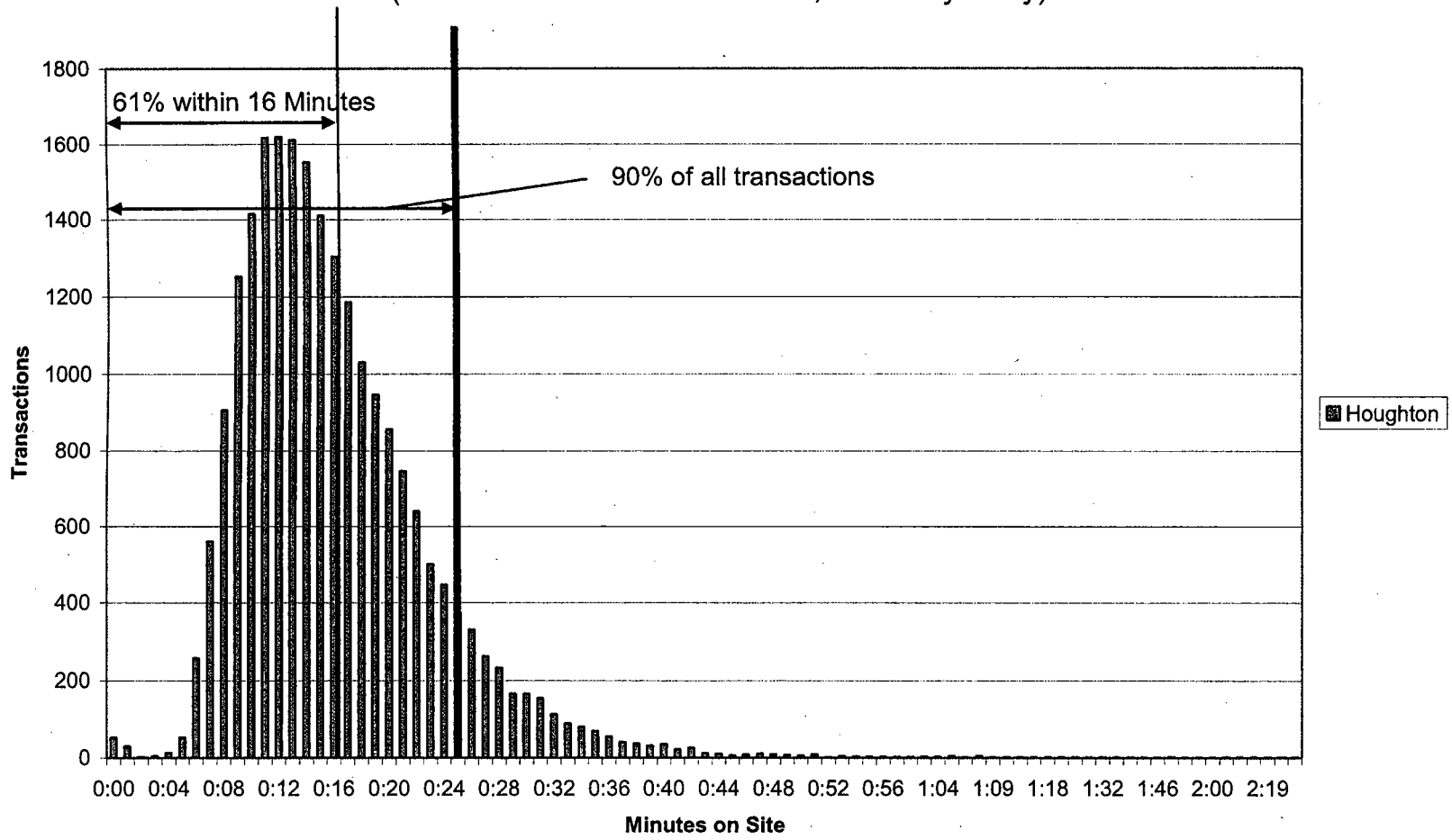
December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Factoria
(November 2003 - October 2004, Weekend Days only)



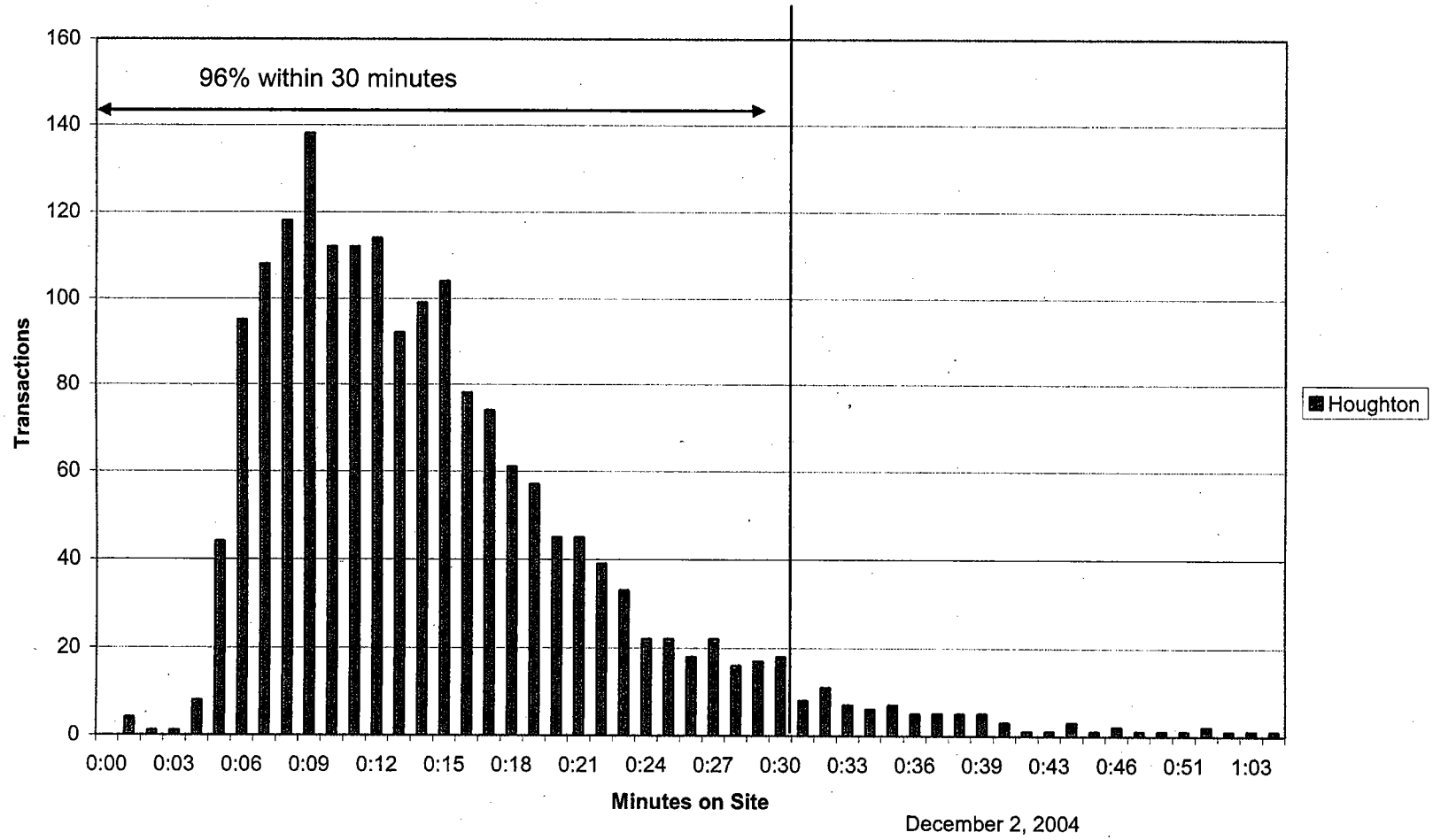
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Commercial Haulers at Houghton
(November 2003-October 2004, Weekdays only)



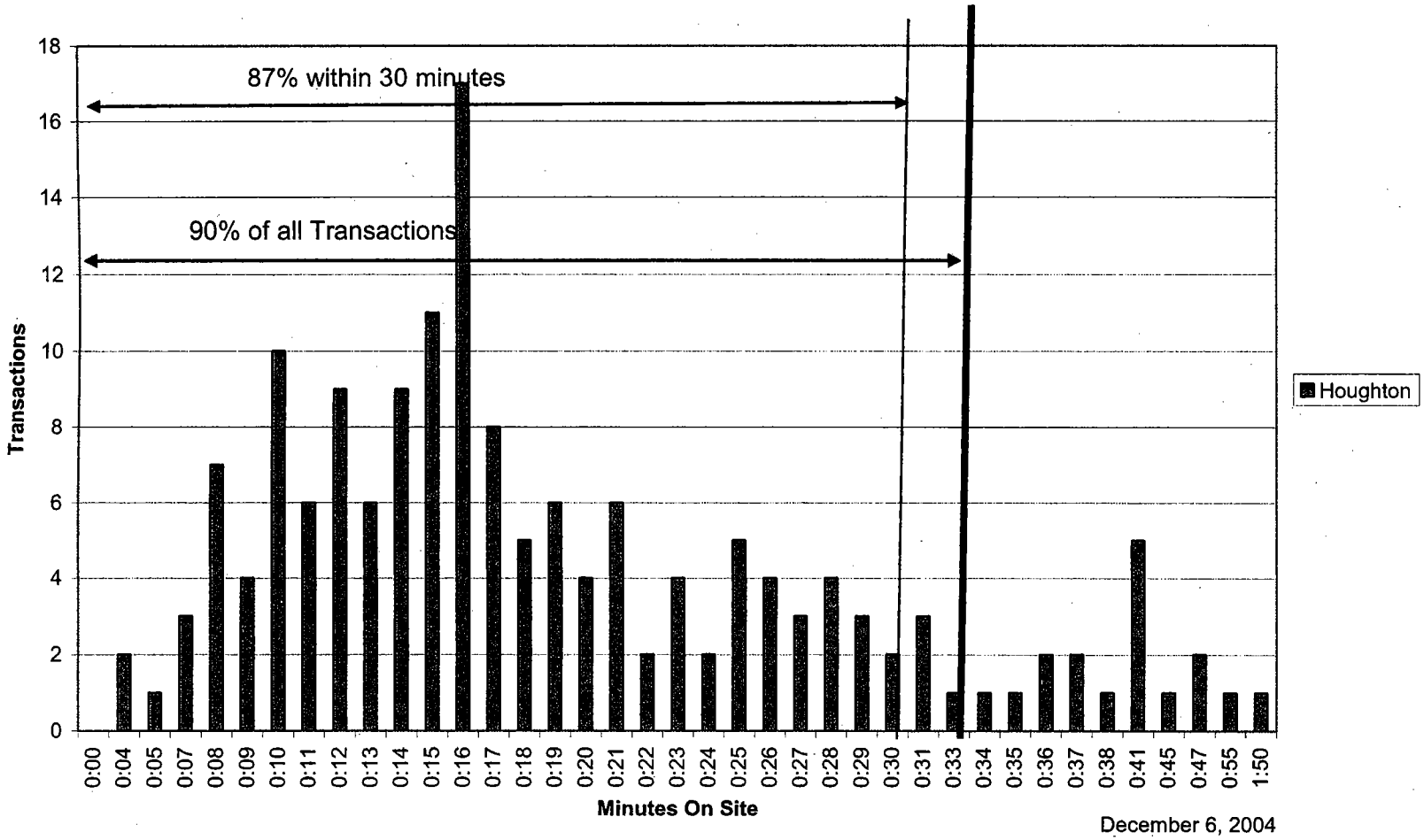
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Houghton
(November 2003 - October 2004, Weekdays only)



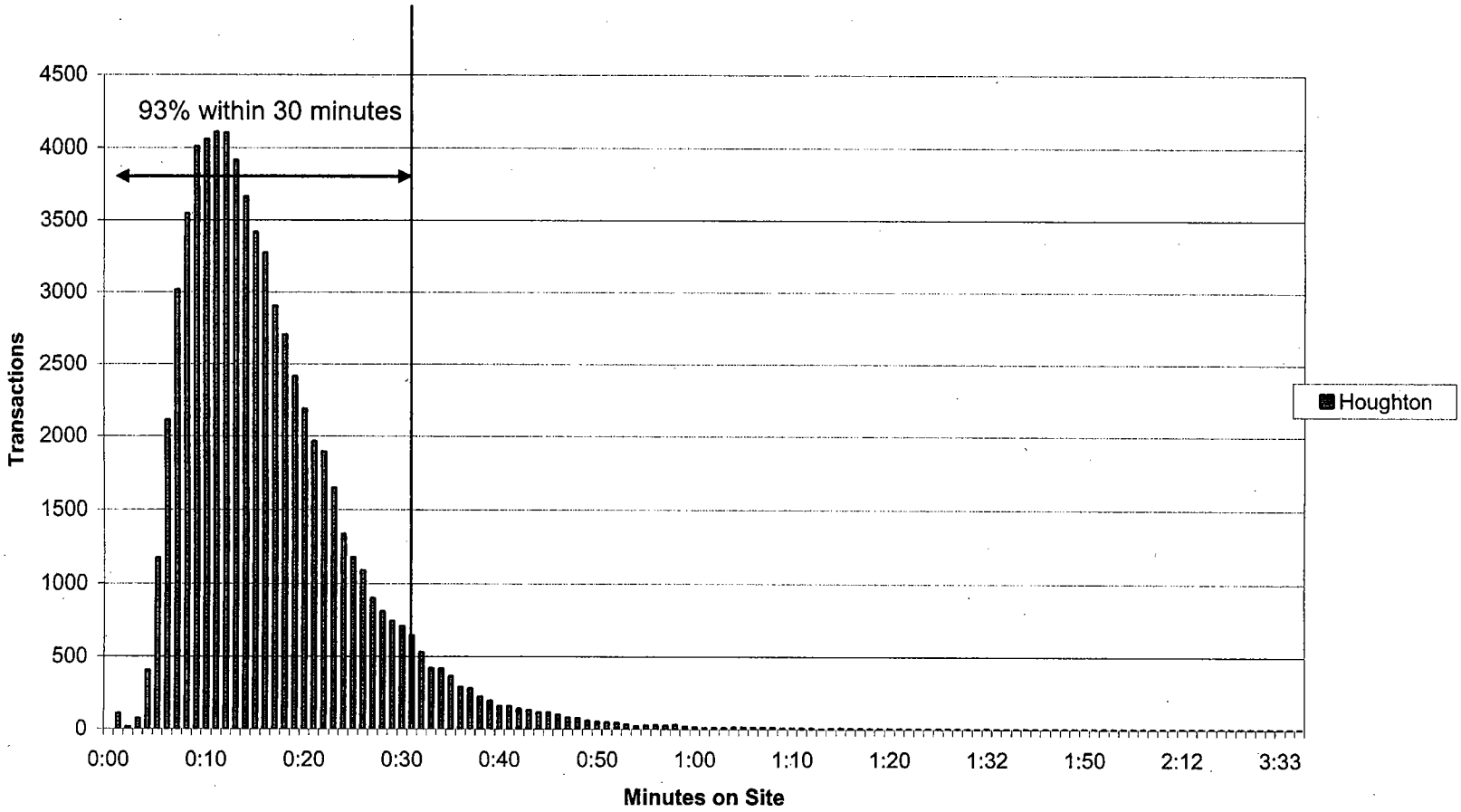
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Houghton
(November 2003 - October 2004, Weekend Days only)



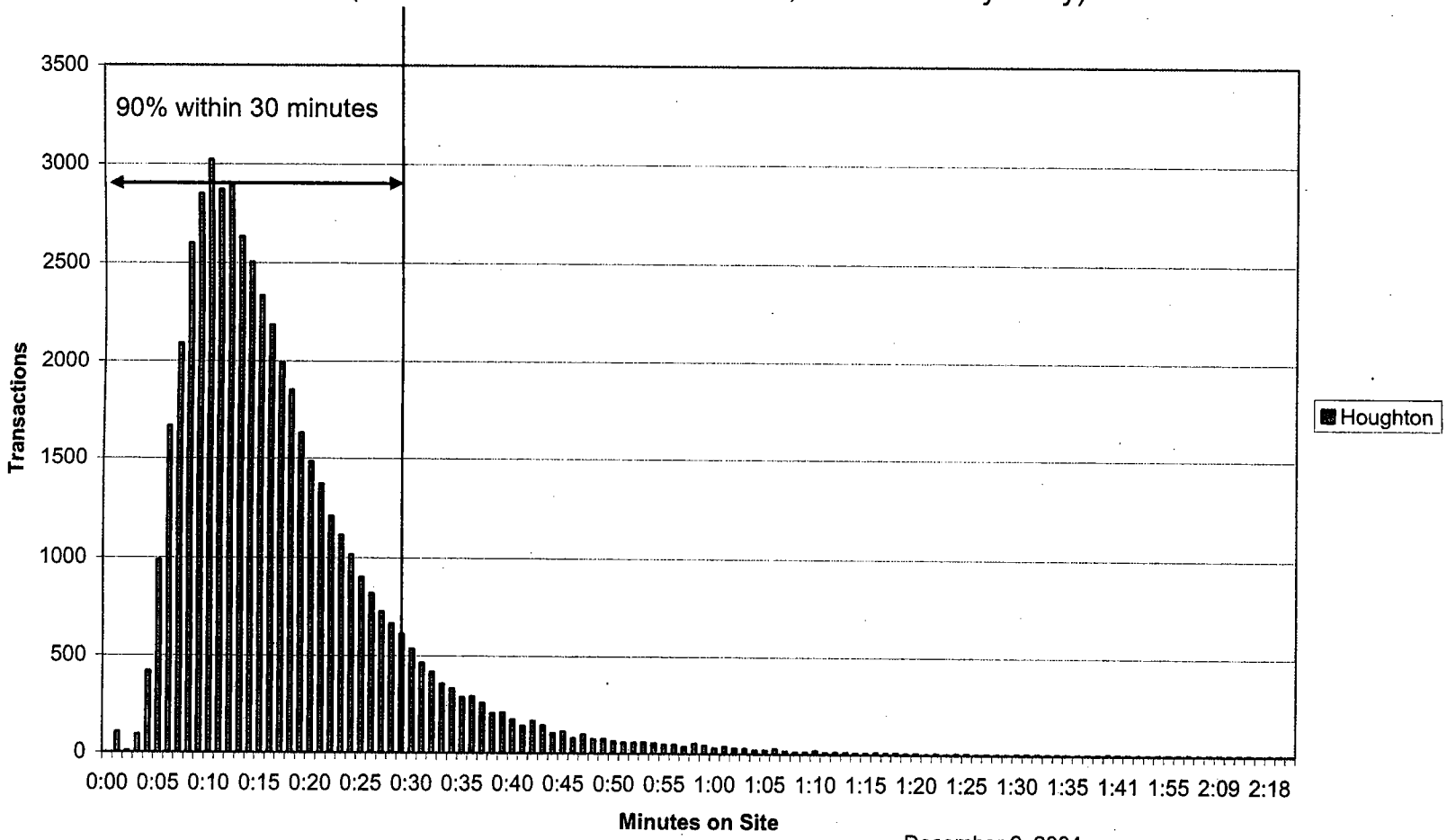
December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Houghton
(November 2003 - October 2004, Weekdays only)



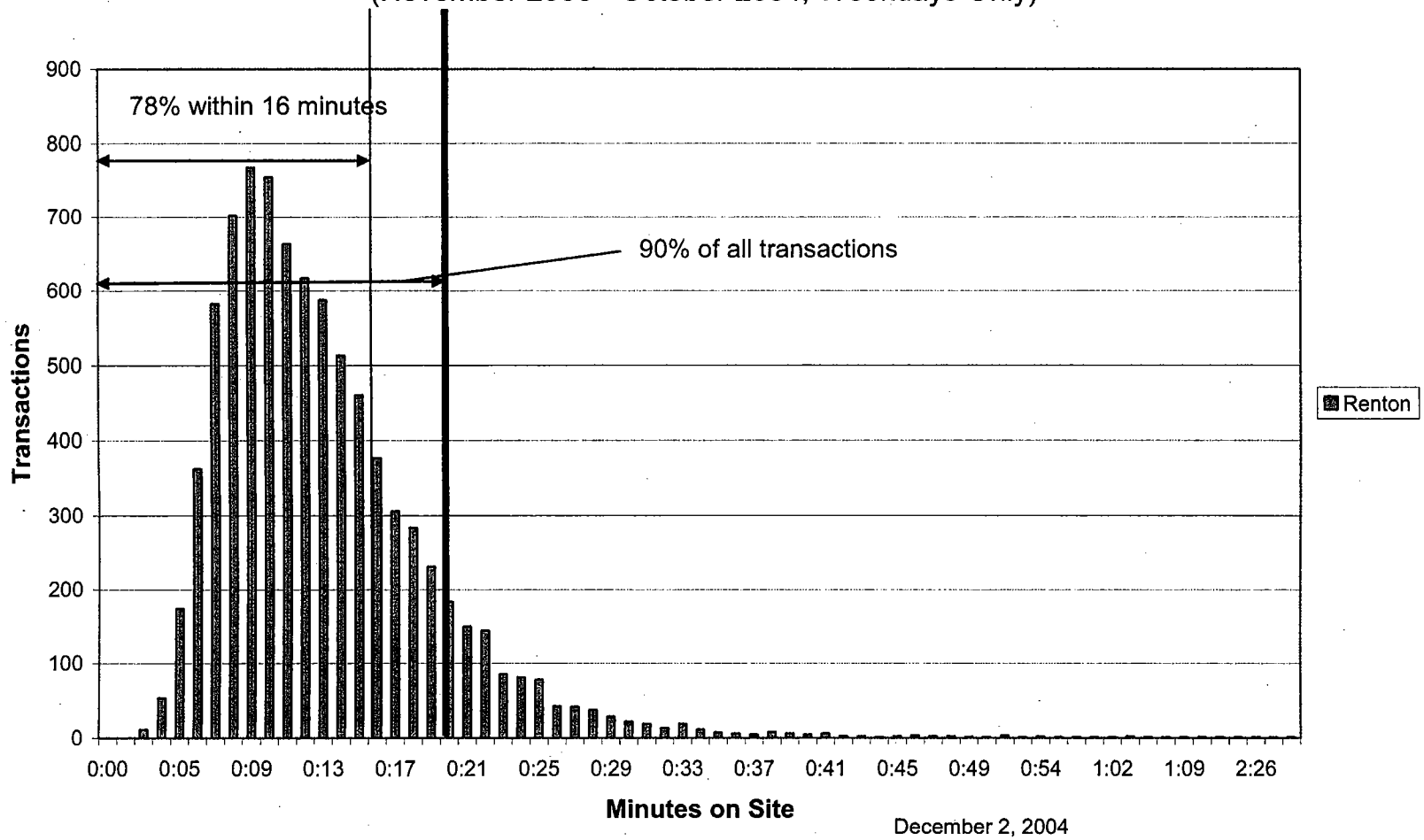
December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Houghton
(November 2003 - October 2004, Weekend Days only)



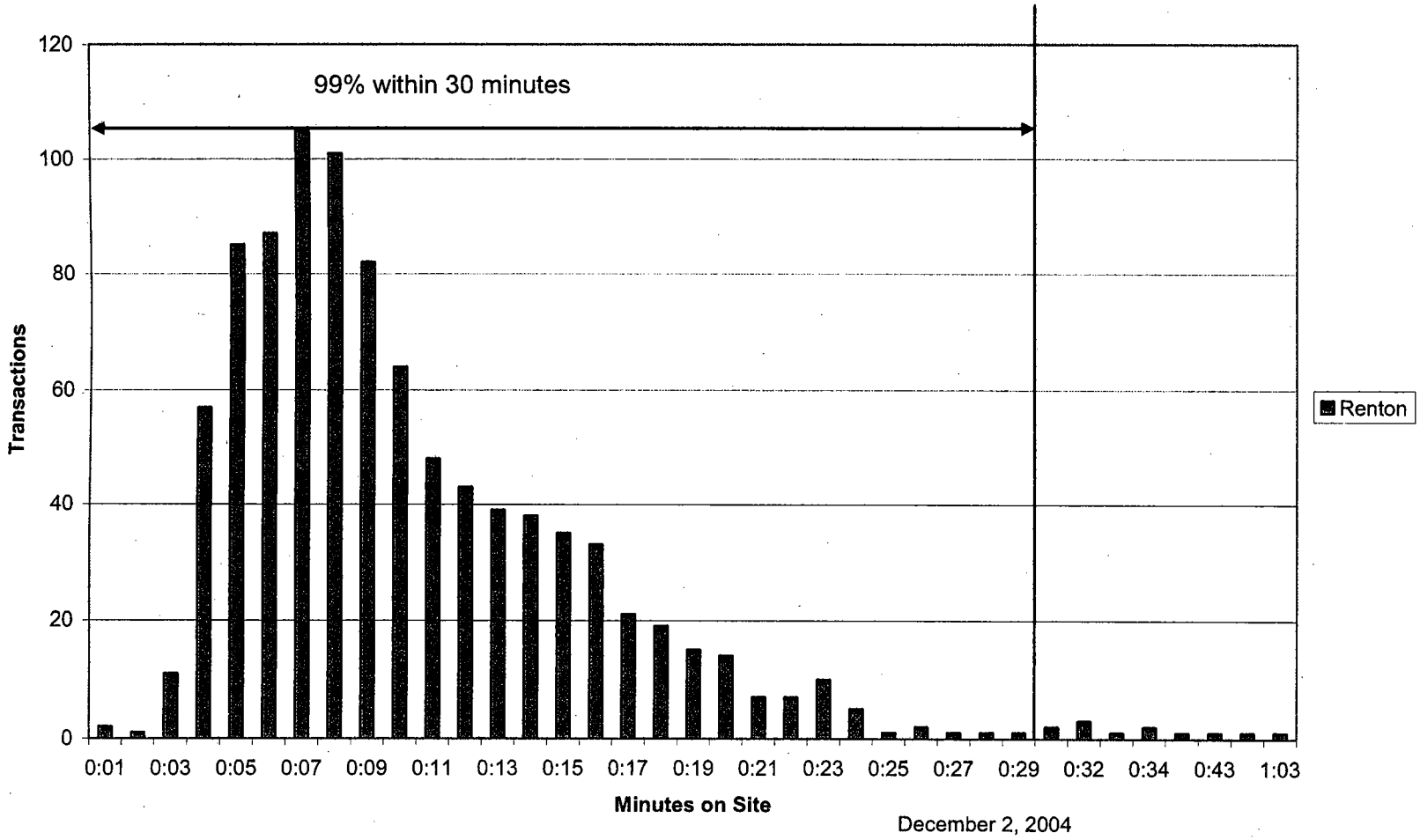
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Commercial Haulers at Renton
(November 2003 - October 2004, Weekdays Only)



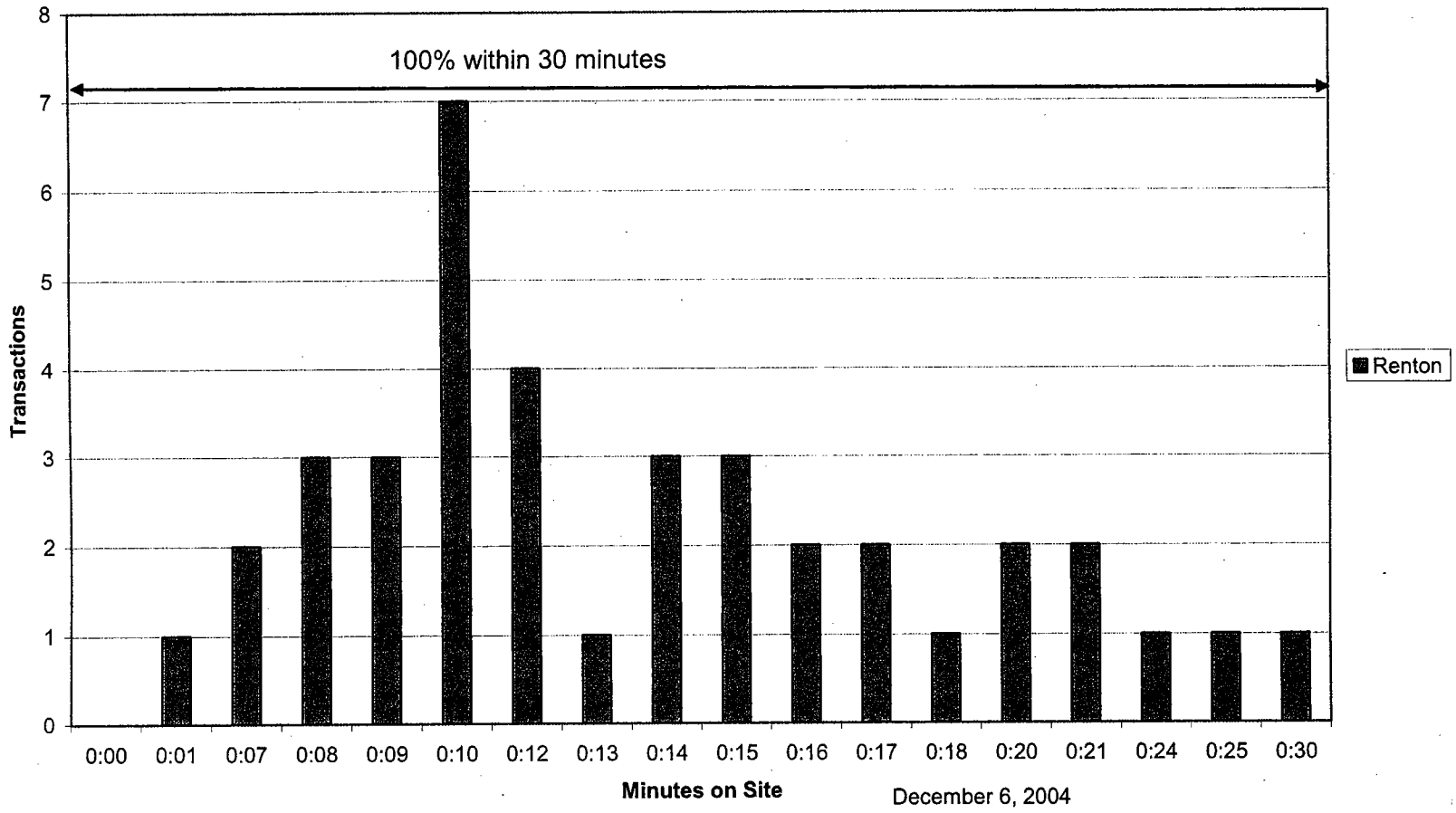
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Renton
(November 2003 - October 2004, Weekdays only)



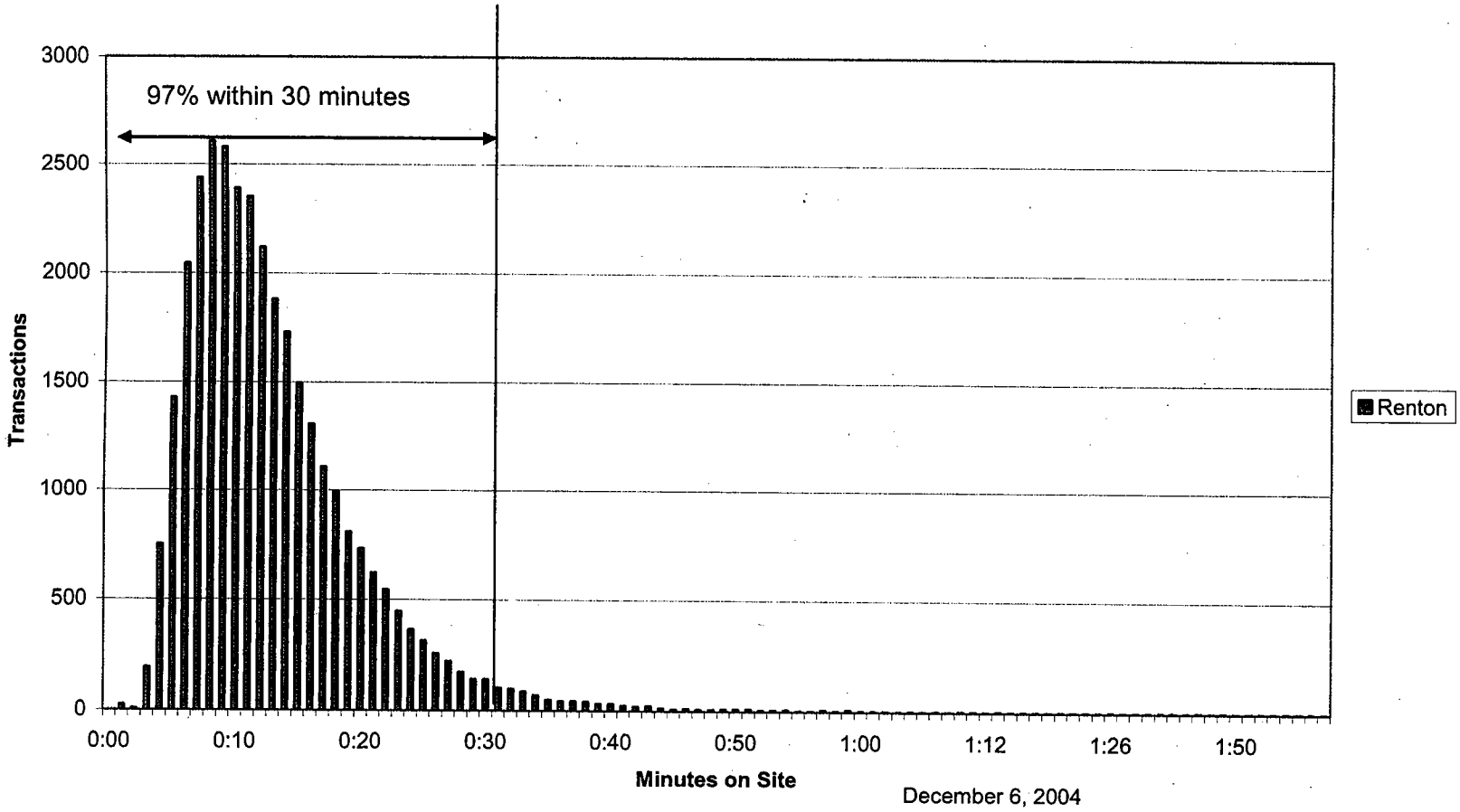
December 2, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Business Self Haulers at Renton
(November 2003 - October 2004, Weekend Days only)



December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Renton
(November 2003 - October 2004, Weekdays only)



December 6, 2004

Transfer System Level of Service Criteria
Criterion 2: Minutes On Site Residential Self Haulers at Renton
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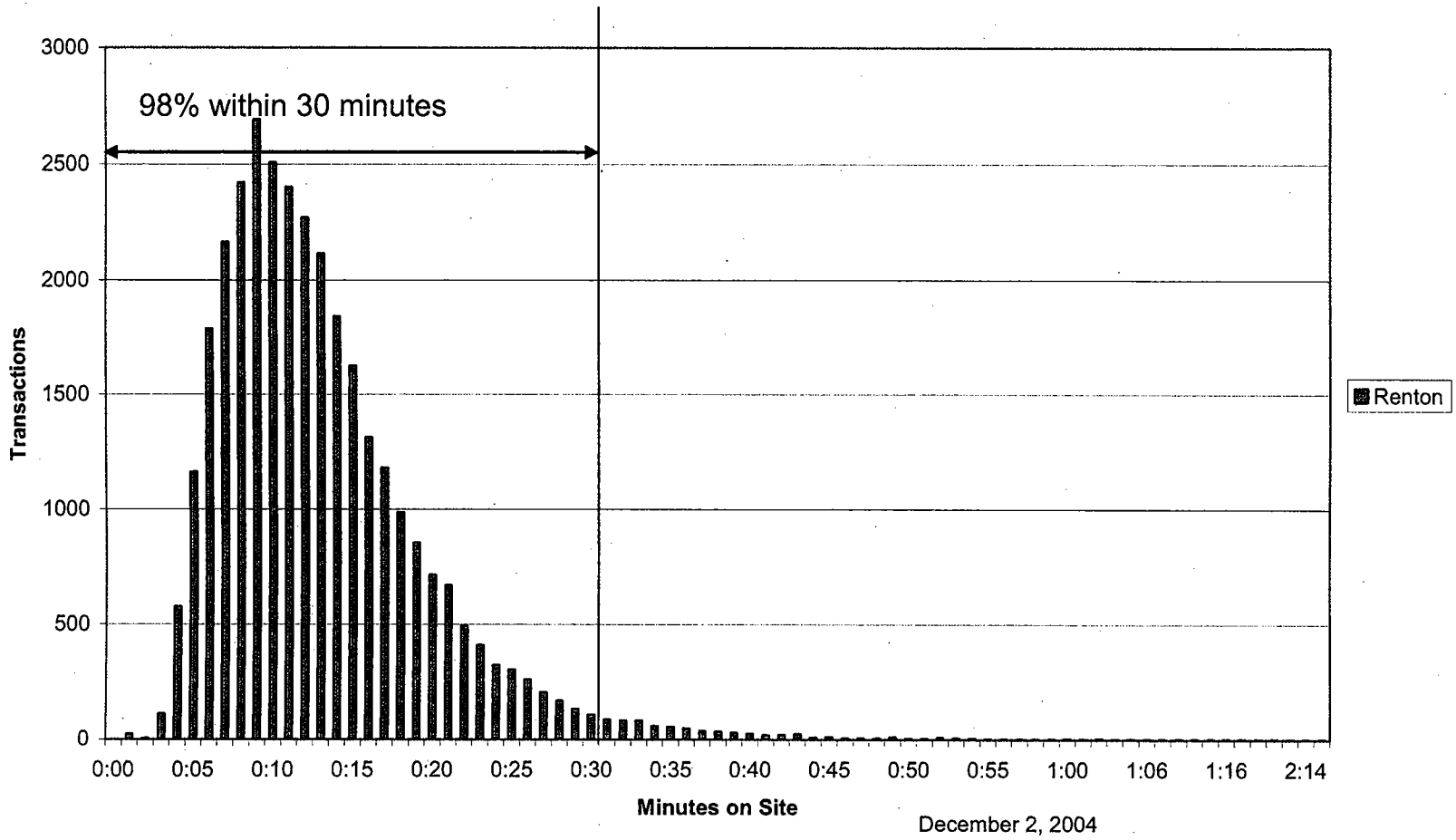


December 2, 2004

Appendix C

Transfer System Level of Service Criteria
Criterion 3: Facility Hours Meet User Demand

Transfer System Level of Service Criteria
Criterion 3: Facility Hours Meet User Demand

A number of different factors were evaluated to assess whether transfer facility hours currently meet user demand. These included: a) Tons and number of transactions per hour for commercial and self haulers during a work day (for week days as for weekend days) and transaction data for the end of each day; b) Operational observations ; c) Requests from the commercial haulers for specific hours to meet their service needs; and d) reported customer comments about hours. This appendix summarizes the evaluation of tonnage and transaction data used to evaluate factor (a).

Average tons and transactions were evaluated for each of the five urban transfer stations using data the division obtains from scale house transactions. These data include detailed, transaction-specific information about time of use, customer type, and waste tonnage brought. Graphing the average tons and the average number of transactions per hour for weekend days and weekdays for commercial haulers and self haulers shows the tonnage and transaction peaks that occur during the course of the day. A "peak" at the beginning or end of the day could signal the need for additional hours.

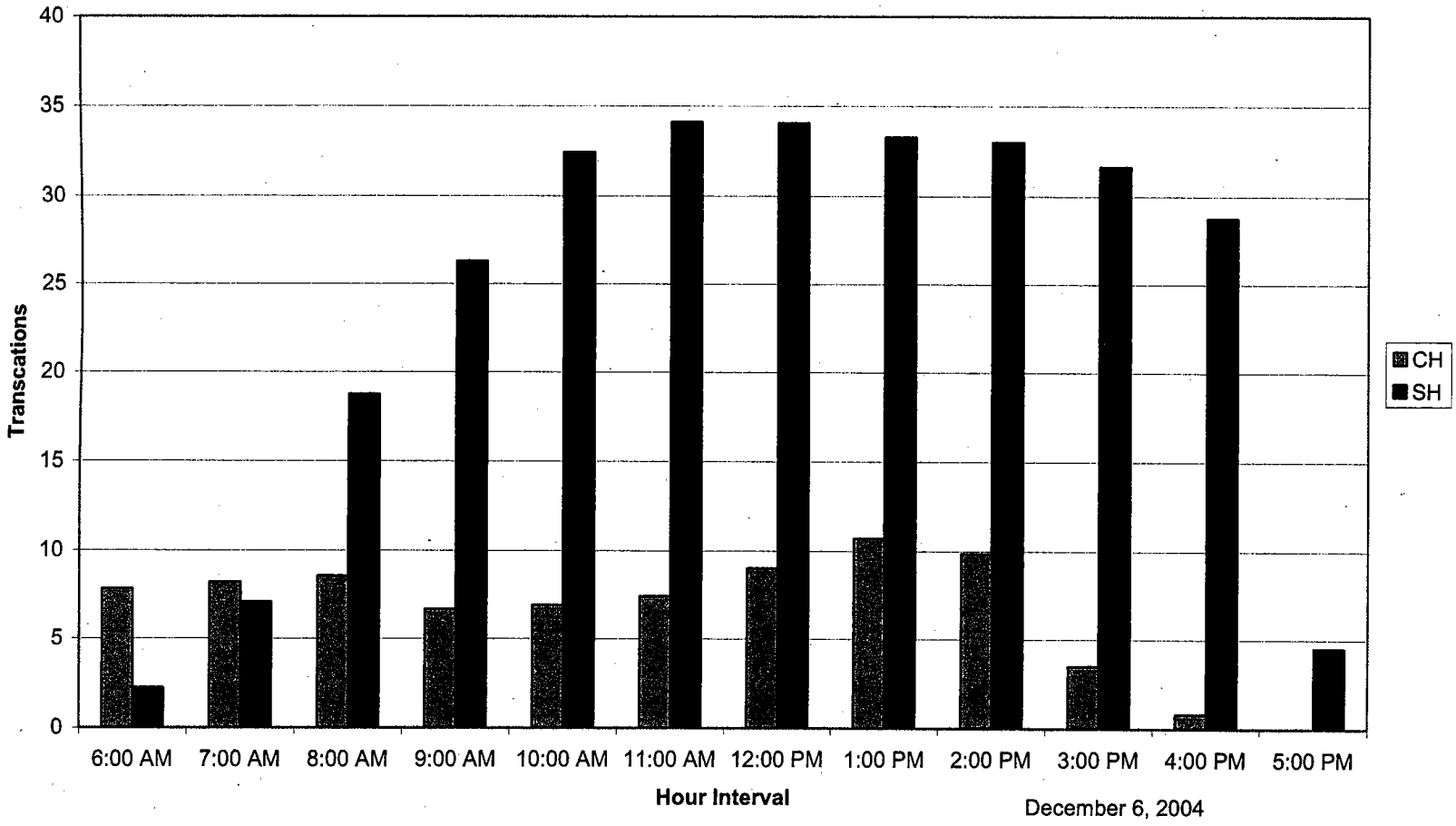
The data indicated that typically there are one or two morning peaks in tonnage and transactions, an early afternoon peak, and then a falling amount of transactions and tonnage activity towards the closing hours. The data did not indicate any specific peaks right when a station opens or when it closes, with the exception of Factoria on weekdays, where there is a high volume of activity during the station's first hour (6.15am – 7 am). However, Factoria's morning peak does not indicate a need for earlier opening hours. The early morning peak is due to a high use by Waste Management, which requested the station be open at this particular time to correspond to their collection route pick-up schedules

Data on the number of transactions occurring right after the station was closed were also reviewed. A high number of transactions after closing hours would indicate that there was high demand at (or after) closure, or a need for longer hours to reduce customer backlogs. It is standard practice that customers who are waiting in line in front of the gate to be served even after the closure time of the transfer station. The division evaluated the number of occurrences of "end of the day" transactions and the average time in minutes those vehicles stayed on site, for both weekdays and weekend days. The data indicated that within the first 5 – 10 minutes after closing, most of the vehicles passing the outbound scale where on site at closing time – they were not waiting outside the gate. Also, the data indicated that the numbers of vehicles falls quickly soon after closing hours, suggesting that there generally is not a long queue of vehicles waiting being served at the time the stations close.

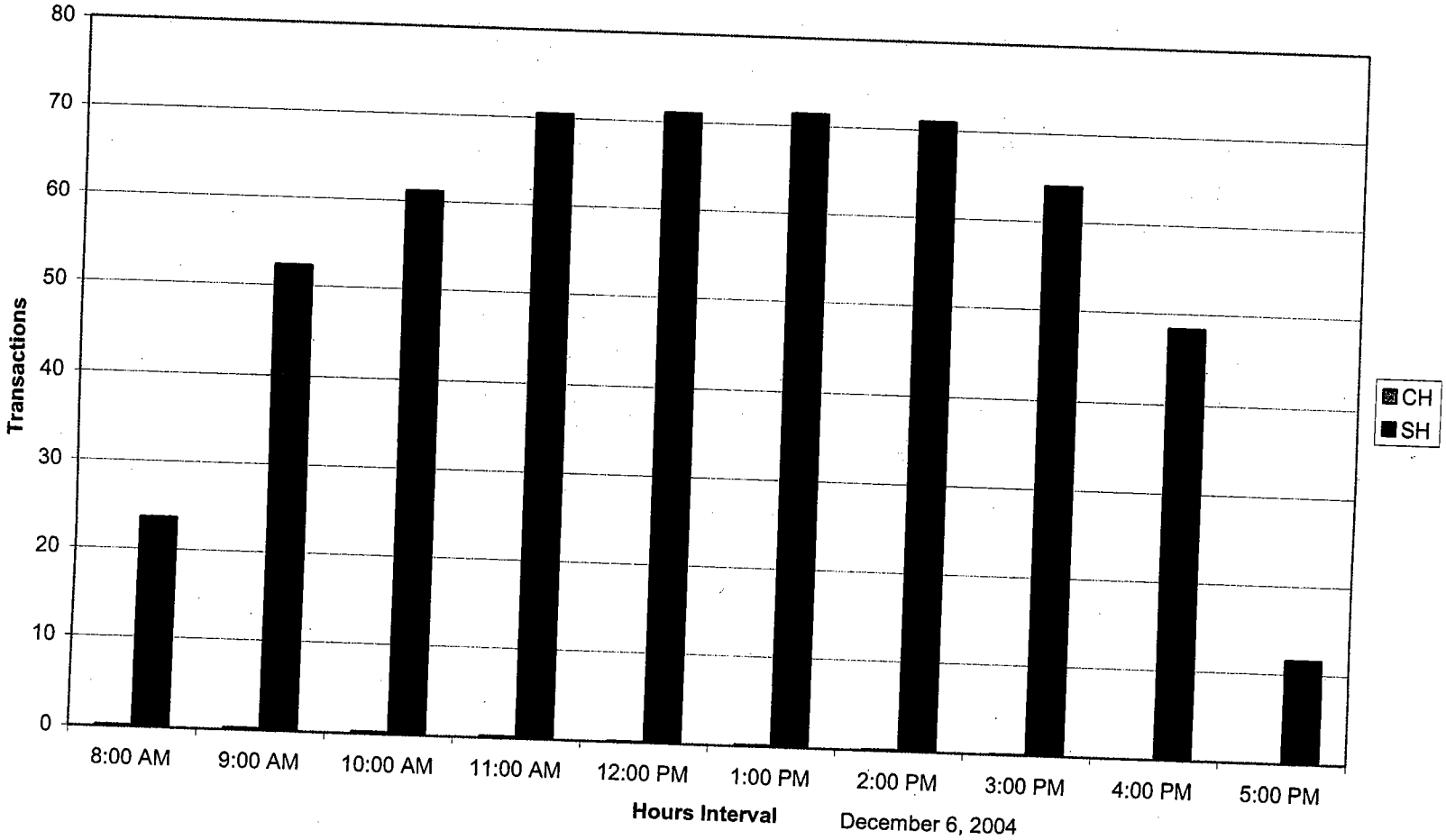
The data suggests that there is no the need of extended hours at this time. Note, however, that the transaction data used in this analysis is only fall through winter in 200, as this captures the period over which the current hours have been in effect. Further monitoring could indicate that additional hour changes might be warranted during high traffic volume seasons, such as spring and summer. The division will continually monitor customer use of its facilities and the need to change operating hours.

It should be mentioned that data did not, at this time, support operational observations about potential need for additional hours. For example, operations staff observed that the traffic volume appeared higher at Factoria during days the Cedar Falls Drop Box was closed (Tuesdays and Thursdays). The data did not support this conclusion because higher tonnage volumes at the Factoria transfer station were observed long before the changes in hours at Cedar Falls occurred. However, the division will continue to monitor customer use and examine the need for additional hours, particularly during the summer months, and recommend changes in hours to accommodate any observed changes in customer demand.

Transfer System Level of Service Criteria
Criterion 3a) Average Transactions Per Hour Interval at Algona
(November 2003 - October 2004, *Weekdays* Only, Current Hours)



Transfer System Level of Service Criteria
Criterion 3a) Average Transactions Per Hour Interval at Algona
(November 2003 - October 2004, *Weekend Days* Only, Current Hours)



December 6, 2004

Transfer Sytem Level of Service Criteria
Criterion 3a) Average Transactions Per Hour Interval at Bow Lake
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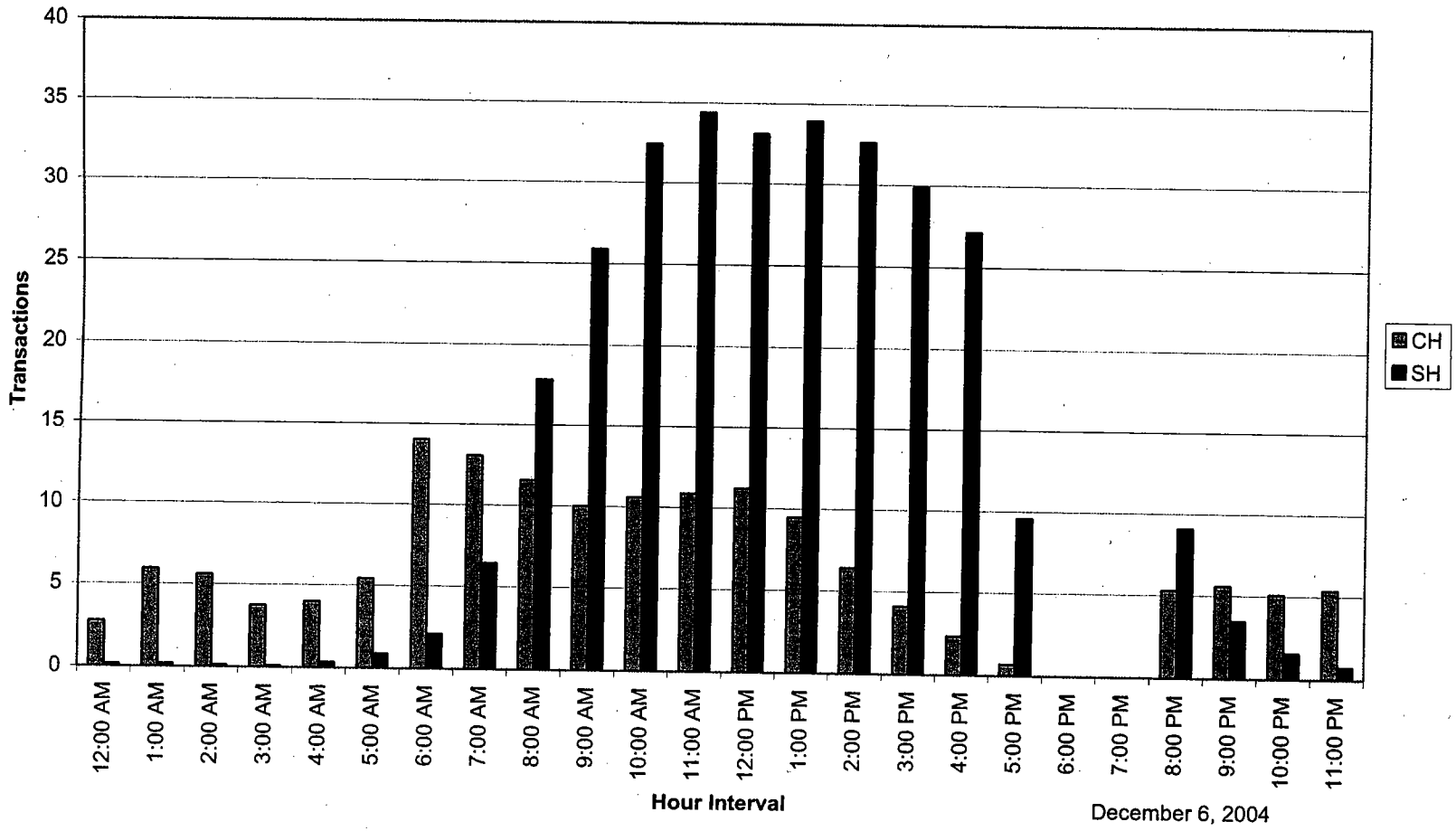

December 6, 2004

Transfer System Level of Service Criteria
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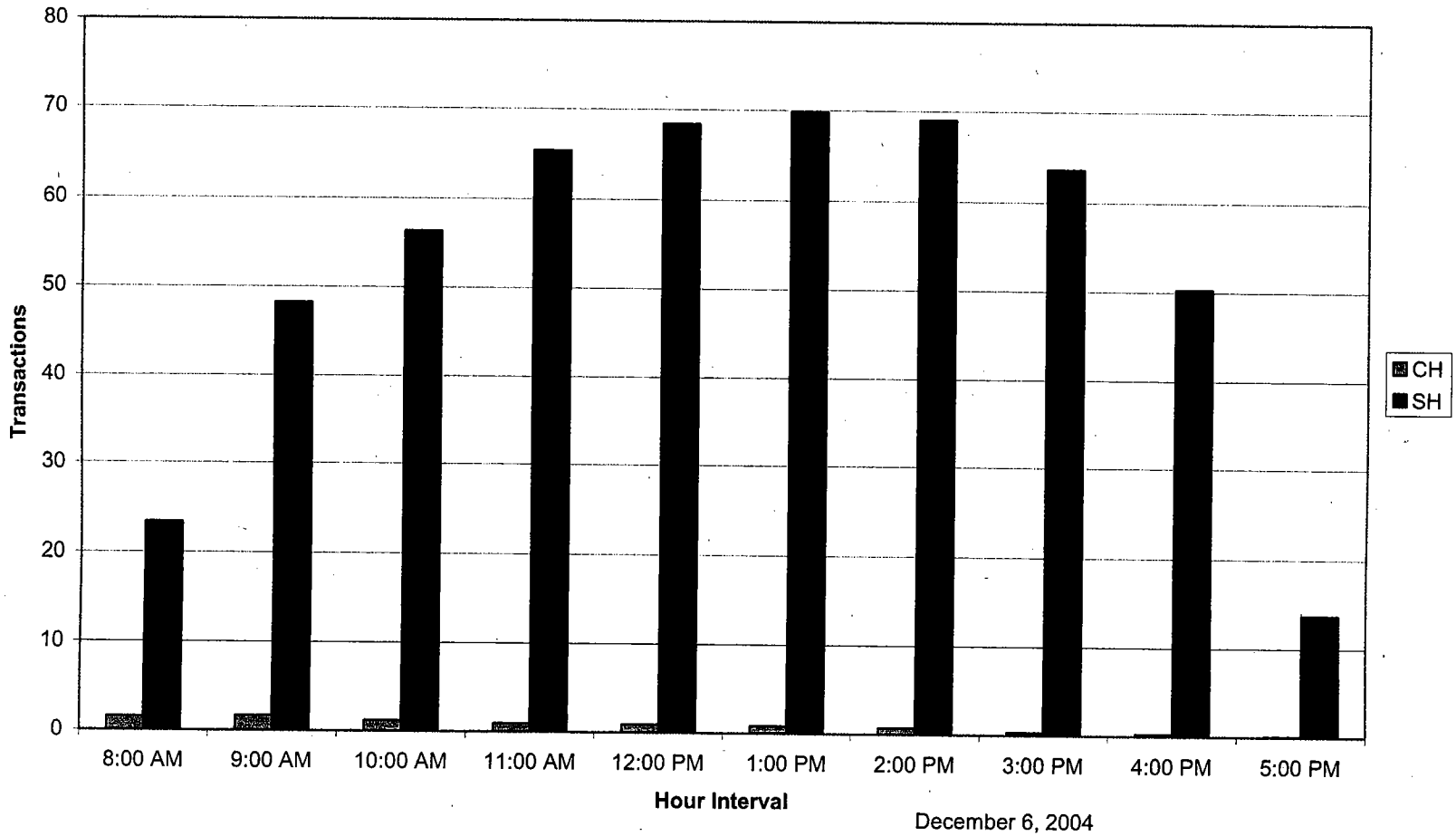

December 6, 2004

Transfer System Service Level Criteria
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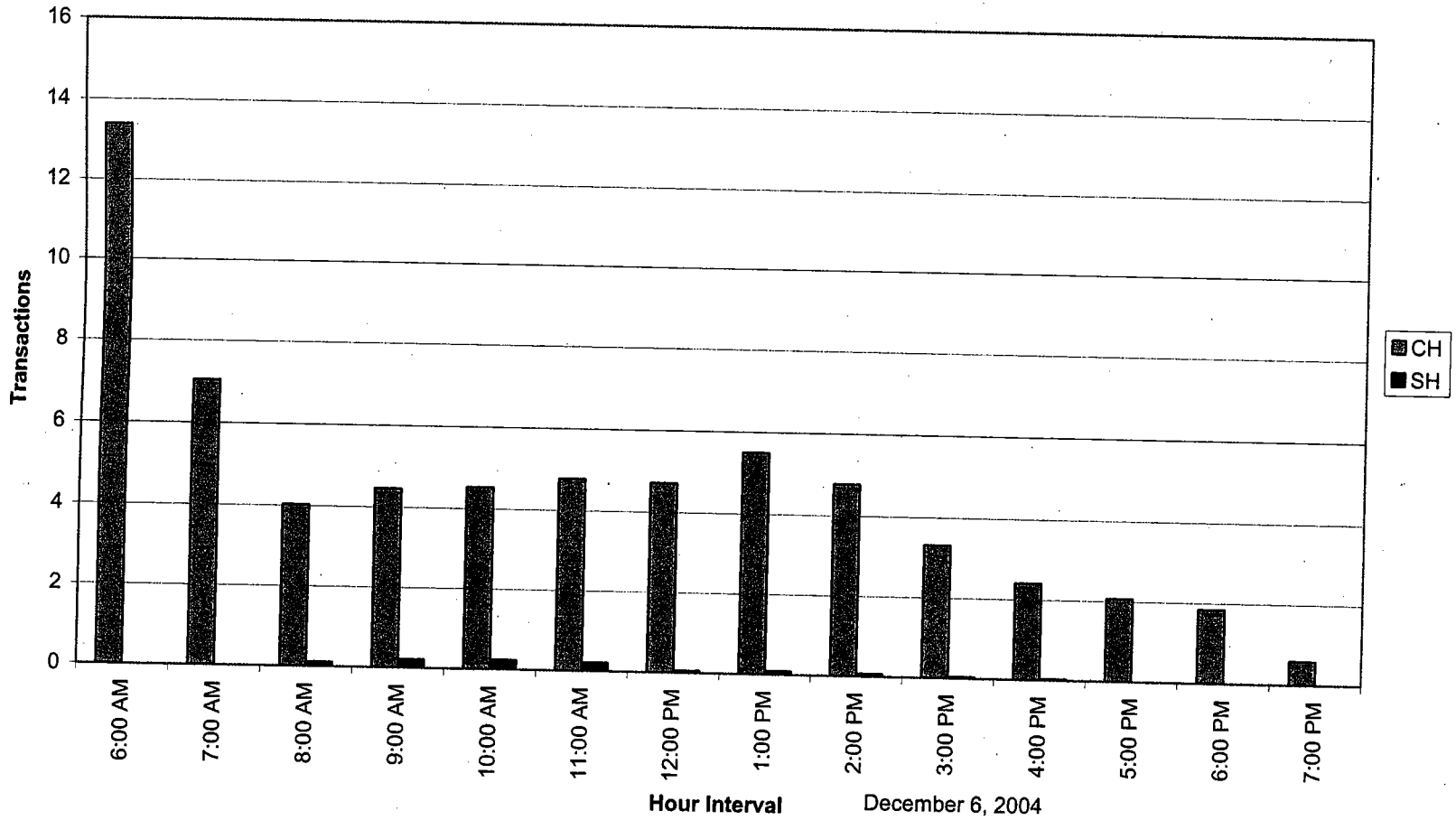

Transfer System Service Level Criteria
Criterion 3a) Average Transactions Per Hour Interval at Factoria
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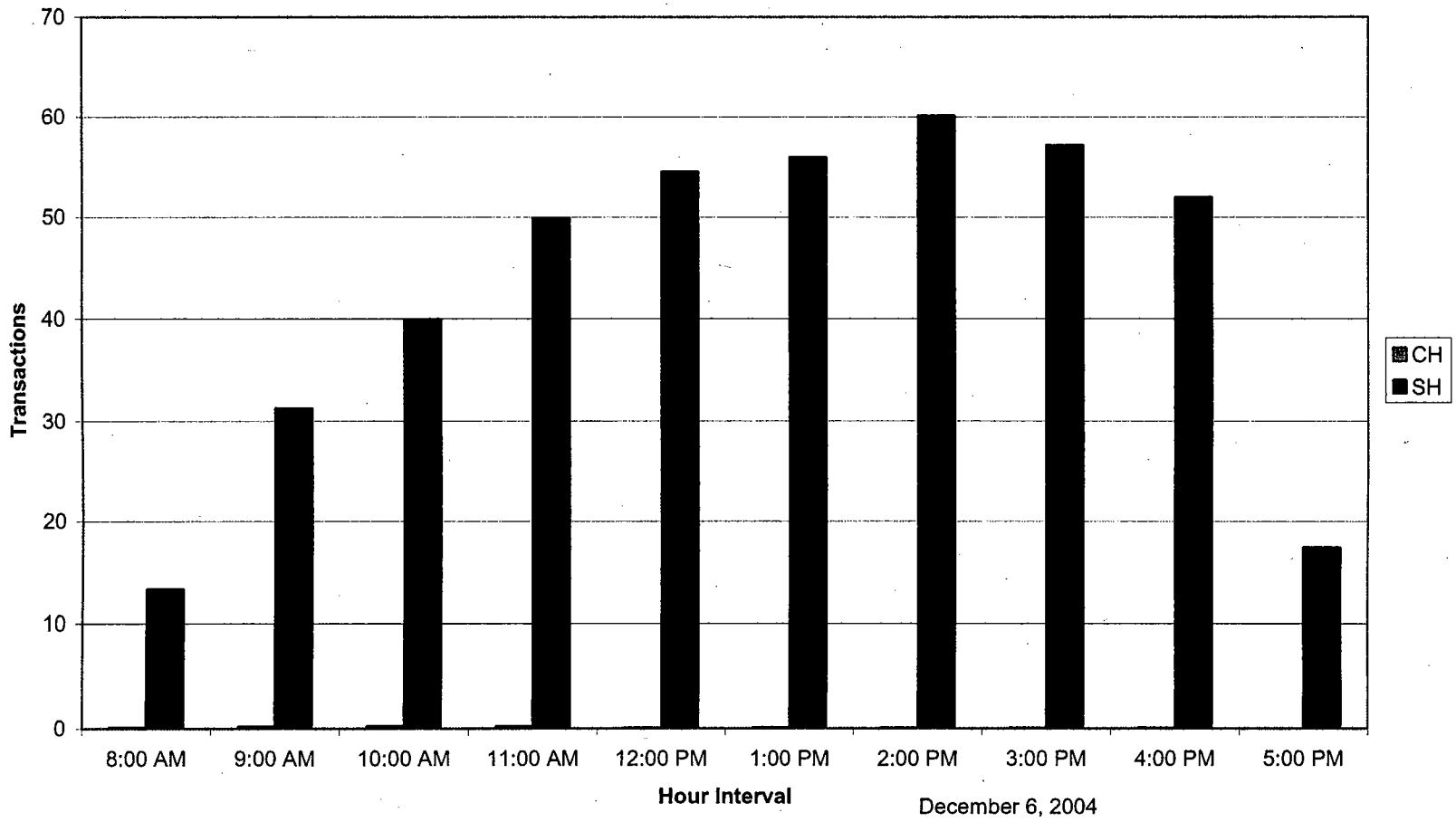

December 6, 2004

Transfer System Level of Service Criteria
Criterion 3a) Average Transactions Per Hour Interval at Houghton
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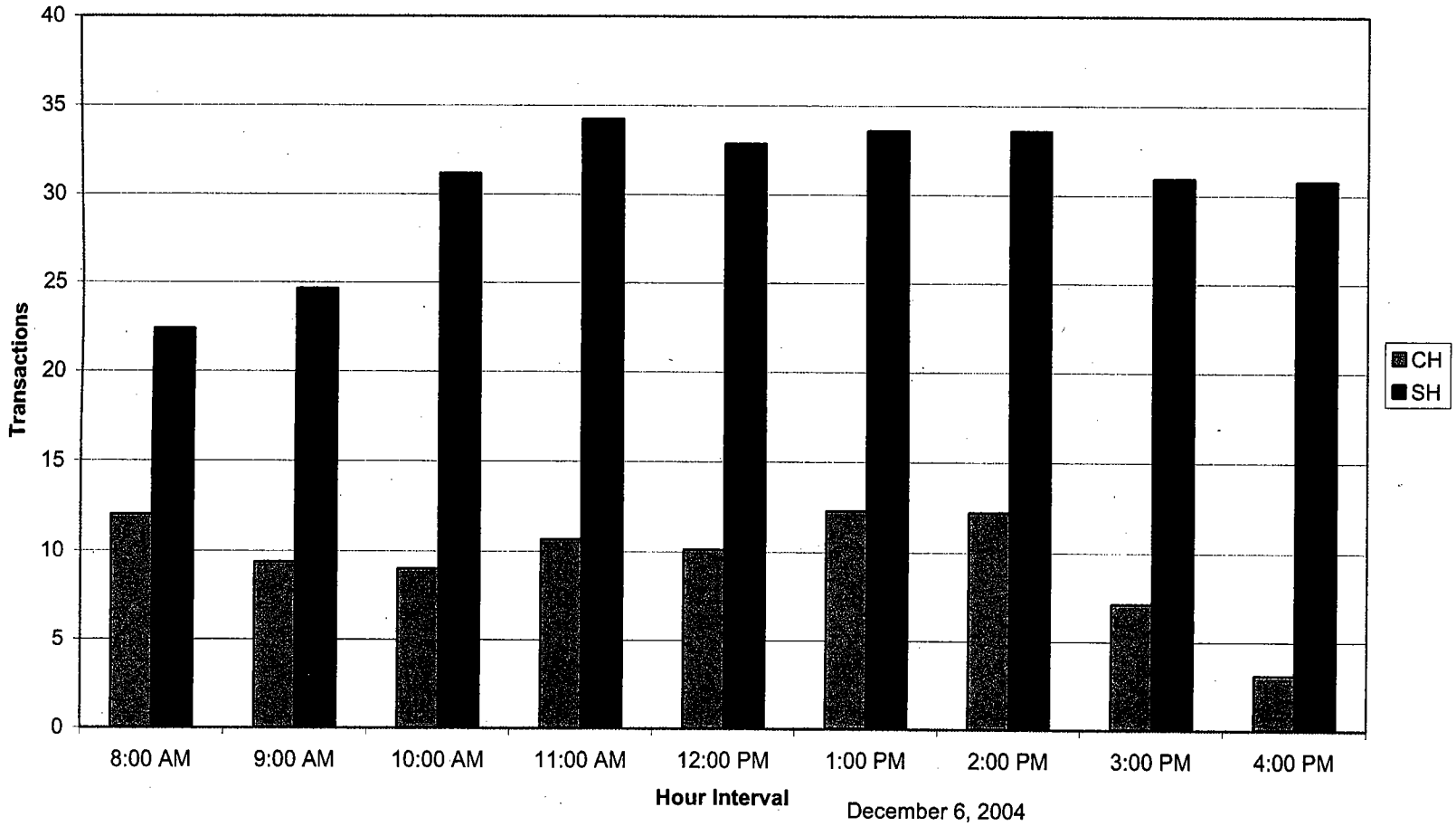

December 6, 2004

Transfer System Level of Service Criteria
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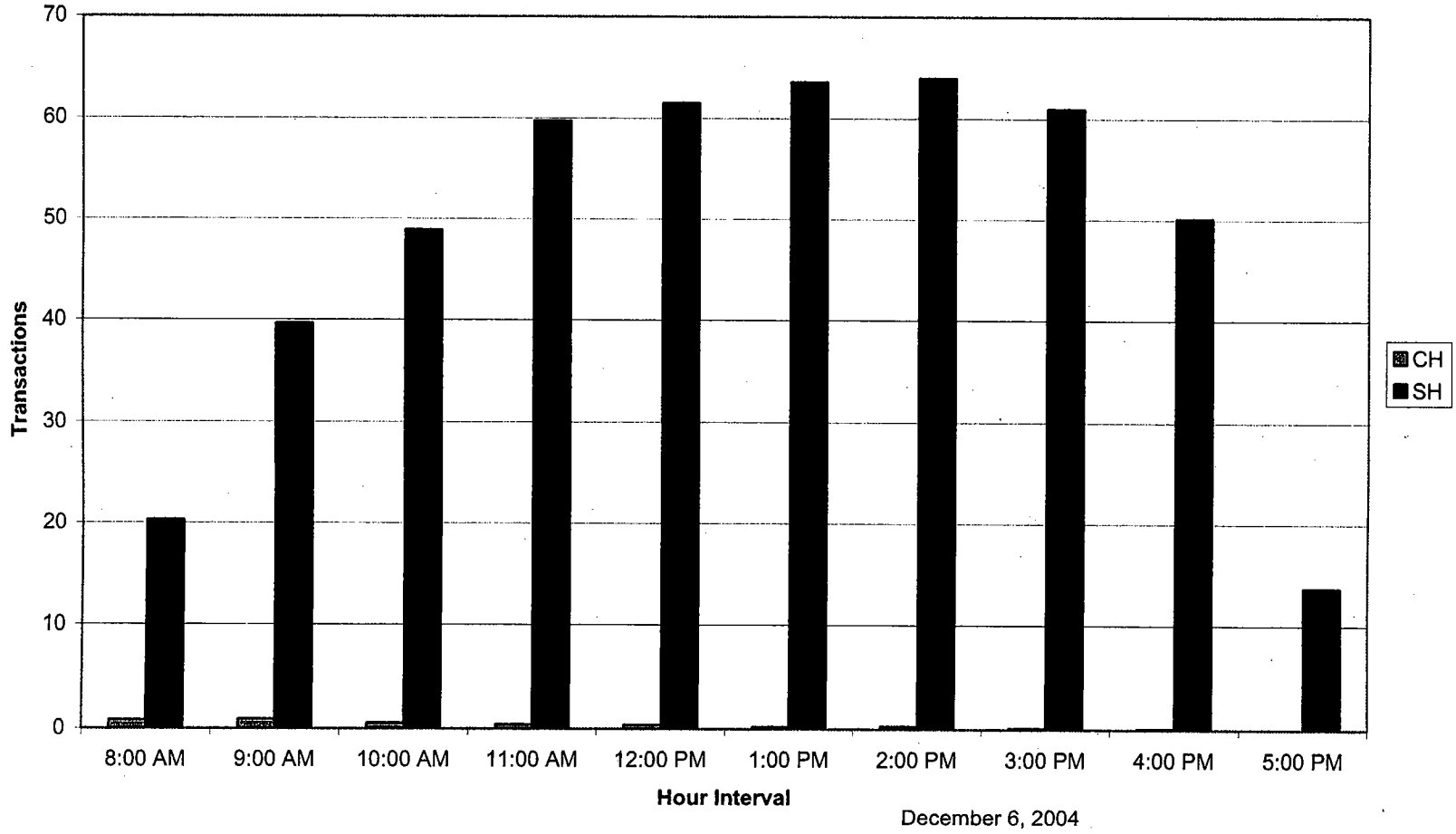

December 6, 2004

Transfer System Level of Service Criteria
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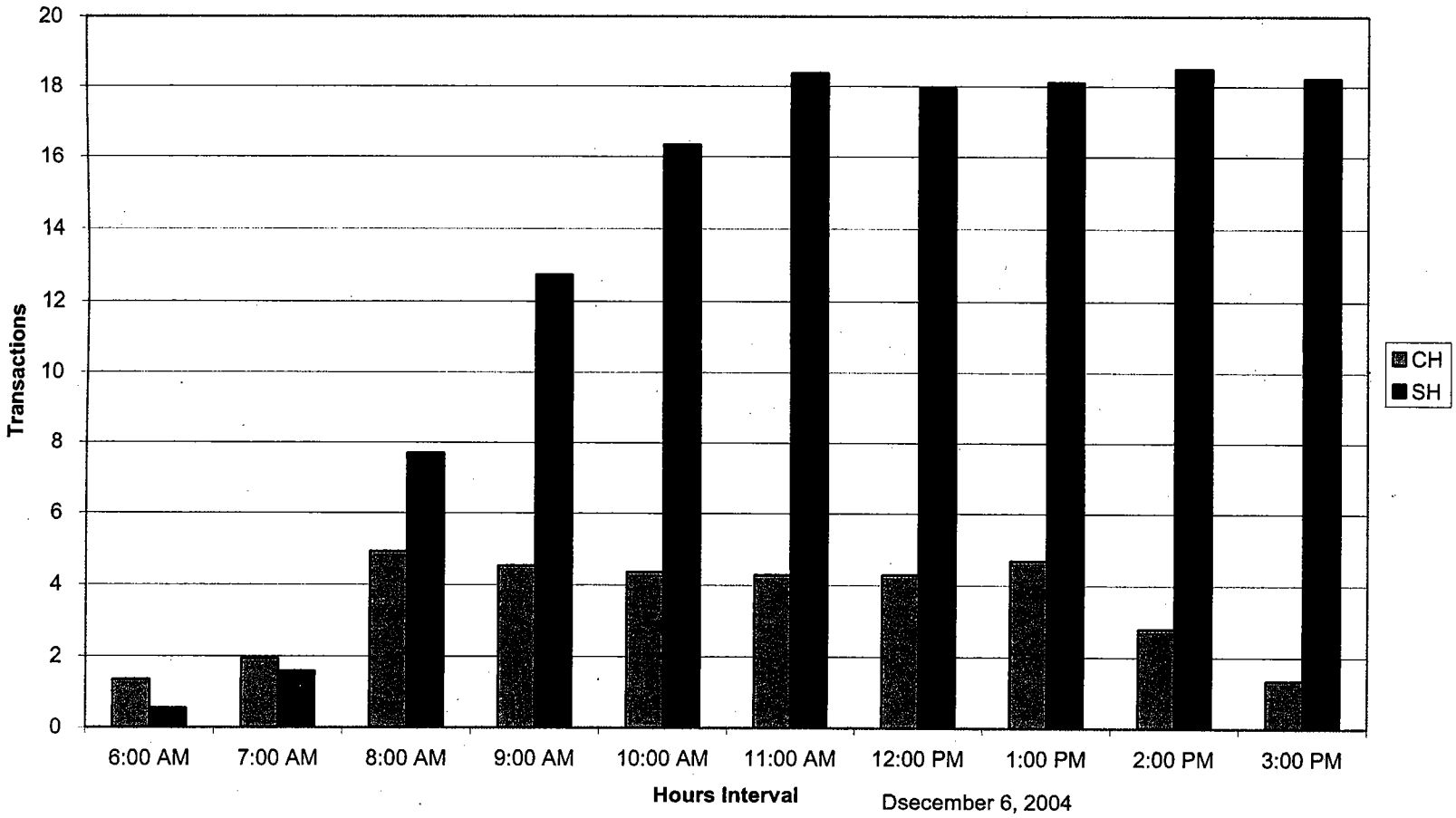

Dsecember 6, 2004

Transfer System Level of Service Criteria
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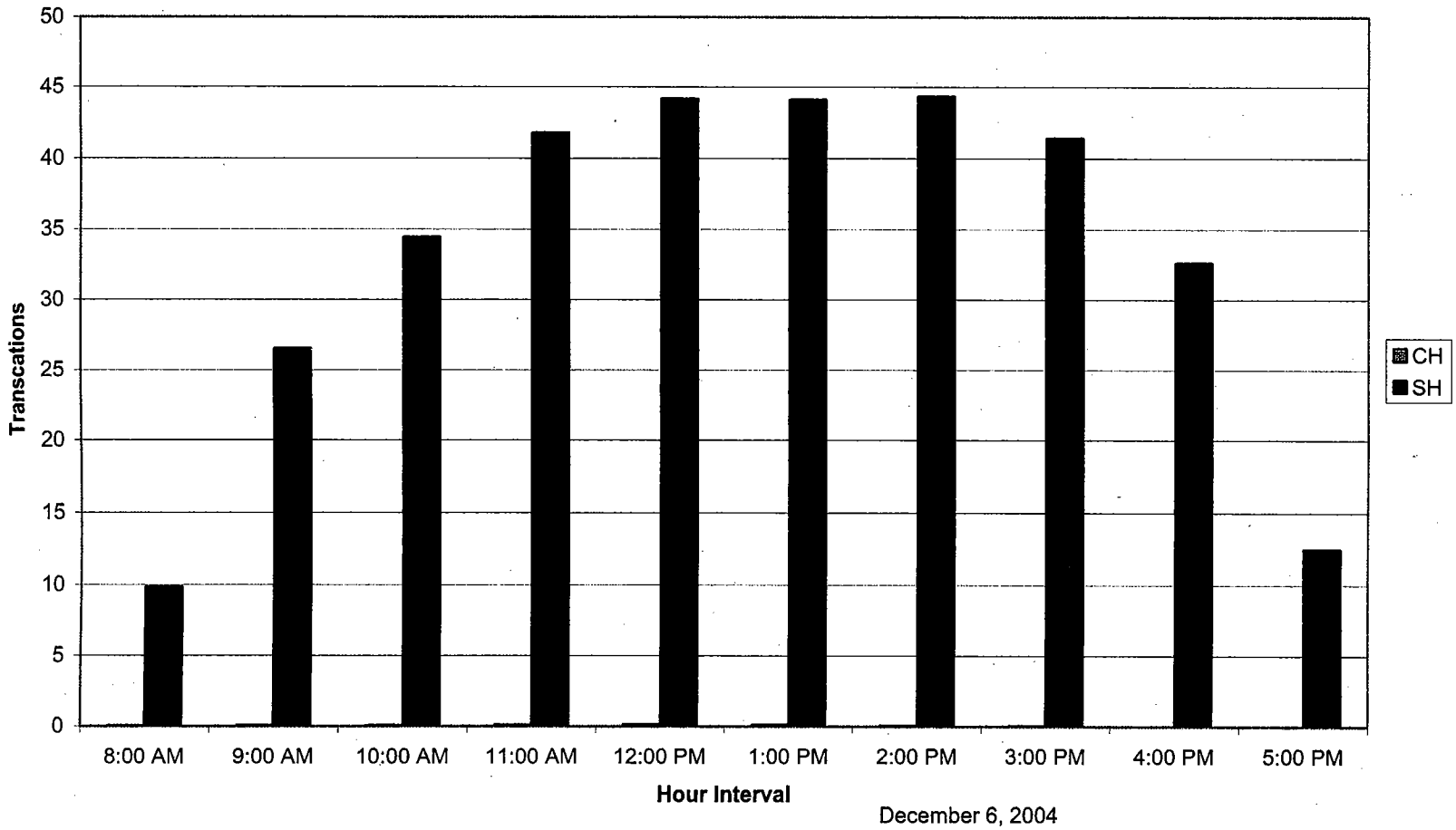

December 6, 2004

Transfer System Level of Service Criteria
Criterion 3a) Average Tons Per Hour Interval at Algona
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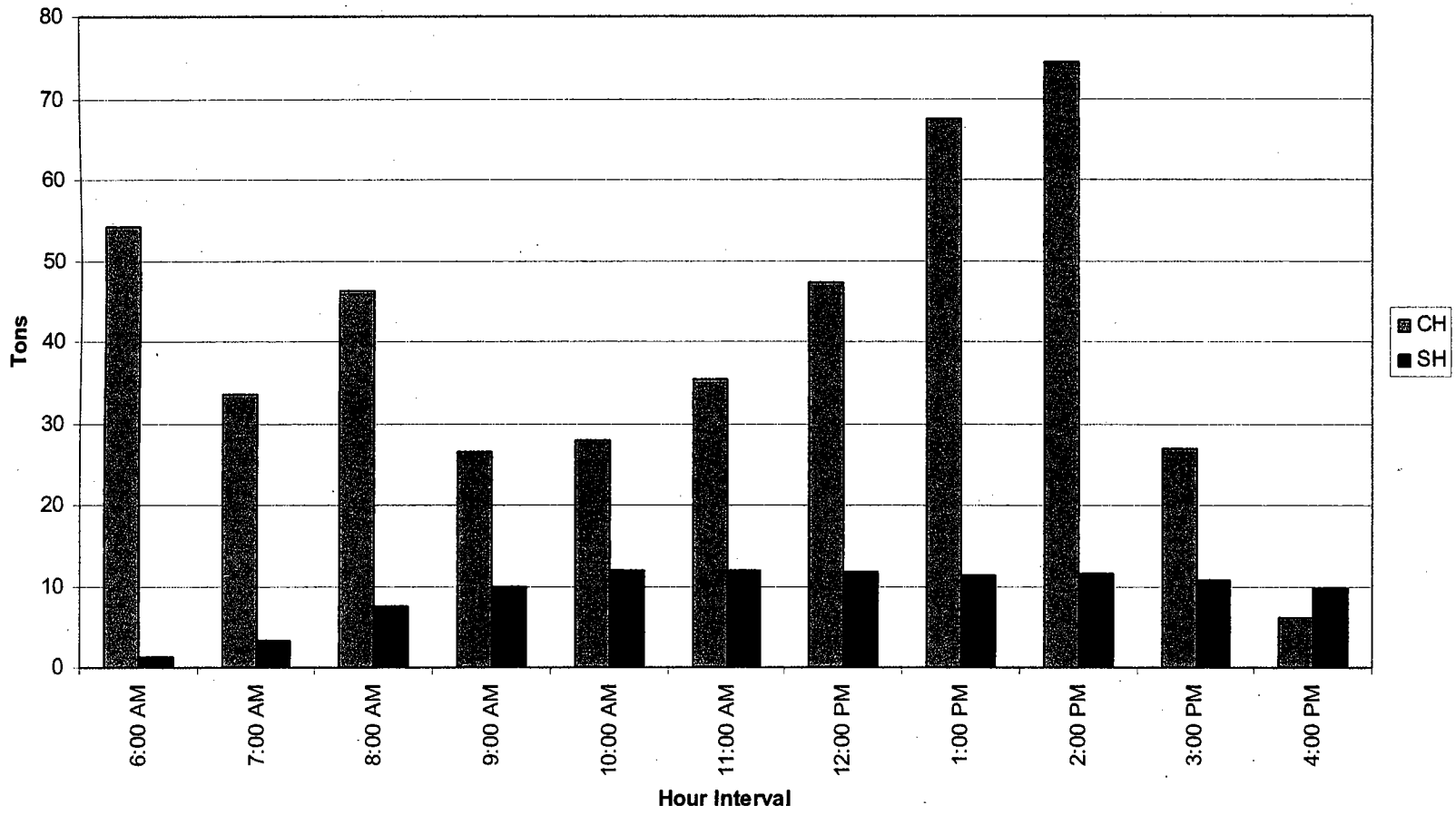

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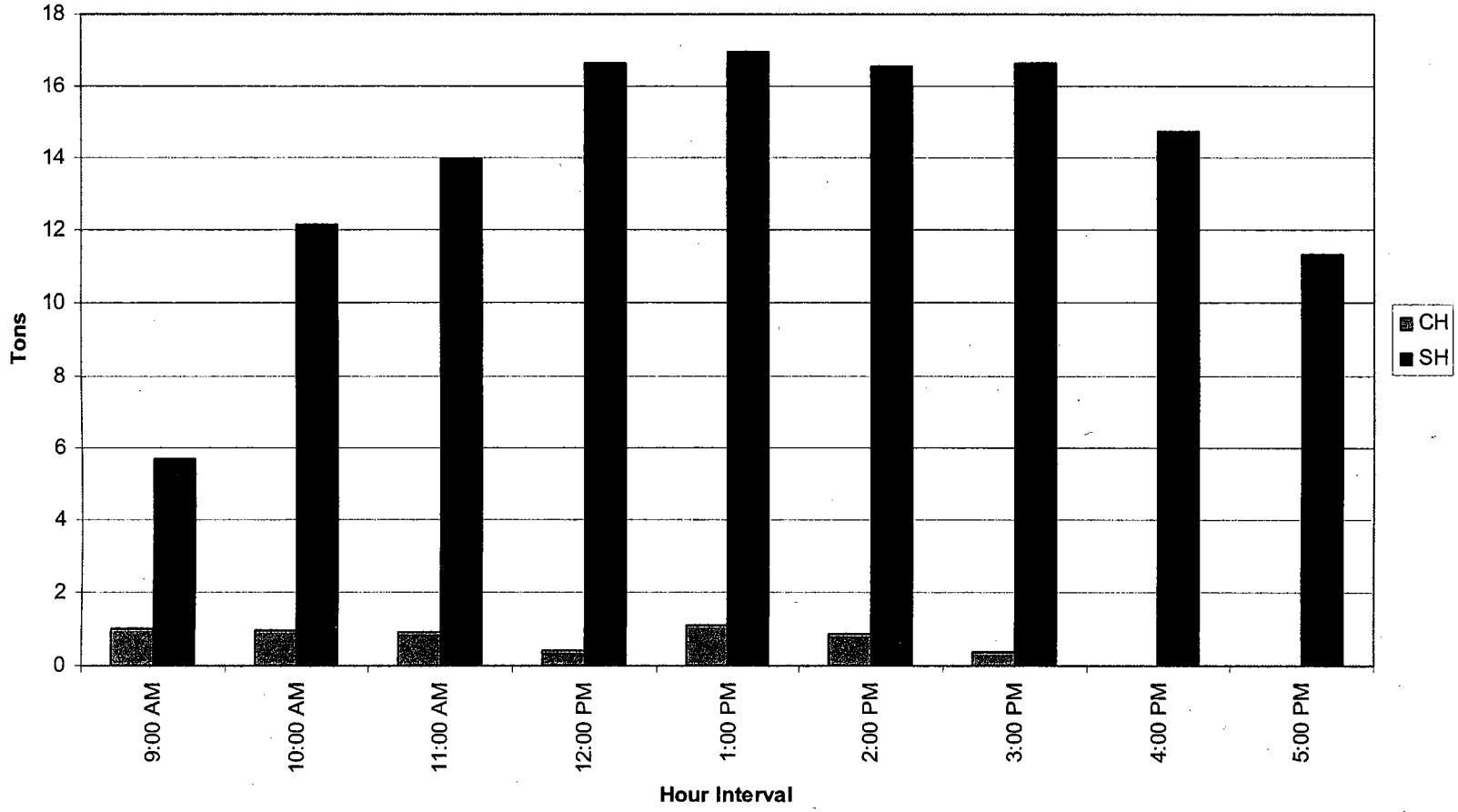

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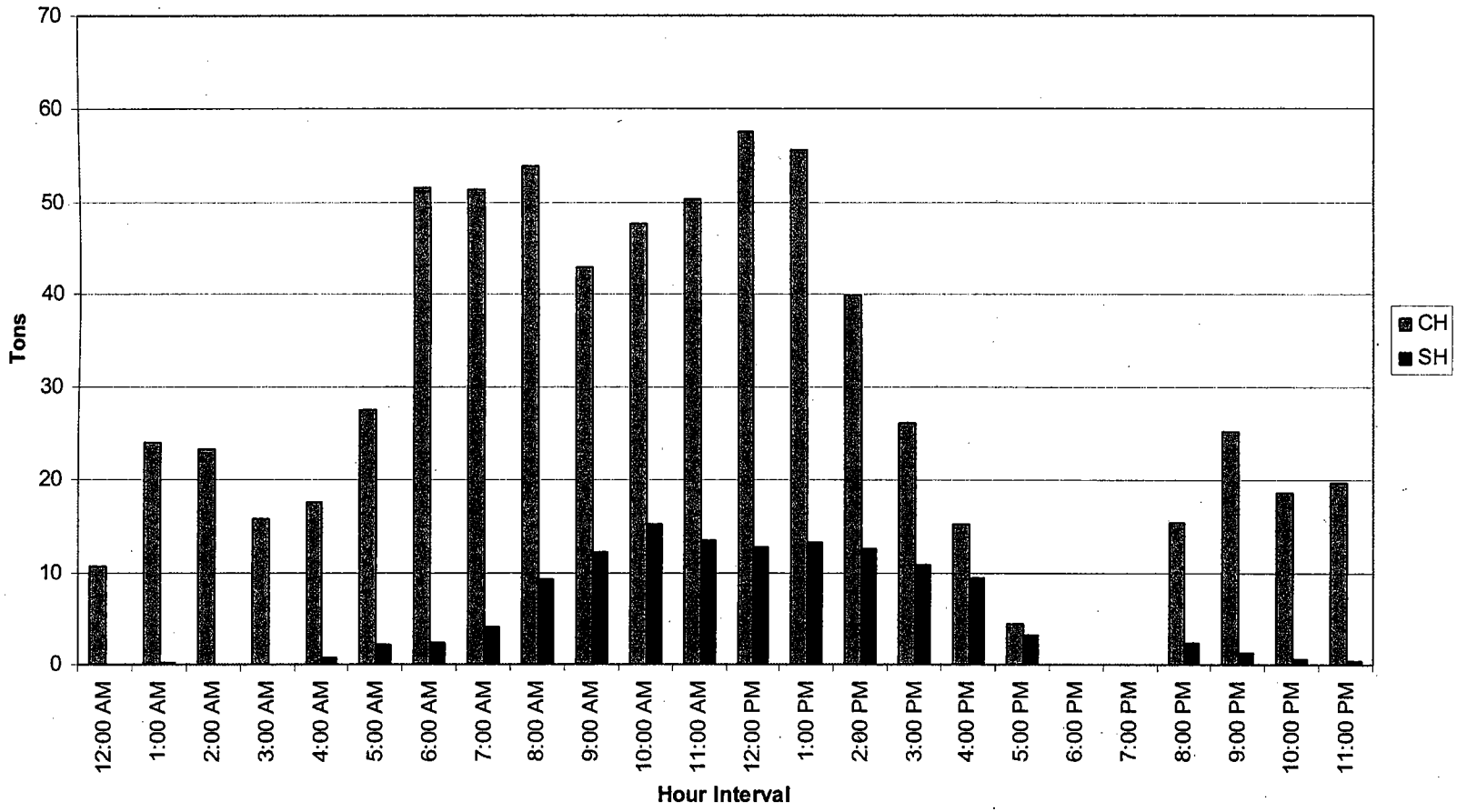

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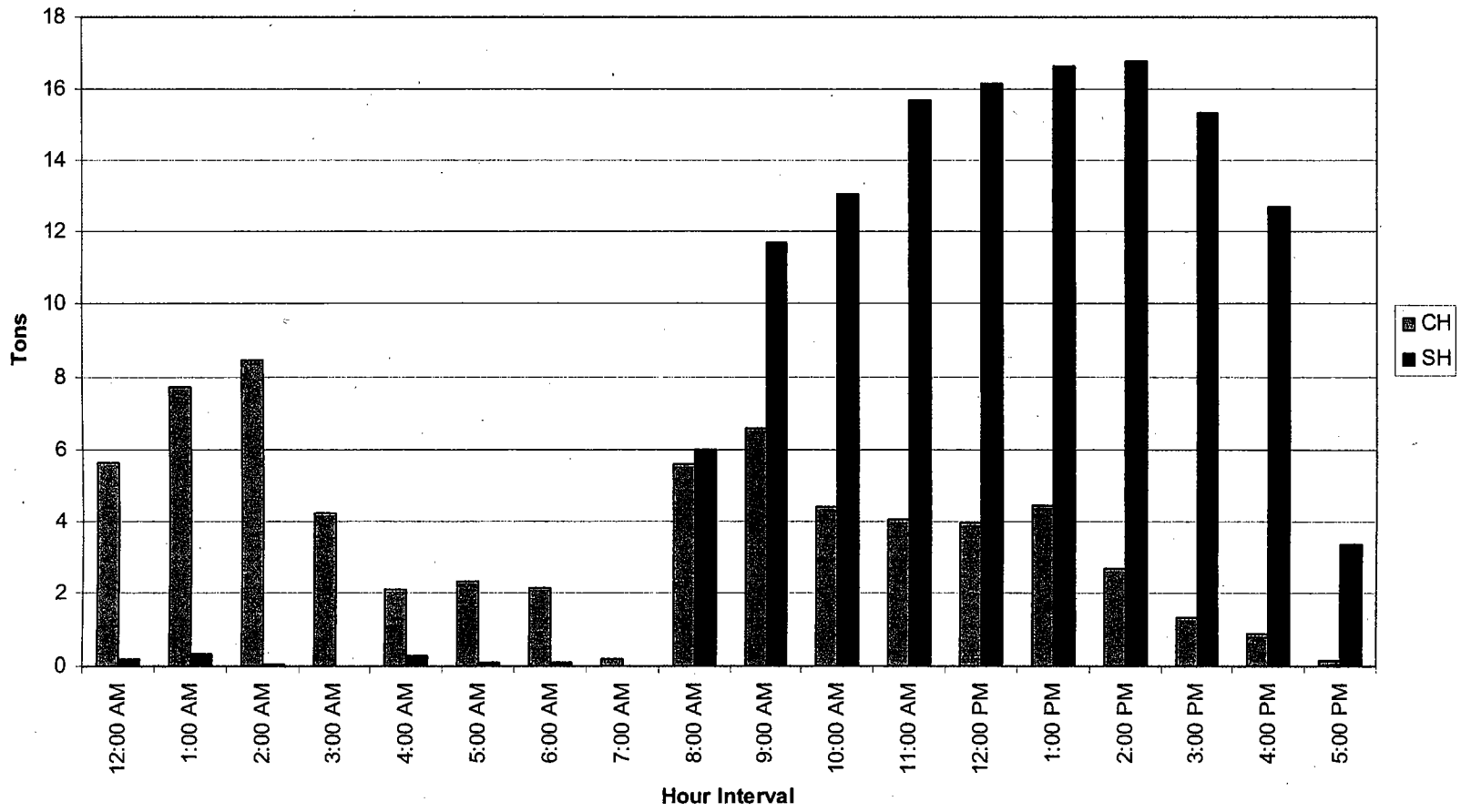

Transfer System Service Level Criteria
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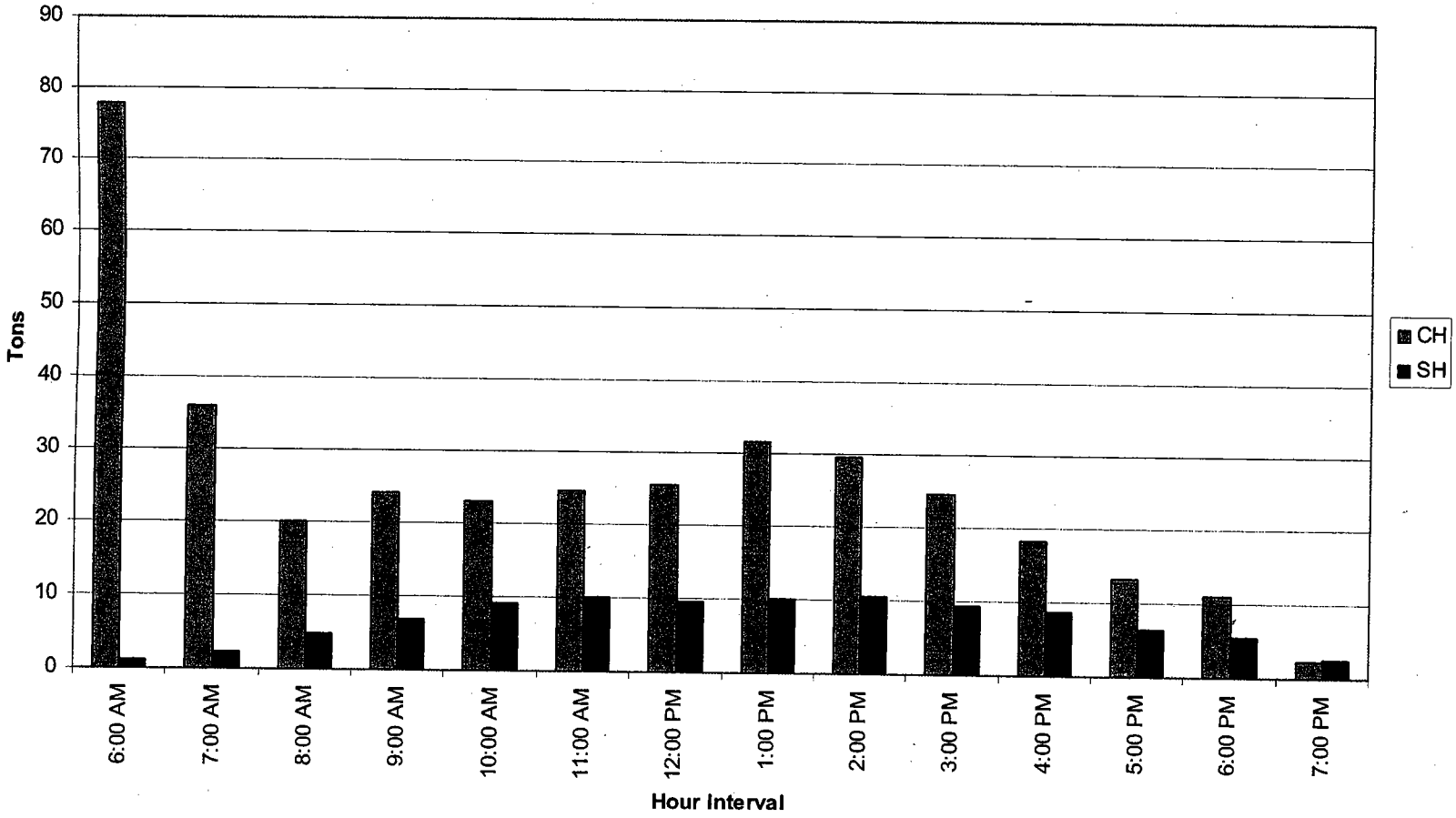

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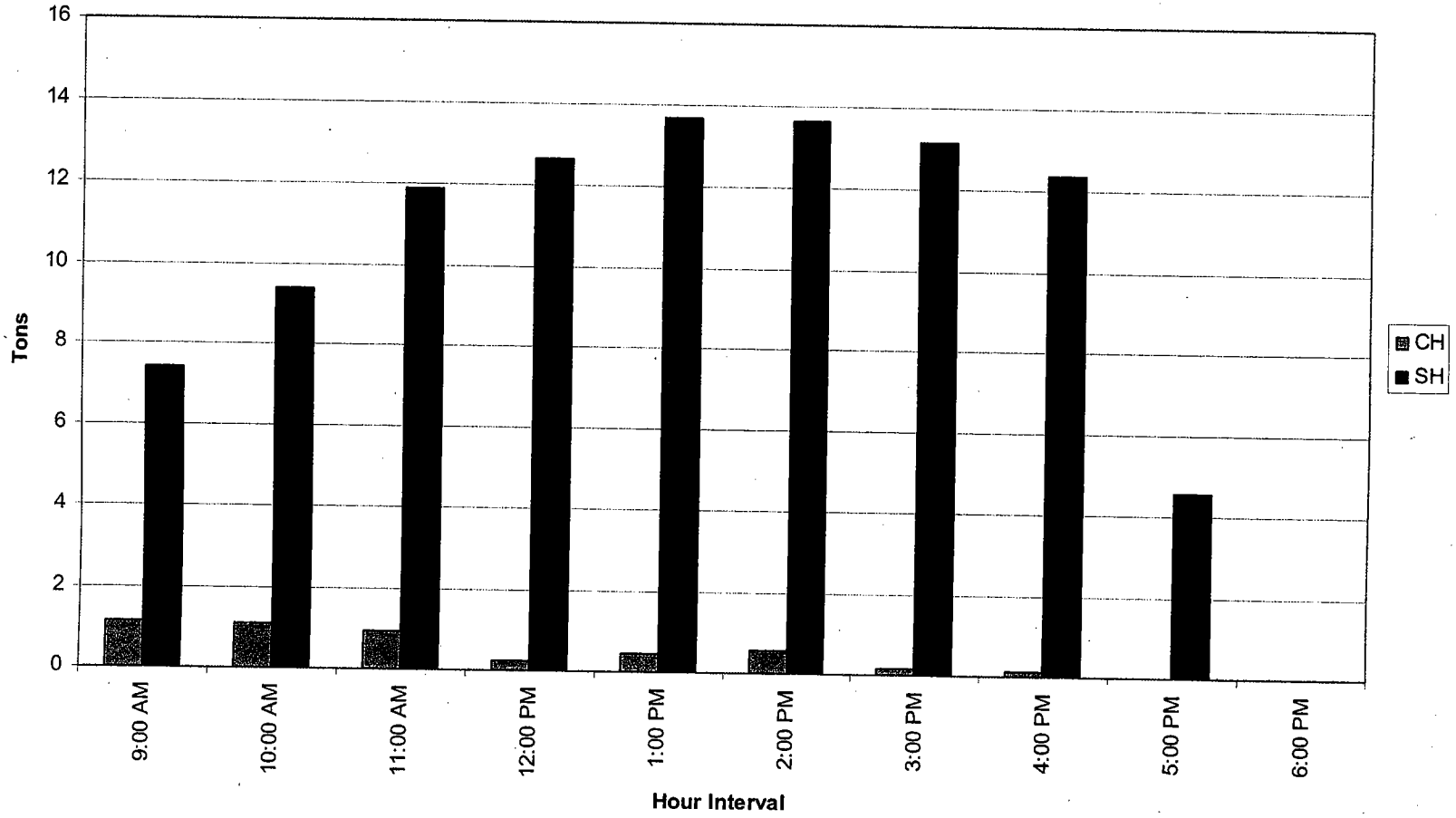

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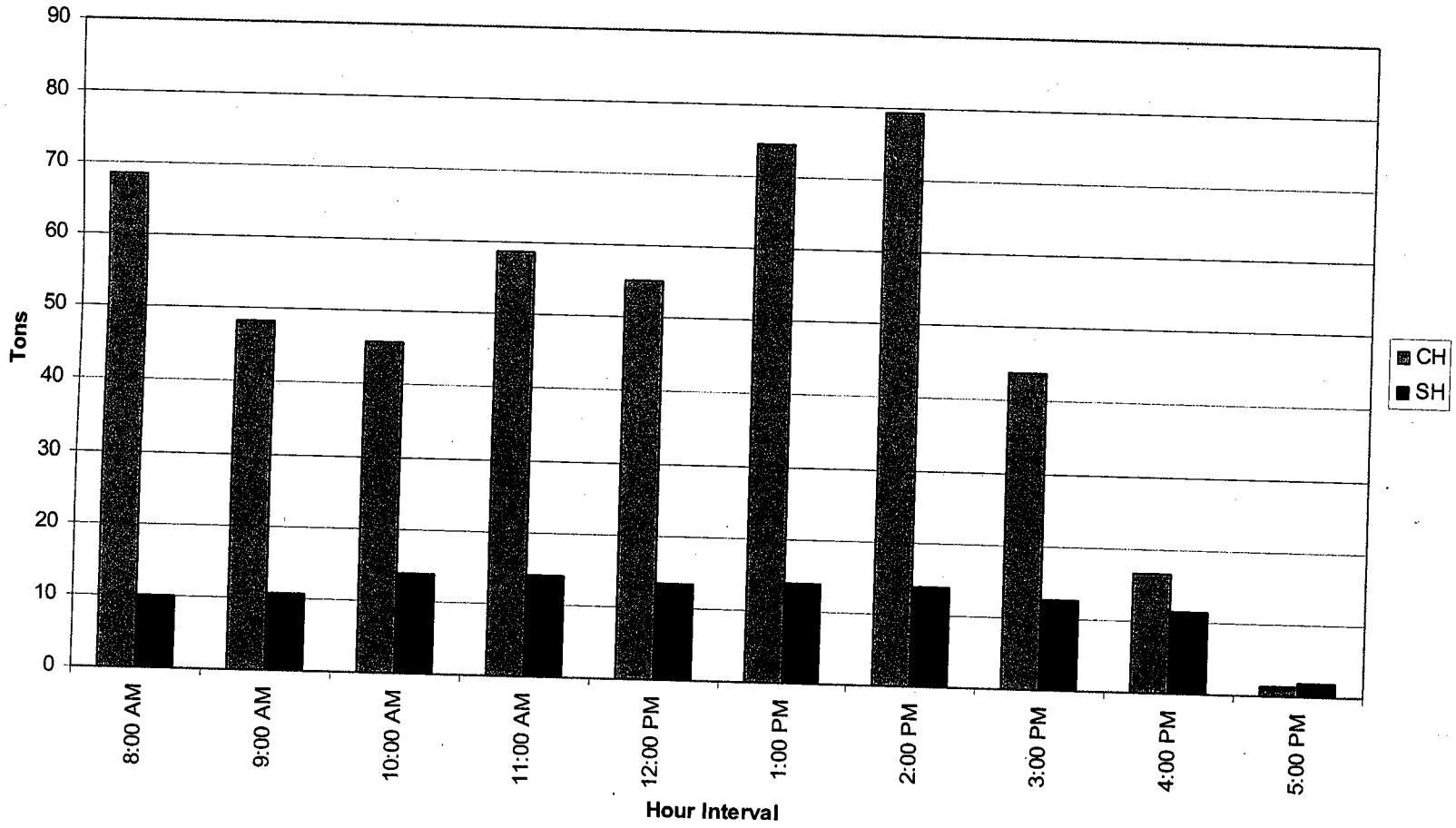

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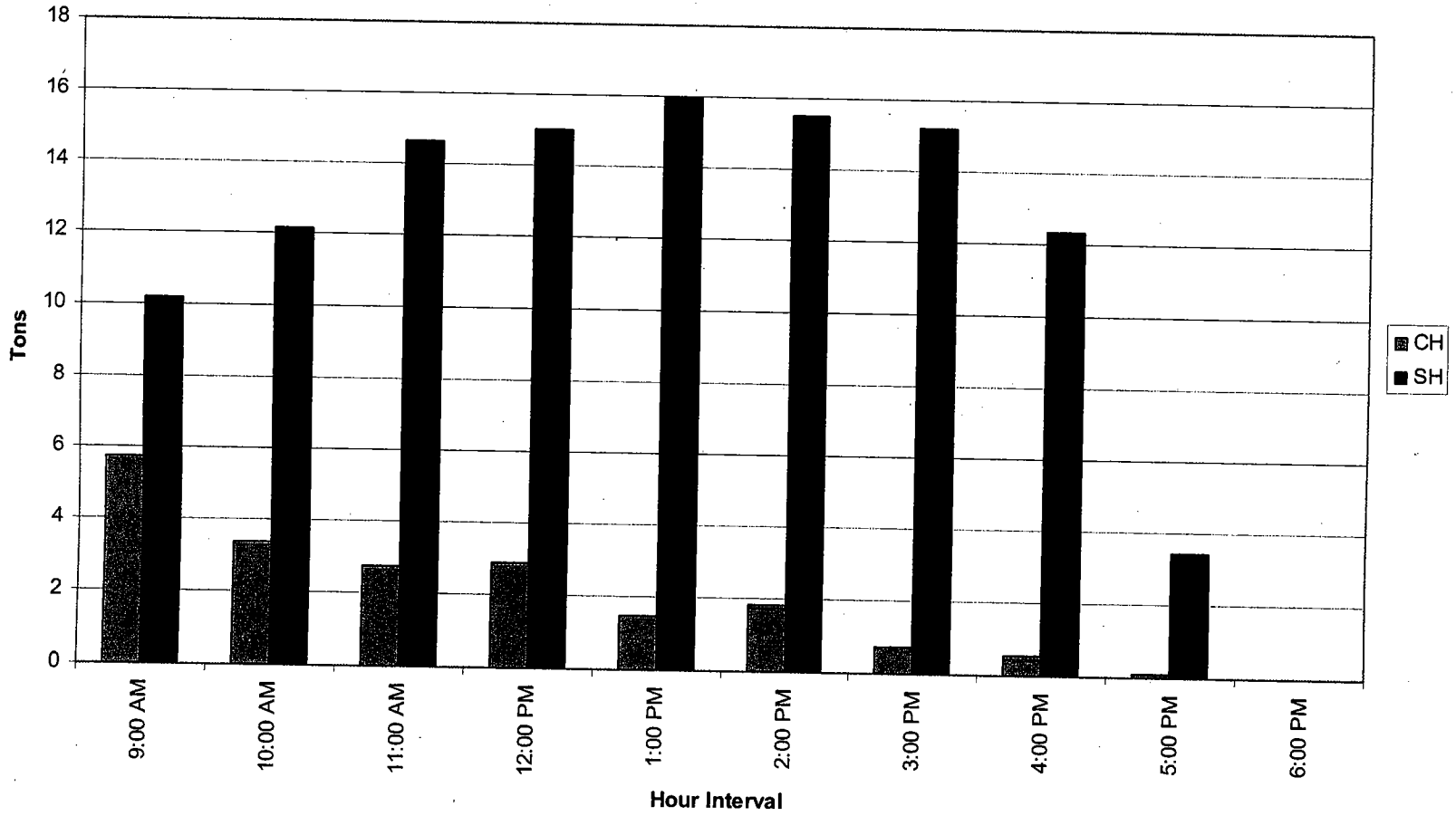

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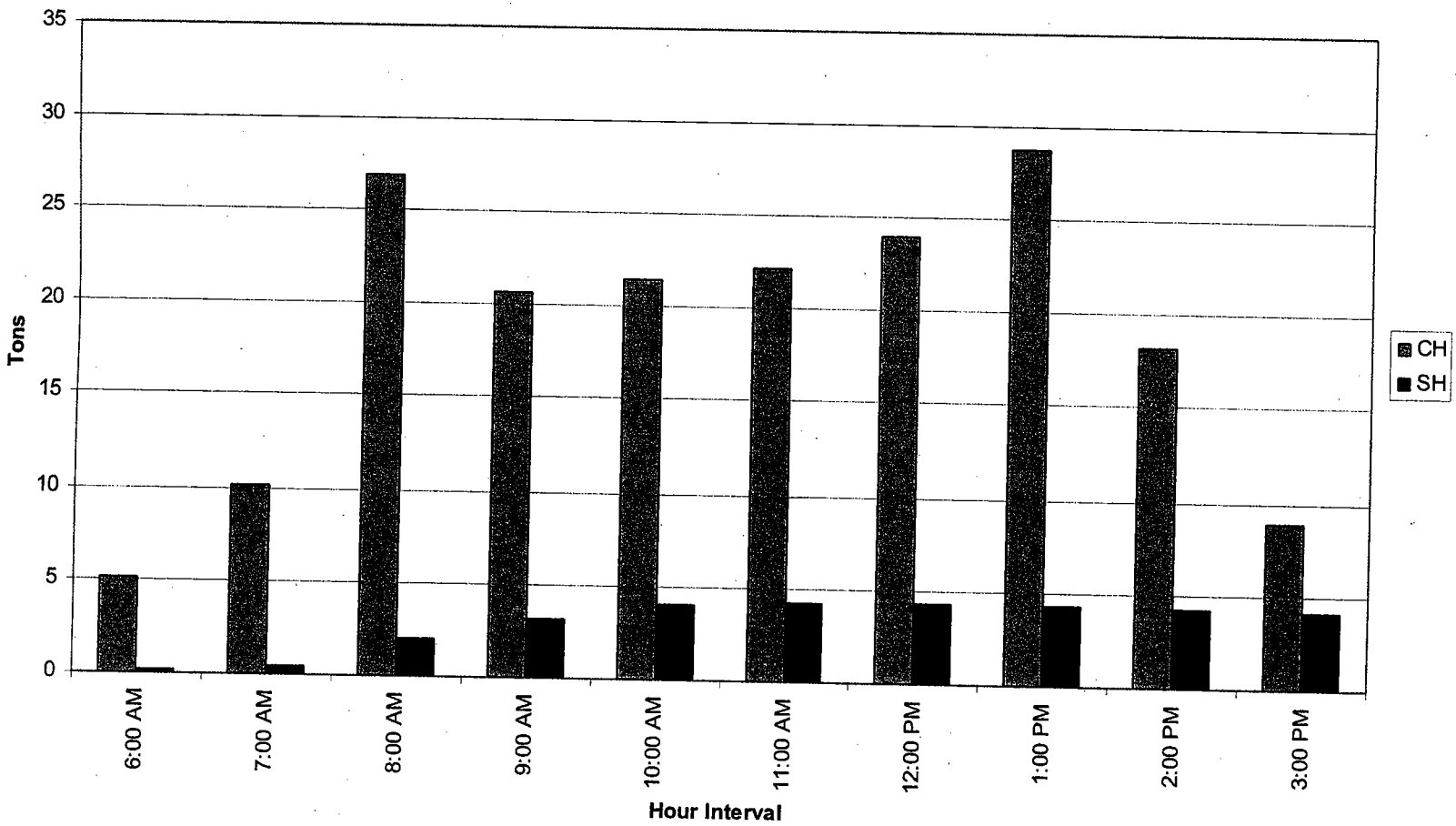

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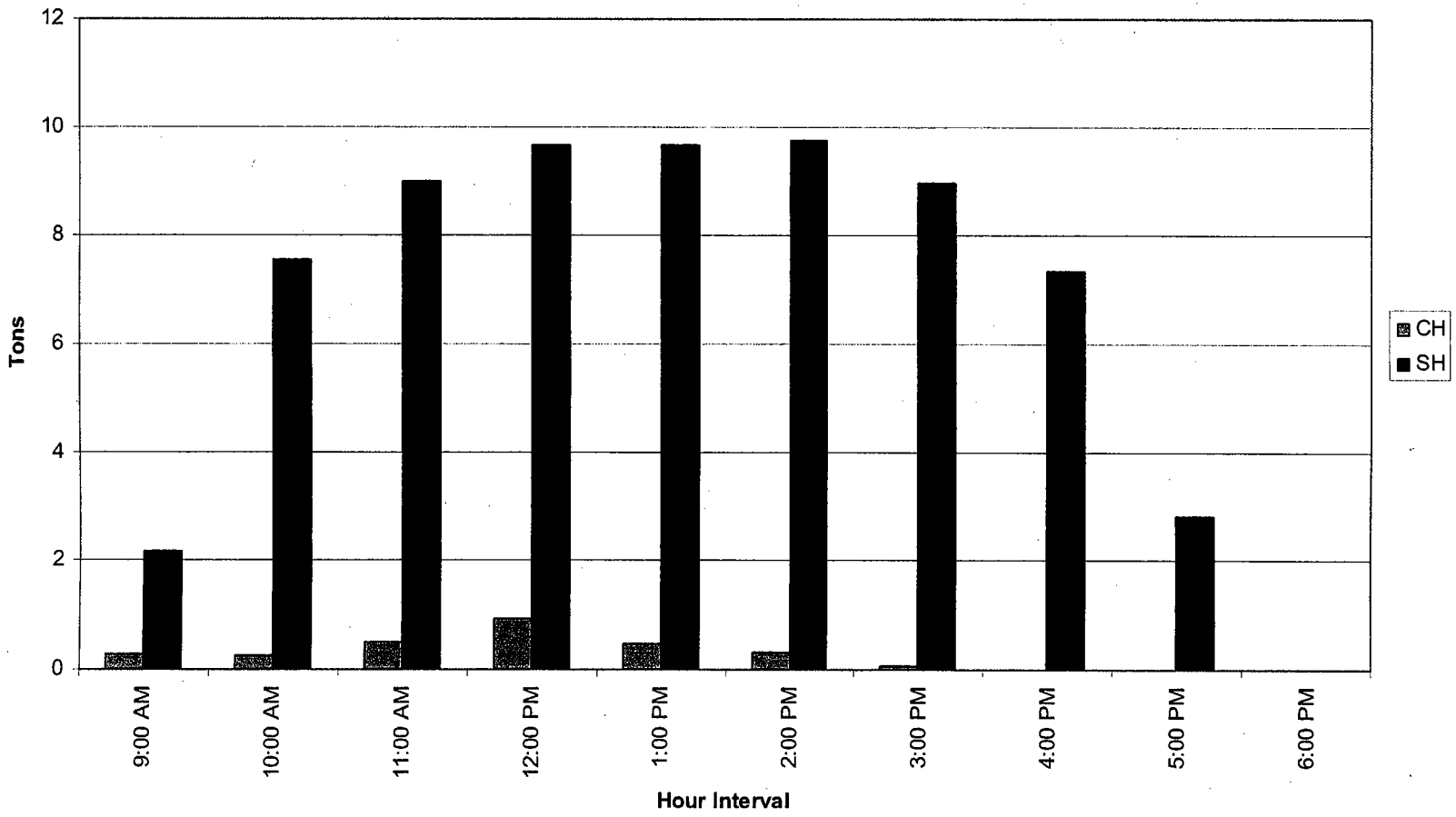

Transfer System Level of Service Criteria
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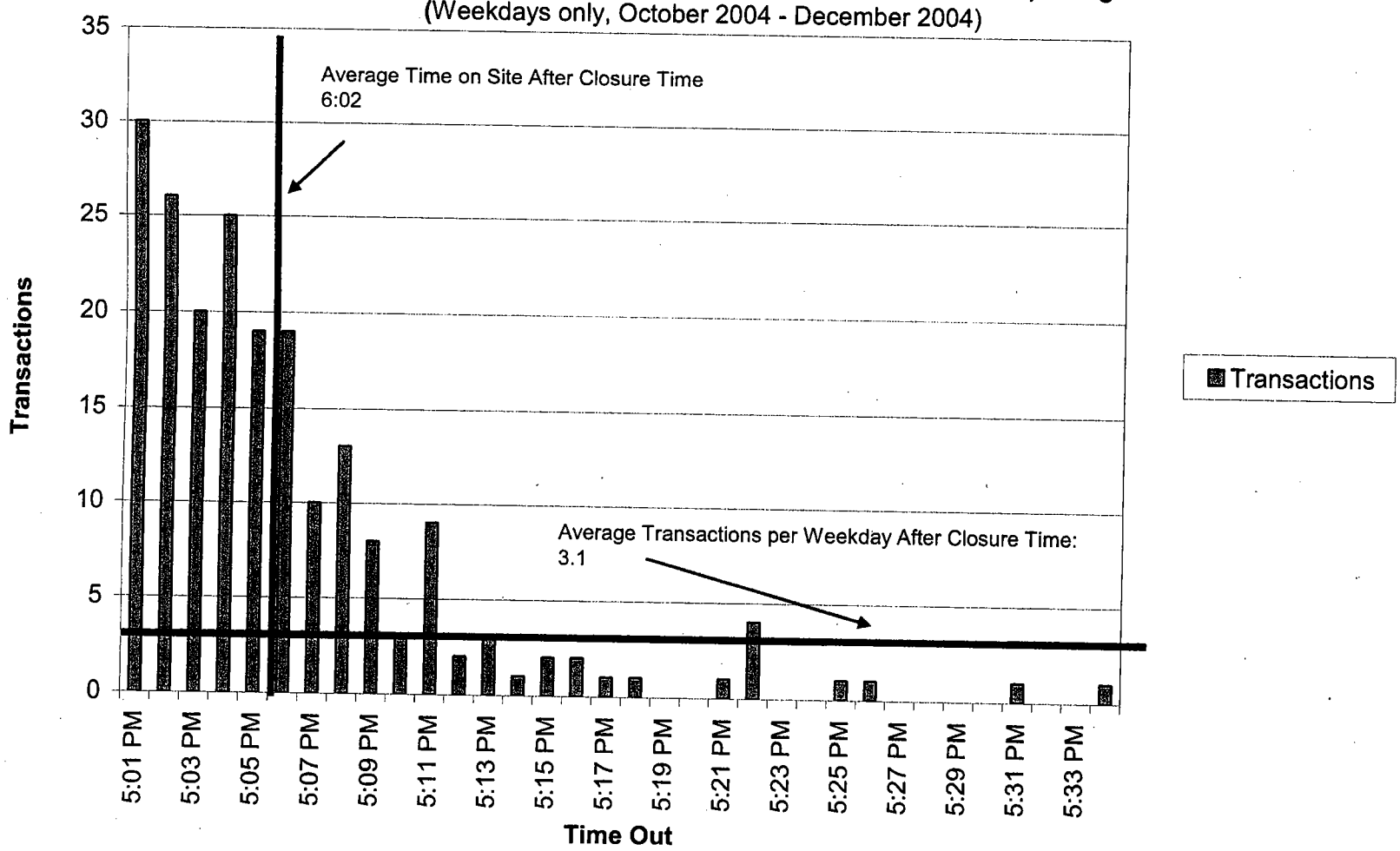

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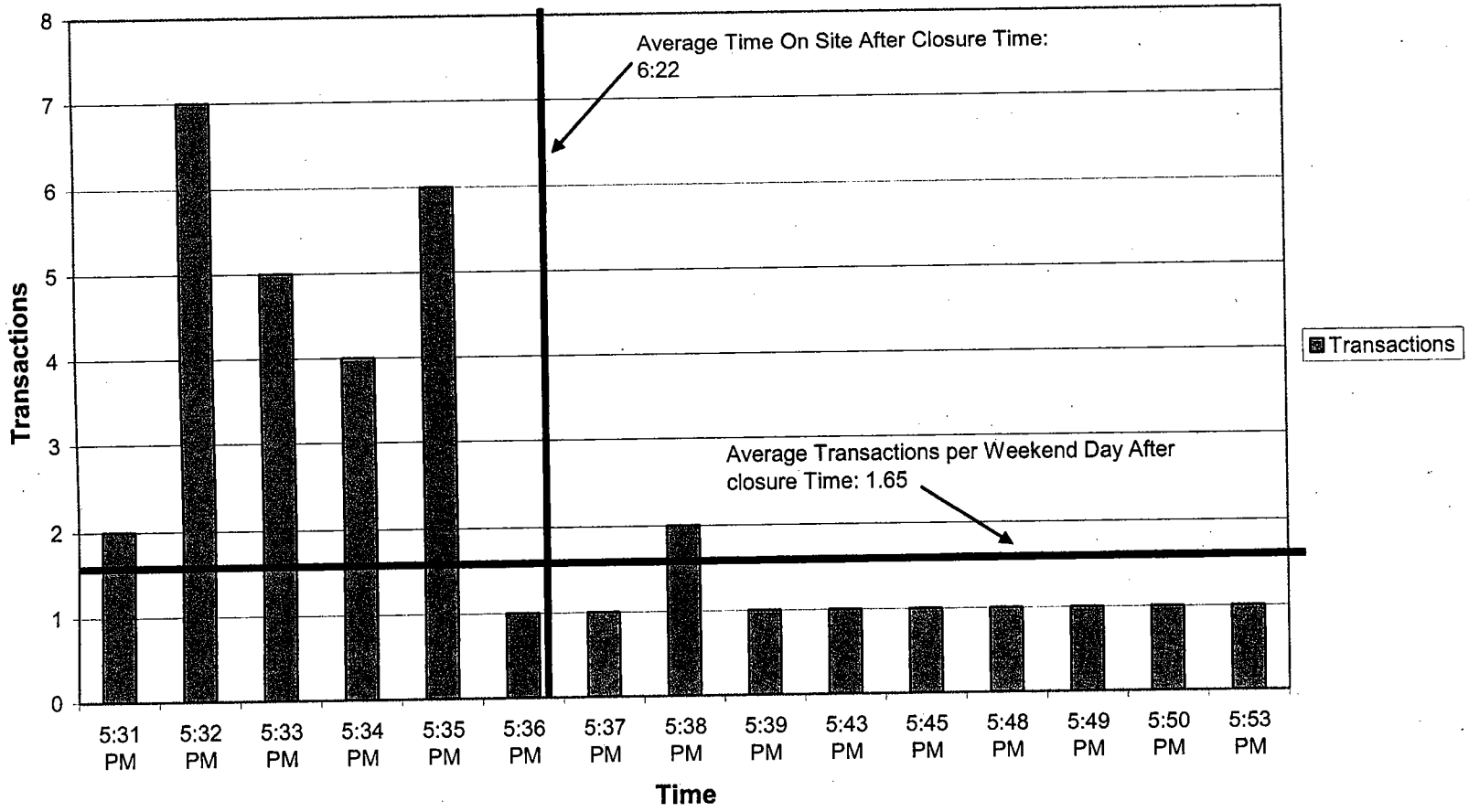

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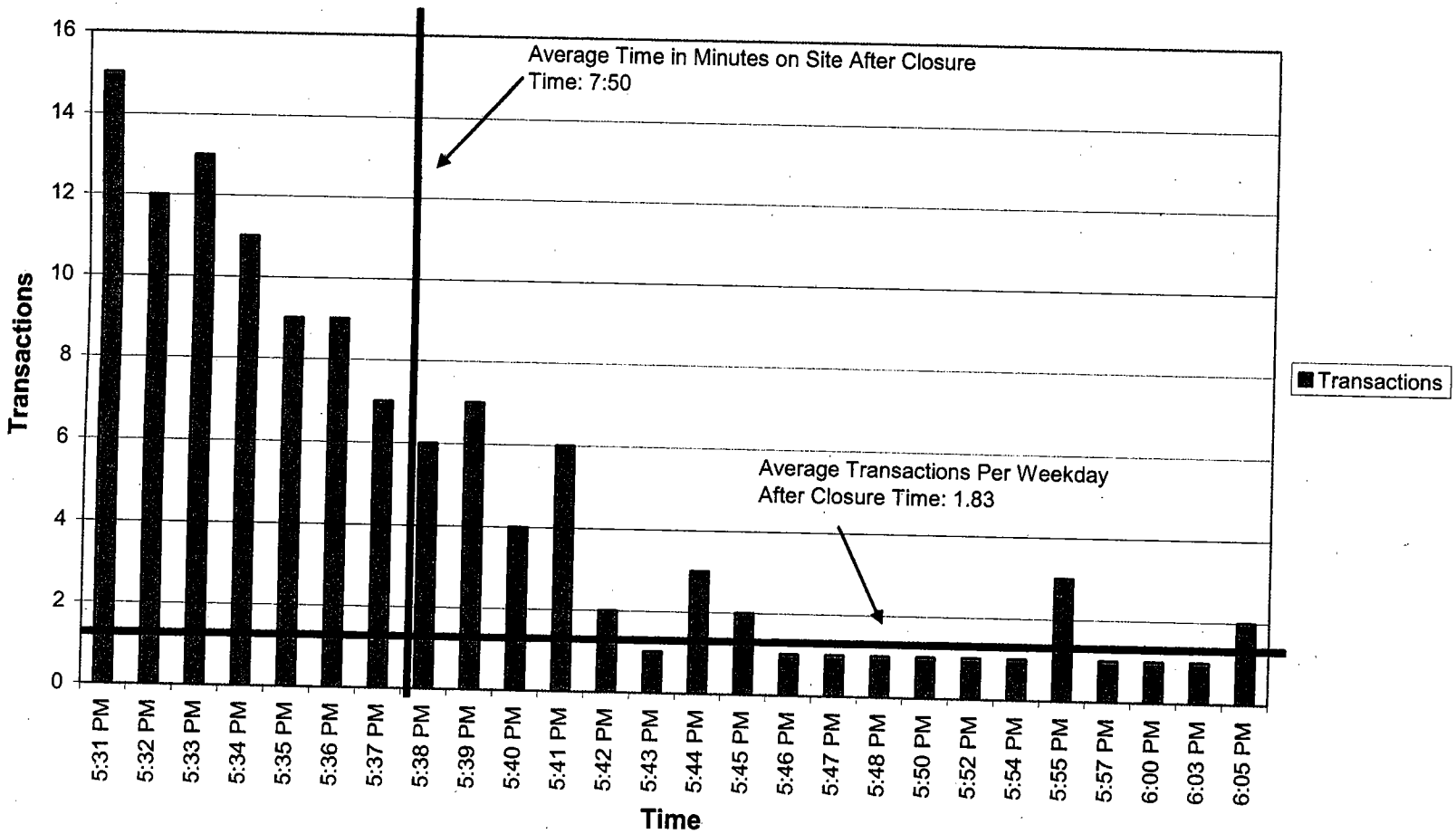

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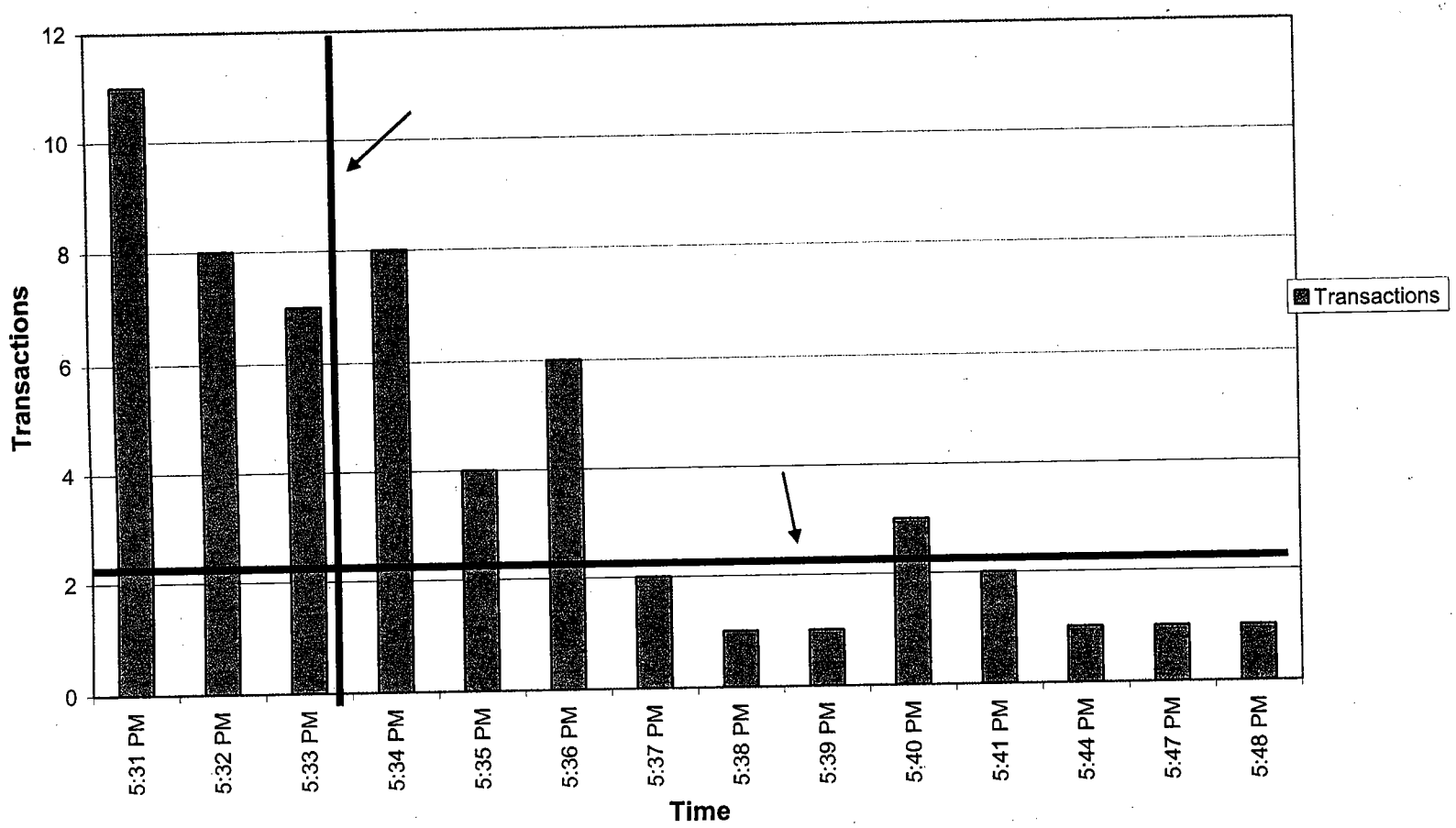

Transfer System Level of Service Criteria
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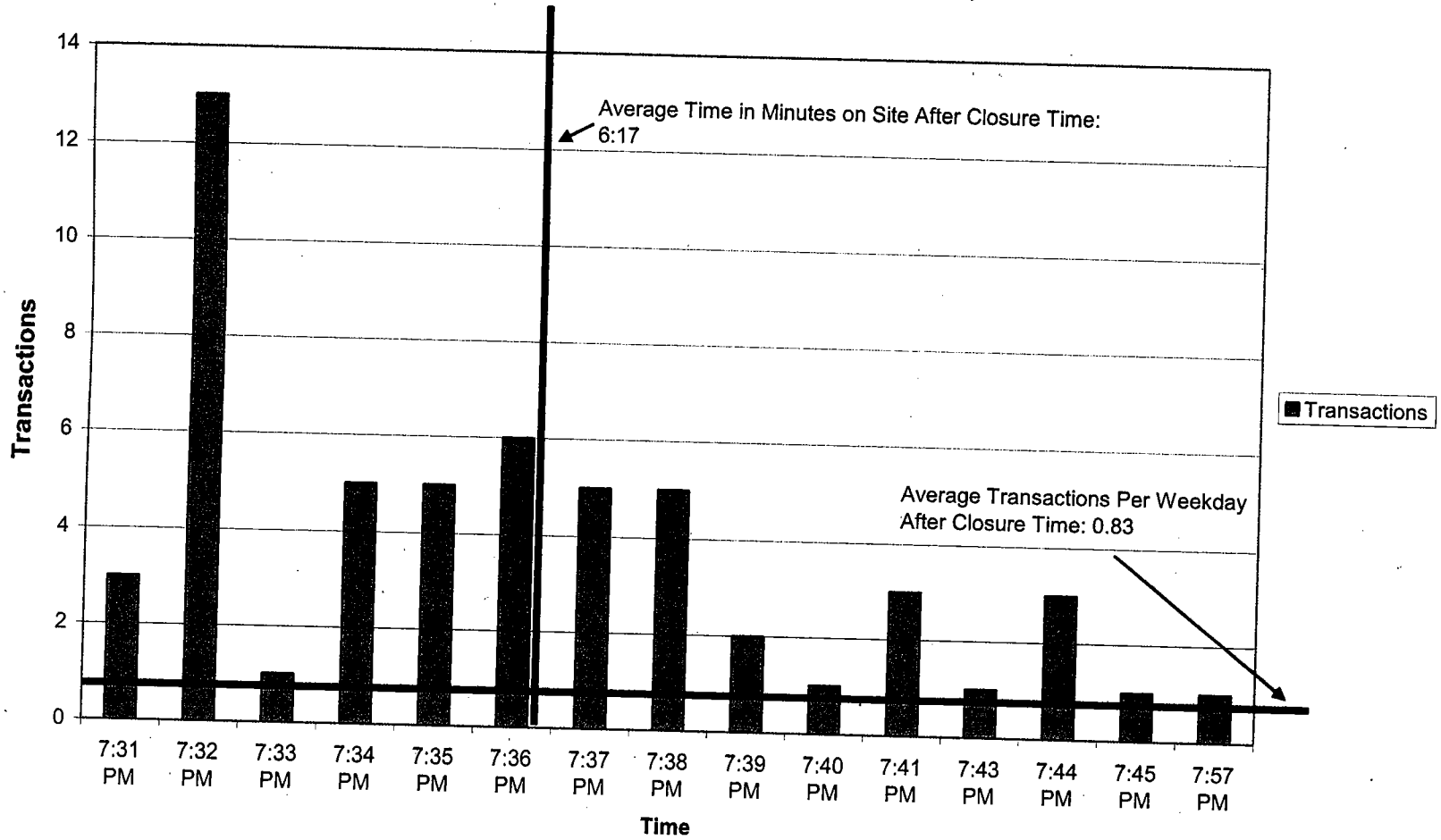

January 10, 2005

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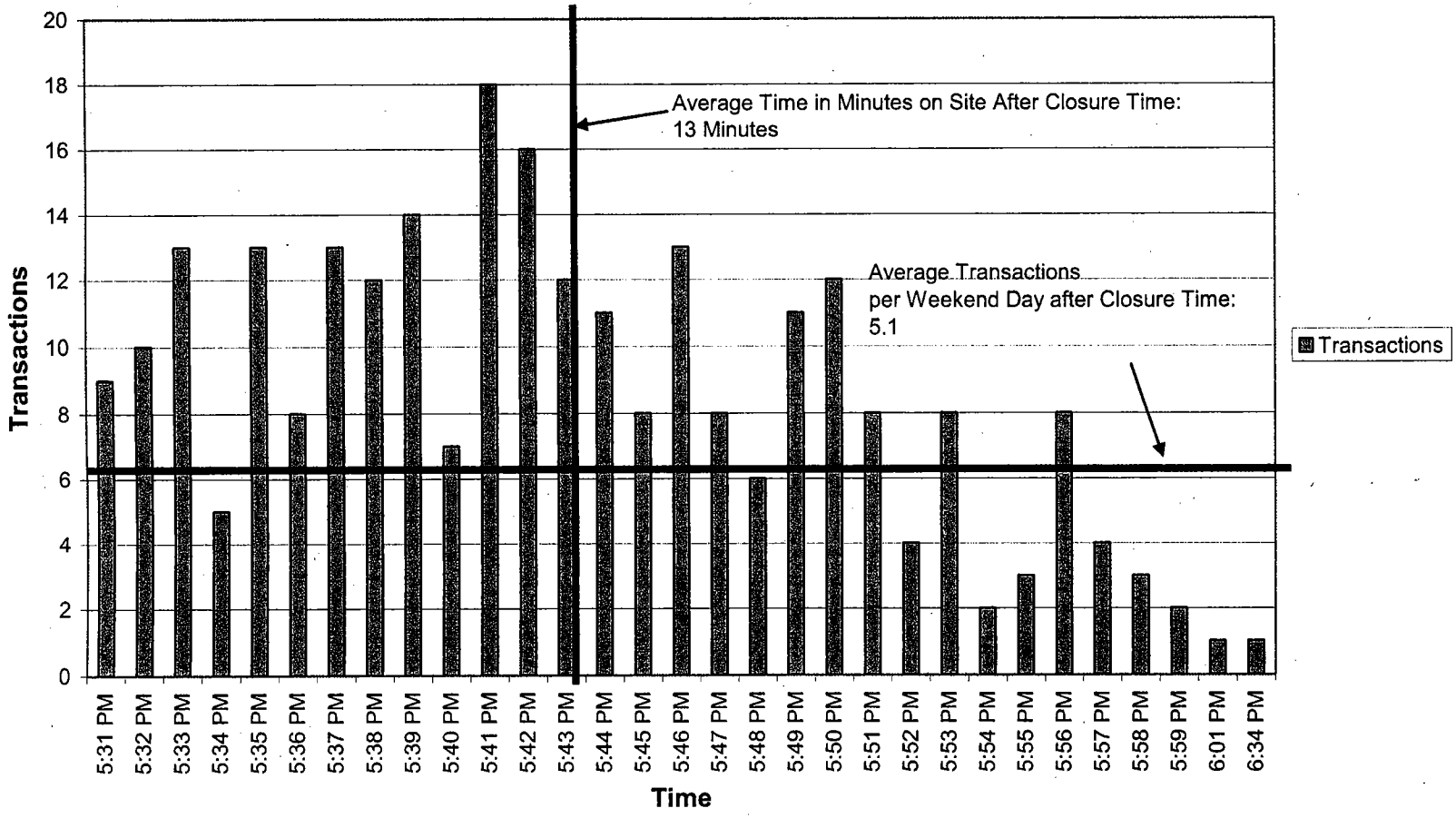

Transfer System Level of Service Criteria
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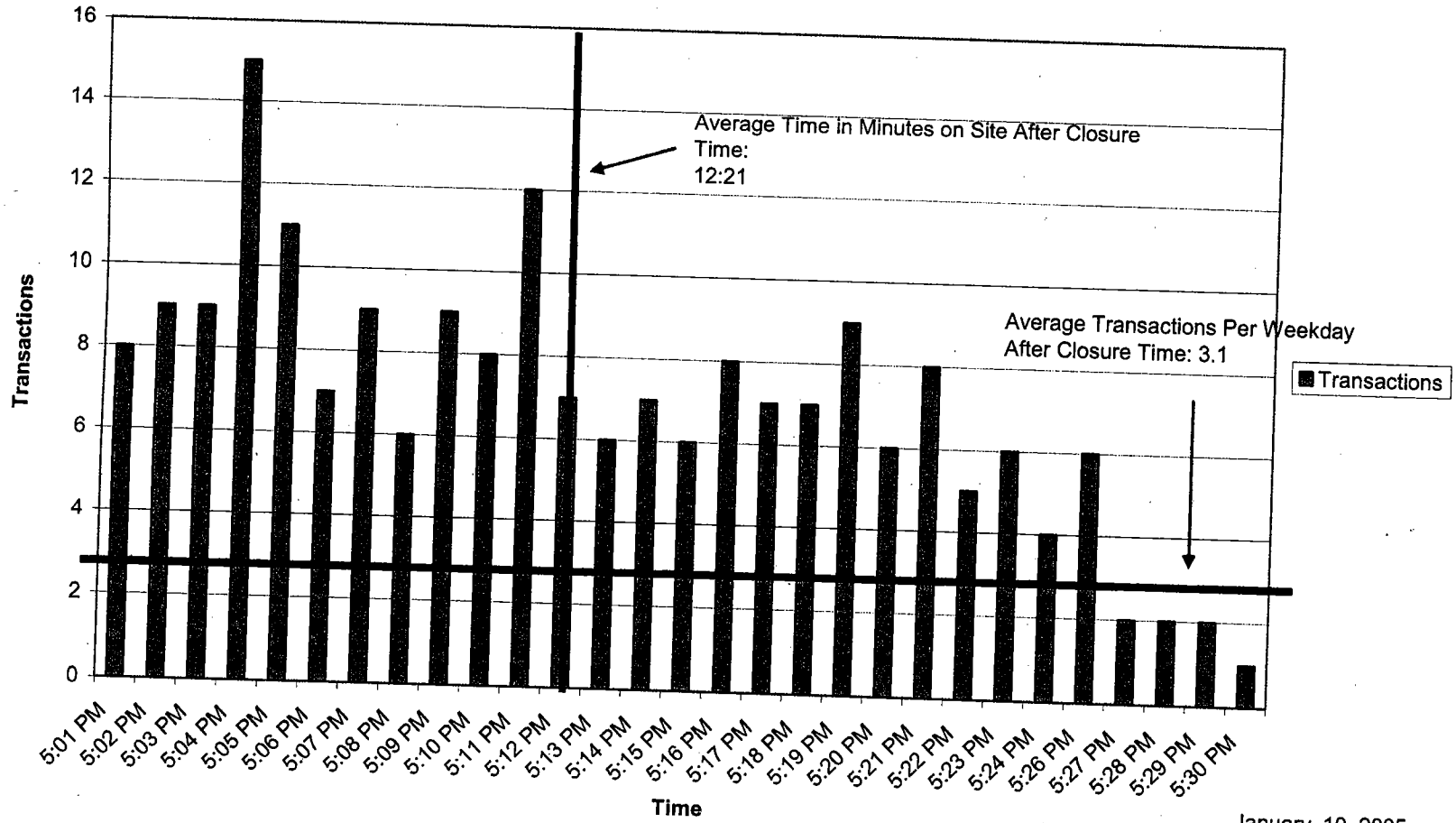

January, 10, 2005

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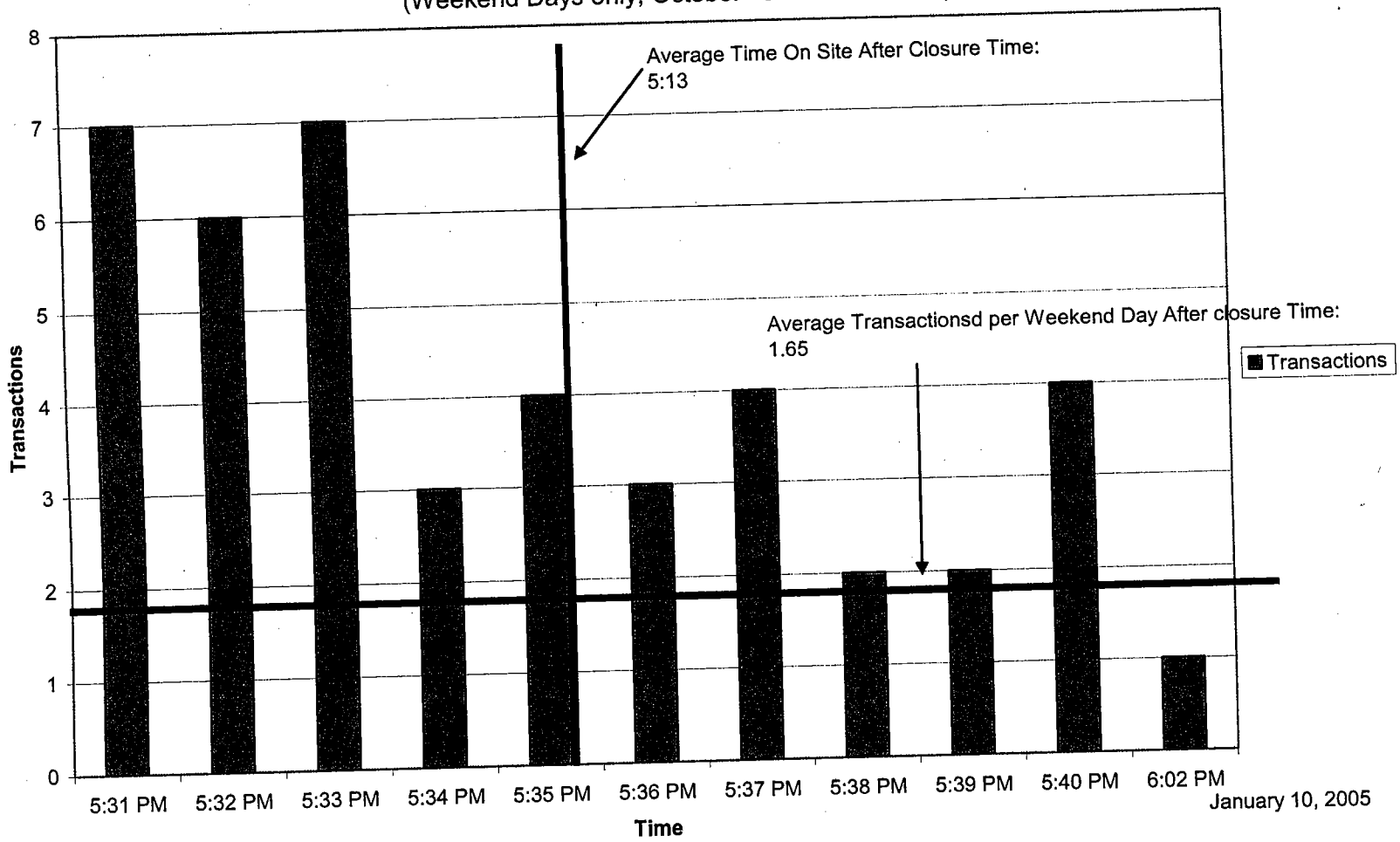

Transfer System Level of Service Criteria
Criterion 3b) Data for End of Day Transactions (after 4pm) at Renton
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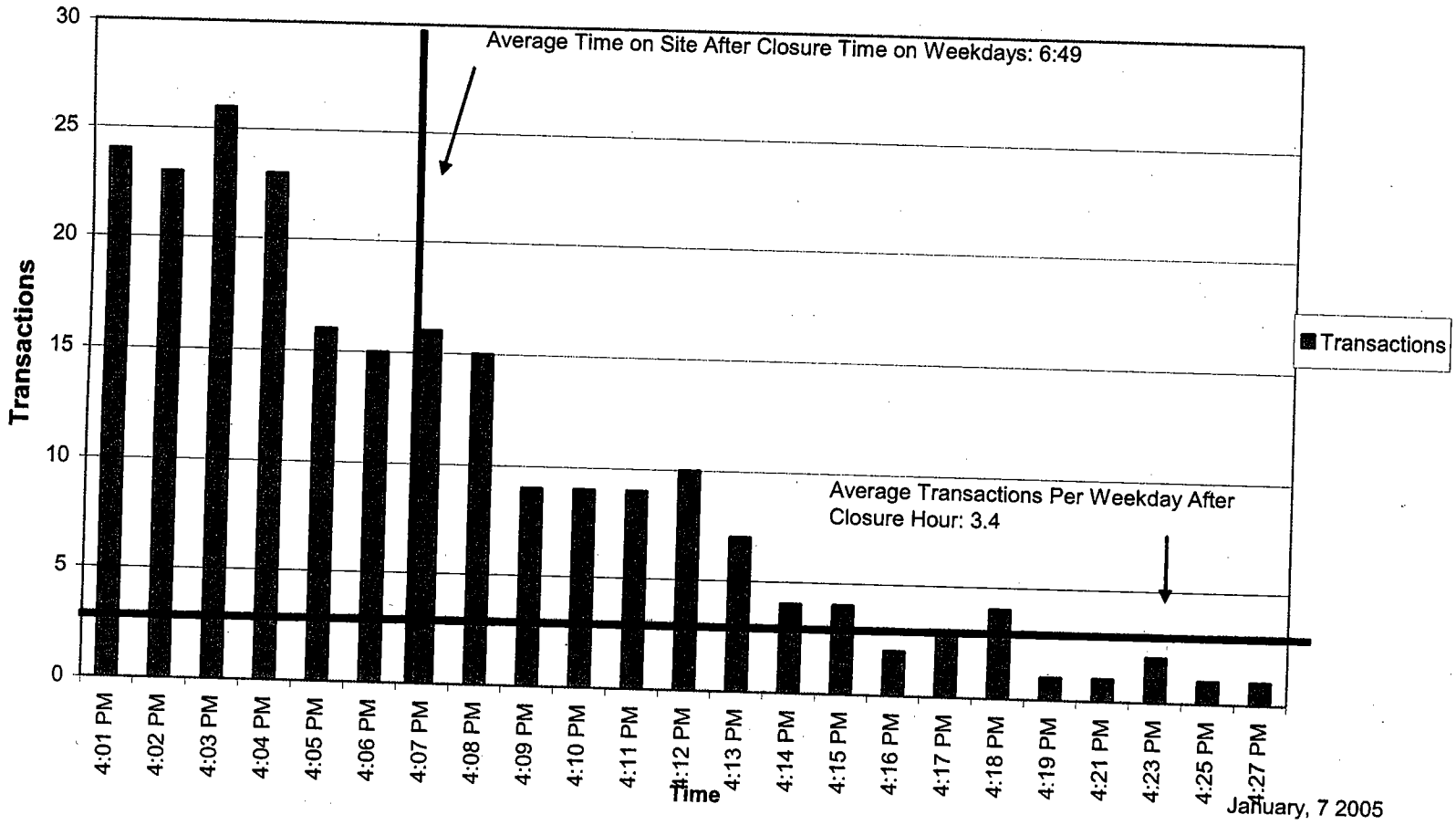

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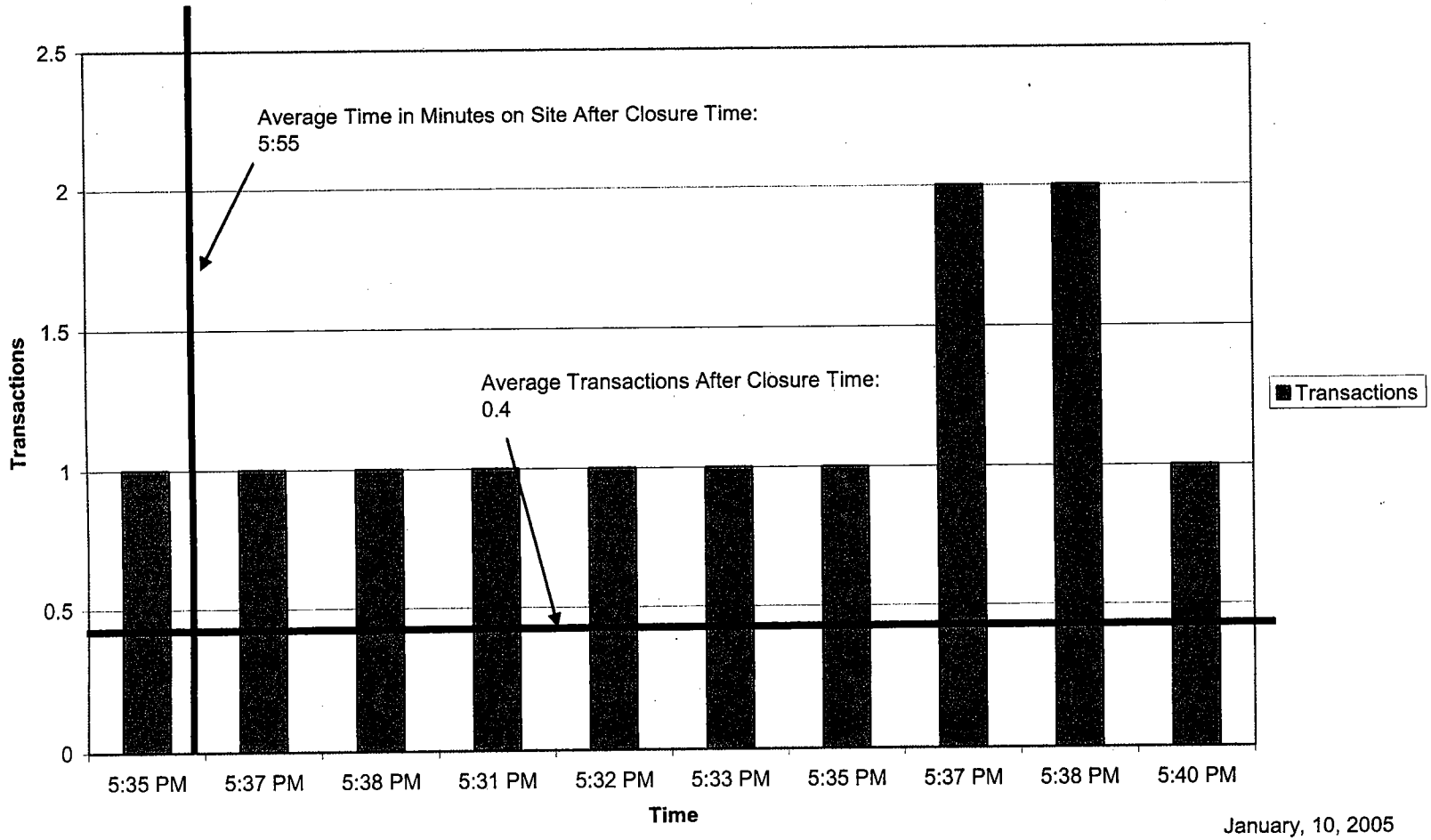

January, 10, 2005

Appendix D

Transfer System Level of Service Criteria
Criteria 5 and 6:
Vehicle and Tonnage Capacity

CAPACITY EVALUATION FOR KING COUNTY TRANSFER STATIONS

Criteria 5 - Vehicle Capacity
Criteria 6 - Tonnage Capacity

Prepared for
King County Solid Waste Division

Prepared by
HDR Engineering, Inc.
500 108th Avenue NE, Suite 1200
Bellevue, WA 98004

February 2005

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CRITERIA 5 - VEHICLE CAPACITY
CRITERIA 6 - TONNAGE CAPACITY

BACKGROUND

HDR Engineering (HDR) performed an analysis of the vehicle and tonnage capacities at five King County Transfer Stations to evaluate their ability to meet current and 20-year forecast needs. The five stations reviewed were Algona, Bow Lake, Factoria, Houghton, and Renton.

In 2002 King County adopted a set of criteria and standards to determine when a County owned and operated transfer station has exceeded its capacity to efficiently service the needs of its customers, in reply to Ordinance 14246 adopting the Final 2001 Comprehensive Solid Waste Management Plan for King County.

At that time, the King County Solid Waste Division (Division) developed a level or service scale similar to the Level of Service (LOS) used in roadway and intersection analysis. The scale is based on operating capacity defined as the amount of waste that can be managed in a working day (tons/day). This LOS methodology graded transfer station capacity on a scale of 'A' to 'F', based on numerical measurements. A value for each transfer station was calculated by dividing the number of vehicles or tonnage processed by the operating capacity. The resulting ratios were assigned a LOS value The LOS measurements and values are defined in Table 1:

Table 1 – Level of Service (LOS) Definition and Values

LOS	Definition
A	Easily accommodates vehicle or tonnage throughput all times of the day.
B	Accommodates vehicle or tonnage throughput at most times of the day.
C	**Able to accommodate vehicles or tonnage throughput all times of the day, except for occasional peak hour times.**
D	Beginning to have difficulty accommodating all vehicle or tonnage throughput during peak hours.
E	Cannot accommodate vehicle or tonnage throughput without off-site impacts or overloading on-site resources.
F	Cannot accommodate vehicle or tonnage throughput without off-site impacts and overloading of on-site resources. Throughput capacity exceeded most hours.

METHODOLOGY DESCRIPTION

Overview

HDR was retained by the Division to evaluate vehicle and tonnage capacity and update the findings from the 2002 report, for both the current levels of use and 20-year projections. Prior to discussing the methodology, it is useful to briefly review the history of the five stations, and how they are operated.

With the exception of Bow Lake, the transfer station configurations were developed in the 1960s. These were some of the first transfer stations in the nation and state of the art for the time. However, since that time technology has advanced in both collection vehicles and transfer station design. The current transfer station configurations are no longer state of the art.

At a typical King County transfer station, vehicles enter the transfer dumping area and dump directly into the transfer trailer. When the trailer is full, it is removed and exchanged with an empty trailer. The typical movement through a transfer station follows this general pattern:

- A vehicle enters the site and joins the inbound scale queue.
- The vehicle is weighed and enters the queue for the dumping area.
- Once given a stall, the vehicle's waste load is dumped into the transfer trailer.
- When dumping is completed, the vehicle enters the queue to the outbound scale.
- The vehicle is weighed and the resulting payment transaction is completed.
- The vehicle exits the site.

Each of these movements has associated transaction times and is constrained by multiple factors:

- Queuing lengths at each transfer station
- Safety considerations, including:
    - Volume of commercial vehicles necessitates dumping from only one side of the trailer
    - Vehicle maneuverability around the stalls.
- All waste storage is in the trailers, which requires vehicles to wait for full trailers to be changed before they dump.

These aspects were considered in the analysis to understand how they impact both vehicle and tonnage throughput at the five transfer stations, and were used to help determine each station's maximum sustainable operating capacity.

HDR held a meeting in early February 2005 with the Division operations staff to discuss sustainable operating levels at each of the transfer stations. The staff was asked to provide current information, including constraining factors at each transfer station.

Using the County's LOS scale of A to F, the Division used a rating of "C" or better as the benchmark by which to judge whether a station met capacity needs (yes or no). This rating is defined as "able to accommodate vehicle and tonnage throughput all times of the

day, except for occasional peak hour times (see Table 1)." The "C" rating reflects an assessment of what is likely to be acceptable to the region.

The evaluation for both criteria, vehicle capacity and tonnage capacity, was performed in Microsoft Excel, using the sort, count and calculation functions to count the occurrences (hours of operation) where the LOS C capacity was exceeded at each transfer station.

HDR's method for calculating the LOS for both 2004 and 2025 was to determine the percent of total operating hours at each transfer station where vehicle counts and tonnage exceeded operating capacity for the transfer stations. The percentage was calculated by dividing the number of hours during which capacity was exceeded by the total operating hours at each transfer station. The LOS was determined as follows:

Table 2 – 2004 Evaluation Values

LOS	% of Hours Exceeding Capacity
A	< 0.5%
B	0.5% - 5%
C	5% - 10%
D	10% - 20%
E	20% - 50%
F	> 50%

The hourly counts for both vehicles and tonnage used in the analysis were provided by King County. Data from the second half of 2004 (July 1 through December 31, 2004) was used because both tonnage data[1] and facility hours were substantially different in the second half of 2004 than in the first half, and it is assumed that current use patterns will continue.

Forecasts of vehicles and tonnage in 2025 were based on the Division's econometric forecasting model, which predicts tonnage volumes based on a series of demographic factors including economic and population growth, as well as assumed increases in waste reduction and recycling from existing and planned programs.

The methodology specific to each criteria is explained in further detail below.

Criteria 5 - Vehicle Capacity

The first step in the evaluation was to calculate the sustainable vehicles per hour (vph) for each transfer station, based on the constraints by number of unloading stalls. The formula used to calculate the vph is the number of unloading stalls multiplied by the vehicles per hour. The vehicles per hour are calculated by dividing 60 minutes by the unloading time

[1] The tonnage data changed as a result of a significant increase in commercial tonnage received at the transfer stations due to the private transfer stations using the County sites rather than delivering regional direct tonnage to the Cedar Hills landfill.

in minutes, which is based on the average unloading time per vehicle. The vph calculation was further split between commercial and self haul vehicles, as well as weekdays versus weekends, to ensure accuracy in the number of vehicles per hour each transfer station can reasonably sustain. Finally, because some transfer stations accept commercial vehicles on Saturdays, the weekend count of stalls available to self-haul was based on Sunday operations.

The transfer station evaluation identified the following constraints that would limit vehicle throughput:

- the number of unloading stalls on the tipping floor available to commercial and self haul vehicles,
- the average unloading time by type of vehicle,
- the amount of waste storage, or lack thereof, at each facility,
- the amount of space available on the inbound access road to store vehicles,
- the transaction time through the inbound scales, and
- the number of vehicles able to exit the site per hour through the outbound scales.

The analysis determined the primary constraining factor at all five transfer stations was the number of vehicles that can exit the site per hour, based on the average transaction times for processing payments at the outbound scales. This analysis resulted in a higher weekend vehicle capacity at the Algona station than the other stations due to the addition of a second outbound scale in mid-2004. It should also be noted only the core operating hours[2] for the Bow Lake station were considered in the vehicle analysis. The results of the vph calculations were compared to the constraining factors, and the lower of the two was used as the hourly sustainable operating capacity. The constraint analysis is included in Attachment A.

Next, the hourly vehicle counts provided by King County were compared to the hourly operating capacity (vph) at each transfer station. The hours where vehicles exceeded each transfer station's vph were counted and a percent of exceedence was calculated and assigned a LOS rating according to the scale in Table 2. All LOS greater than C in either 2004 or 2025 do not meet the criteria.

Criteria 6 - Tonnage Capacity

The formula used to calculate the sustainable tonnage per hour (tph) is the average payload by vehicle type (commercial and self haul) multiplied by the vehicles per hour from criteria 5.

The transfer station evaluation identified the following constraints that would limit tonnage throughput:

- the number of available stalls on the tipping floor for commercial and self haul vehicles,

[2] Bow Lake core operating hours are 8 am to 6 pm Monday through Friday, plus weekend hours.

- the average payload (tonnage capacity) and the average unloading time by type of vehicle,
- the number of transfer trailer exchanges per hour that a work crew could reasonably be expected to maintain throughout a work day,
- the amount of waste storage, or lack thereof, at each facility, and
- the transaction time through the inbound and outbound scales.

The analysis determined the constraining factor at all five transfer stations was the number of trailers that can be changed each hour. Based on the similar operational layout of the sites, the analysis resulted in the same constraint on each transfer station of 4 trailers per hour, or 74 tons per hour. For this analysis, all operating hours were included for the Bow Lake station. The results of the tph calculations were compared to the constraining factors, and the lower of the two (74 tons per hour) was used as the hourly sustainable operating capacity for the purposes of this analysis. The constraint analysis is included in Attachment A.

The hourly tonnage counts provided by King County were then compared to the hourly operating capacity (tph). The hours where tonnage exceeded the individual transfer station sustainable operating capacity were counted and a percent of exceedence was calculated and assigned a LOS rating. All LOS greater than C in either 2004 or 2025 were determined to not meet the criteria.

EVALUATION RESULTS

Criteria 5 - Vehicle Capacity

Table 3 – Criteria 5 Overall Vehicle Capacity Evaluation Results

Site	2004 LOS	Meets Criteria	2025 LOS	Meets Criteria
Algona	E	No	F	No
Bow Lake	C	Yes	E	No
Factoria	D	No	E	No
Houghton	E	No	F	No
Renton	B	Yes	D	No

Criteria 6 – Tonnage Capacity

Table 4 – Criteria 6 Overall Tonnage Capacity Evaluation Results

Site	2004 LOS	Meets Criteria	2025 LOS	Meets Criteria
Algona	D	No	E	No
Bow Lake	D	No	E	No
Factoria	C	Yes	E	No
Houghton	E	No	F	No
Renton	A	Yes	C	Yes

The preceding results by criteria are a summary of the overall (weekday and weekend combined) evaluation results. The data analyzed and full evaluation materials are included in Attachment B.

The 2004 results differed from the 2002 results for the following reasons:

- Operating capacity assumptions were adjusted to reflect current operations,
- Use patterns have changed, driven by increases in both self-haul and commercial traffic through the County's transfer stations, the latter as a result of the regional direct commercial loads passing through the King County sites,
- Vehicle capacity at Algona improved with the addition of a second outbound scale in mid 2004, and
- Bow Lake's expanded hours of operation allows commercial tonnage to be received 24 hours a day.

SUMMARY

The purpose of criteria 5 and 6 is to ensure that the transfer stations can accommodate the flow of both commercial and self-haul vehicles and solid waste tonnage during each station's hours of operation, now and for a 20-year planning horizon (2025).

Criteria 5 - Vehicle Capacity

Only two stations (Bow Lake and Renton) meet criteria 5 for vehicle capacity in 2004, and none of the stations will meet the criteria in 2025. Further analysis was conducted, which split the data into weekdays versus weekends. This analysis resulted in three stations (Algona, Factoria, and Renton) meeting the criteria in 2004 for weekends, but again none will meet the criteria in 2025. The weekday results were the same as the overall results, with two stations (Bow Lake and Renton) meeting the criteria in 2004 for weekdays.

It should be noted that the Factoria results exclude vehicle traffic for Household Hazardous Waste (HHW), which averages between 110 – 120 vehicles per day, Thursdays through Sundays. The reason for the exclusion is that these vehicles are not weighed and therefore are not captured in the transaction count data collected by King County that was used in this analysis.

Criteria 6 - Tonnage Capacity

Two transfer stations (Factoria and Renton) meet criteria 6 for tonnage capacity in 2004, and only Renton meets the criteria in 2025.

Appendix E

Transfer System Level of Service Criteria
Criterion 15:
Local Street Traffic Impact Evaluation for King County Transfer Stations

Attachment A

Local Street Traffic Impact Evaluation for King County Transfer Stations

Prepared for
King County Solid Waste Division

Prepared by
HDR Engineering, Inc.
500 108th Avenue NE, Suite 1200
Bellevue, WA 98004

March 4, 2005

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INTRODUCTION

King County is currently assessing existing conditions at five transfer stations in an effort to determine what improvements could be implemented at some or all of the facilities. The County is evaluating 19 measures of effectiveness, including but not limited to, travel time to the facility, time spent on site, recycling services meet goals, daily handling capacity, safety, meets local noise ordinances, and meets criteria for acceptable traffic impacts on local streets.

This technical report documents the analysis for addressing one of the 19 measures of effectiveness, specifically, Criteria 15 as follows:

15. *Meets Criteria for Acceptable Traffic Impacts on Local Streets*
    a) *Local intersections remain below capacity if additional traffic is added, as defined by the* Highway Capacity Manual
    b) *On average, traffic queues entering the transfer station do not spillover onto or impede local streets during 95 percent of the operating hours*

The five King County transfer stations that were evaluated are:

- Algona Station, located in the City of Algona and having immediate traffic impacts to Algona, Auburn and King County local streets,
- Bow Lake Station, located in the City of Tukwila and having immediate traffic impacts to Seatac, Kent, and King County local streets,
- Factoria Station, located in the City of Bellevue and having immediate traffic impacts to Bellevue local streets,
- Houghton Station, located in the City of Kirkland and having immediate traffic impacts to Kirkland, and
- Renton Station, located in the City of Renton and having immediate traffic impacts to Renton.

The methodology, data collection, and results for Criteria 15 are provided in detail in the following report.

METHODOLOGY

Intersection Analysis

For Criterion 15a, the traffic analysis software program Synchro/SimTraffic was used to analyze local intersections. Most agencies require the analysis of the weekday p.m. peak hour, because it is typically the time period that the local street system is experiencing the most traffic. Although traffic associated with King County transfer stations may not be the highest during the weekday p.m. peak hour, the total volume on the local street system will likely be higher during the weekday p.m. peak hour, than during an hour that demand is highest for a transfer station (typically on a weekend). For this reason the weekday p.m. peak hour was analyzed at each of the study intersections.

A traffic operational analysis (level of service (LOS) and volume-to-capacity calculation) was performed at the intersections selected by each host Agency deemed to be most impacted by transfer station traffic. LOS refers to the degree of congestion at an intersection, measured in average control delay, and based on the methodologies provided in the Highway Capacity Manual. LOS A represents free-flow conditions (motorists experience little or no delay and traffic levels are well below roadway capacity), LOS F represents forced-flow conditions (motorists experience very long delays, in excess of 80 seconds at signalized intersections

and more than 50 seconds at unsignalized intersections, and traffic levels exceed roadway capacity), and LOS B to E represent decreasing desirable conditions. A more detailed discussion of the LOS concept is presented in the technical report.

The volume-to-capacity ratio (v/c) is the peak hour traffic volume (vehicles/hour) at an intersection divided by the maximum traffic volume that the intersection can maintain. For example, when v/c equals 0.85, it can be said that peak hour traffic uses 85 percent of the intersection's capacity; or 15 percent of the capacity is not used. When v/c approaches 1.0 (e.g., 0.95), traffic flow becomes unstable such that small disruptions can cause traffic flow to break down and long traffic queues to form.

If an intersection operates at LOS F or exceeds a v/c of 1.0, Criteria 15a is not achieved.

As mentioned previously, each host Agency selected the intersections that they deemed to be most impacted by transfer station traffic, with the exception of the City of Renton. The intersections analyzed in the City of Renton were selected by the project team in the absence of recommendations directly from the City. Intersection p.m. peak hour turning movement counts and intersection channelization were either obtained directly from the host agency, or collected in the field. The selected intersections are as follows for each transfer station:

Algona

- West Valley Highway/Driveway
- West Valley Highway/15th Street SW
- West Valley Highway/1st Avenue N

Bow Lake

- Orillia Road/Driveway
- S. 188th Street/I-5 NB Ramp
- S. 188th Street/Military Rd.

Factoria

- Richards Road/SE 32nd
- Richards Road/Eastgate Way

Houghton

- 116th Avenue NE/NE 60th Street
- 116th Avenue NE/NE 70th Street
- 116th Avenue NE/I-405 NB ramps
- NE 60th Street/Driveway

Renton

- NE 3rd St/Edmonds Avenue NE
- NE 4th St/Jefferson Avenue NE
- NE 4th St/Union Avenue NE

Queue Analysis

For Criterion 15b, basic queuing theory as described in *Traffic Flow Fundamentals* (Adolf D. May, 1990) was applied to estimate the average queue formed at each transfer station weigh station upon entering. The equation used to estimate the average queue is as follows:

$$E(n) = (2\rho - \rho^2) \div (2(1-\rho))$$

$E(n)$ = average number in system (vehicle)
ρ = traffic intensity

$$\rho = \frac{\lambda}{\mu}$$

λ = mean arrival rate (vehicles per hour)
μ = mean service rate per lane (vehicles per hour)

In addition, the following assumptions were made in order to apply the above queuing equation to the available data:

- Vehicle arrival rate is assumed to be random, that is, vehicles do not arrive at transfer stations at equal increments of time, rather they arrive at "random" times.
- Vehicle service rate is assumed to be constant
- Traffic intensity (volume-to-capacity ratio) must be less than 1.0
- There is only one inbound scale at each transfer station

If the average vehicle queue exceeds the available storage capacity, then the queue is spilling over onto the local street system or impeding local street operations. The available storage capacity was defined as the distance from the inbound transfer station scale to the first driveway or intersection on a local street or a point on the local street at which the queue from the transfer station would impede non-transfer station traffic.

If the average queue exceeds the available storage capacity more than 95 percent of the operating hours, Criteria 15b is not met.

For Criteria 15b, transaction data entering each transfer station was obtained from King County, for every operating hour and every operating day in 2004. That data indicates the hourly demand for each transfer station by vehicle type. Based on two studies performed by King County in the mid 1990's at the Algona, Renton, Bow Lake, and 1st Avenue NE transfer stations, it was determined that the average time spent on the inbound scale is between 22 and 28 seconds. With these two pieces of data (hourly demand and average transaction time) the average vehicle queue waiting to be served entering a transfer station was calculated based on the equations listed above.

At one station, the Bow Lake Transfer Station, each hour was not analyzed. Out of the 22 hours of the day that Bow Lake is open, only the core hours of 8 am to 6 pm for weekdays and 8:30 am to 5:30 pm for weekends were analyzed, so that the data did not skew the results for hours where little traffic is experienced.

Forecasts

Both Criteria 15a and 15b were also analyzed based on 2030 projections, provided by King County. The Solid Waste Division developed the projections using its forecast model. This model predicts waste disposal based on such factors as growth in population, employment, income, and assumptions about additional recycling activity.

RESULTS

Intersection Analysis

The results for Criteria 15a, the intersection operational analysis, are summarized in **Tables 1** and **2** for existing conditions (2005) and 2025, respectively. In 2005, the Algona, Factoria, and Renton transfer stations all meet current intersection LOS standards (Criteria 15a). Both the Bow Lake and Houghton transfer stations have one intersection that does not meet the current intersection LOS standard, meaning, the intersection is LOS F and/or the v/c ratio is greater than or equal to 1.0. At Bow Lake, it is estimated that if there were no vehicles related to the transfer station at the intersection, the intersection would operate below capacity. Conversely, at the Houghton station, the intersection exceeds capacity even without traffic associated with the transfer station.

By 2025, all of the transfer stations have at least one over-capacity intersection impacted by the transfer station, with or without additional growth at the transfer station (see **Table 2** and **Figure 2**)

Figures 1 and **2** illustrate the same information presented in **Tables 1** and **2**, graphically.

Table 1

Criteria 15a - Existing Conditions (2005) Analysis Summary

			Existing w/o Transfer Station				Existing w/ Transfer Station			
Facility	Intersection		Delay (sec/veh)	LOS	V/C	Meets Criteria?	Delay (sec/veh)	LOS	V/C	Meets Criteria?
Algona	W/H Driveway	STOP	[illegible]	[illegible]	0.62	YES	[illegible]	E	[illegible]	YES
	W/H/Gill St		22.0	C	0.73	YES	22.0	C	0.85	YES
	W/H/1st Ave	STOP	41.3	E	[illegible]	YES	41.0	E	[illegible]	YES
[illegible]	[illegible]	STOP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Factoria	Richards Rd/32nd St		13.2	B	0.48	YES	15.1	B	0.50	YES
	Richards Rd/Eastgate		31.5	C	0.81	YES	31.2	C	0.81	YES
Houghton	116th Ave/60th St	STOP	18.8	C	0.80	YES	19.3	C	0.81	YES
	116th Ave/70th St		55.1	E	1.00	NO	55.3	E	1.00	NO
	116th Ave/I-405 NB Ramp		33.7	C	0.93	YES	34.3	C	0.93	YES
	60th St/Driveway	STOP	n/a	n/a	0.08	YES	9.4	A	0.08	YES
Renton	3rd St/Edmonds Ave		13.9	B	0.67	YES	13.9	B	0.67	YES
	4th St/Jefferson Ave		15.6	B	0.75	YES	15.6	B	0.75	YES
	4th St/Union Ave		17.0	B	0.72	YES	17.0	B	0.72	YES

Notes:

1. = signalized intersection, STOP = stop-controlled intersection
2. Delay, or control delay, is measured in seconds per vehicle, and is a measure of all the delay contributable to traffic control measures, such as signals or stop signs. At signalized intersections and all-way stop-controlled intersections, the reported delay is the average of all the control delay experienced for all movements. At one-way and two-way stop-controlled intersections, the reported delay is for only one movement, the movement experiencing the worst control delay, which is typically one of the stop-controlled side street approaches. The control delay reported at two-way stop-controlled intersections is not a valid indication of the operations of the entire intersection.
3. LOS refers to Level of Service and is based on the methodologies outlined in the 2000 *Highway Capacity Manual*. LOS is rated from "A" (low delay) to "F" (delay in excess of 80 seconds per vehicle at signalized intersections, and 50 seconds at unsignalized intersections).
4. V/C = volume-to-capacity ratio
5. n/a = not available because this intersection is stop-controlled and the movement experiencing the worst control delay would be the movement exiting the transfer station, and because this scenario assumes no traffic associated with the transfer station, there is no control delay to report.

Table 2

Criteria 15a - Future Conditions (2025) Analysis Summary

Facility	Intersection		2025 w/o Growth at Transfer Station				2025 w/ Growth at Transfer Station			
			Delay (sec/veh)	LOS	V/C	Meets Criteria?	Delay (sec/veh)	LOS	V/C	Meets Criteria?
[redacted]										
Factoria	Richards Rd/32nd St		24.2	C	0.76	YES	26.6	C	0.79	YES
	Richards Rd/Eastgate		>110	F	1.23	**NO**	>110	F	1.23	**NO**
[redacted]										
Renton	3rd St/Edmonds Ave		21.8	C	0.95	YES	21.8	C	0.95	YES
	4th St/Jefferson Ave		17.8	B	0.85	YES	18.4	B	0.86	YES
	4th St/Union Ave		90.6	F	1.13	**NO**	91.3	F	1.13	**NO**

Notes:

1. = signalized intersection, = stop-controlled intersection
2. Delay, or control delay, is measured in seconds per vehicle, and is a measure of all the delay contributable to traffic control measures, such as signals or stop signs. At signalized intersections and all-way stop-controlled intersections, the reported delay is the average of all the control delay experienced for all movements. At one-way and two-way stop-controlled intersections, the reported delay is for only one movement, the movement experiencing the worst control delay, which is typically one of the stop-controlled side street approaches. The control delay reported at two-way stop-controlled intersections is not a valid indication of the operations of the entire intersection.
3. LOS refers to Level of Service and is based on the methodologies outlined in the 2000 *Highway Capacity Manual*. LOS is rated from "A" (low delay) to "F" (delay in excess of 80 seconds per vehicle at signalized intersections, and 50 seconds at unsignalized intersections).
4. V/C = volume-to-capacity ratio
5. n/c = the volume-to-capacity ratio exceeds calculable limits.

Figure 1
Criteria 15a - Existing Conditions (2005) Analysis Summary

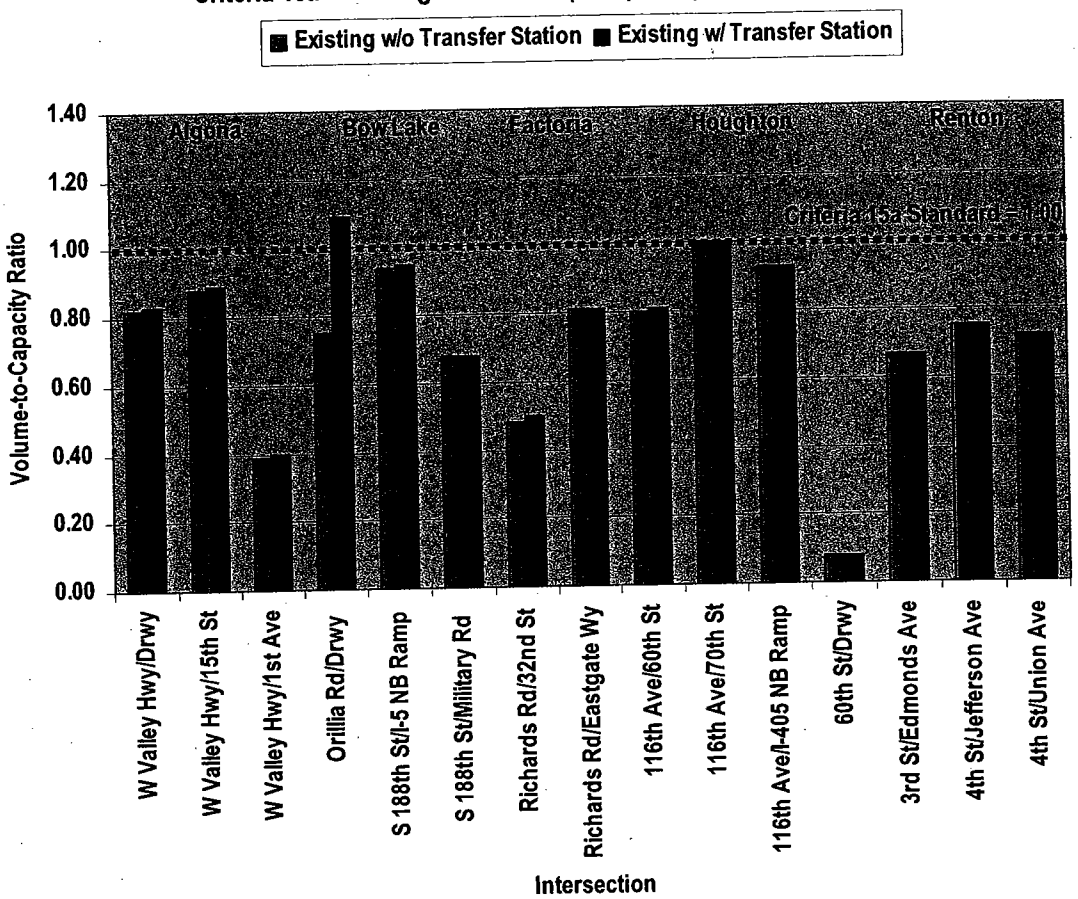
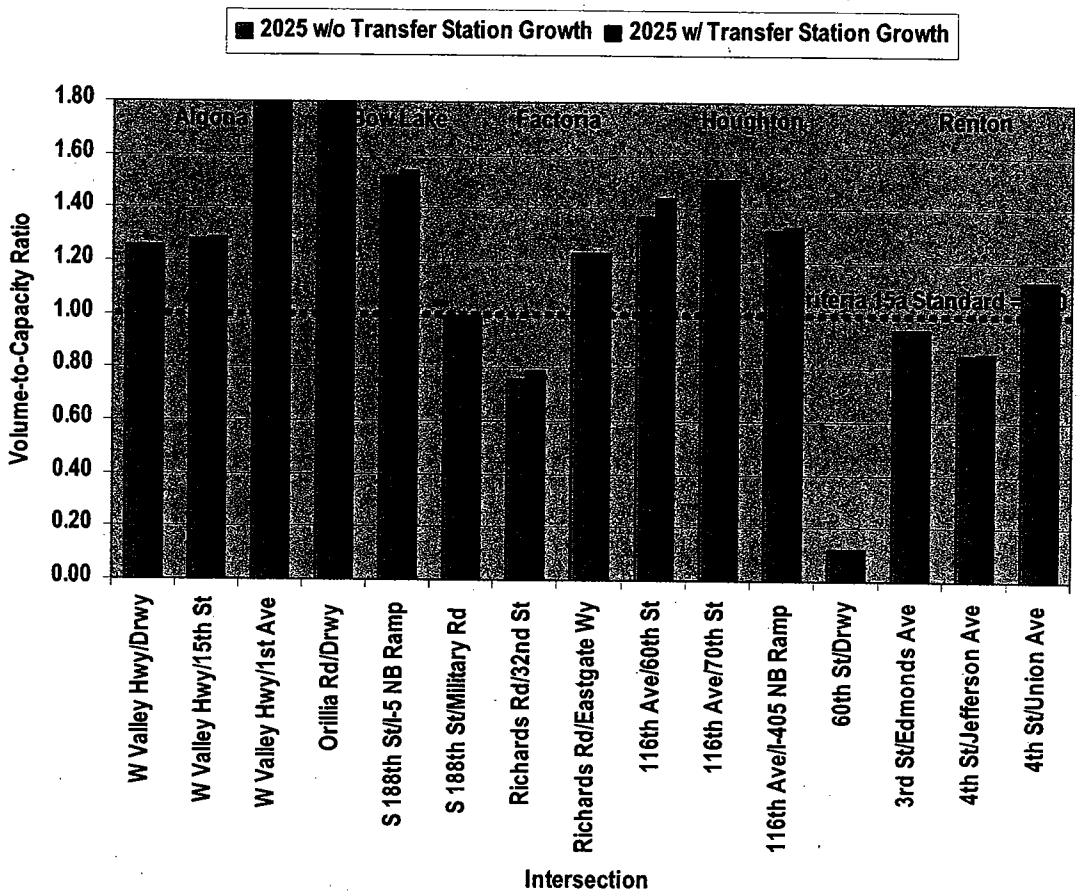


Figure 2
Criteria 15a - Future Conditions (2025) Analysis Summary



Queue Analysis

In order to determine if the average queue at each of the transfer stations exceed available storage, the average vehicle length must be calculated. The average vehicle length was calculated based on the mix of passenger cars versus transfer station trucks at each facility, and assuming 25 feet per passenger car and 75 feet per transfer station truck. The average vehicle length is summarized in **Table 3**.

Table 3
Average Queue Capacity by Site

Facility	Average Vehicle Length (feet)	On-Site Queue Capacity	
		Length (feet)	No. of Vehicles
Algona	27.4	135	4
Bow Lake	32.5	476	14
Factoria	26.8	64	2
Houghton	28.6	346	12
Renton	26.5	70	2

Notes:

1. The average vehicle length was calculated based on the average mix of passenger cars versus transfer station trucks at each facility, and assuming 25 feet per passenger car and 75 feet per transfer station truck.
2. The queue capacity was provided by King County and is the distance from the weigh station to the first off-site intersection or driveway that would be impacted by the queue of vehicles at the transfer station.

The 2004 existing condition results of the Criteria 15b analysis, queuing, are presented in **Table 4**. Based on all data available in 2004 from January to December, only the Renton transfer station meets Criteria 15b, where traffic queues entering the transfer station do not spillover onto or impede local streets during 95 percent of the operating hours. The data was further analyzed to determine if the majority of the off-site queuing took place on the weekend or weekday. In fact, all of the transfer station sites would meet the queue criteria on a weekday, i.e. none of the sites queue off-site more than 95 percent of the operating hours on a weekday. Conversely, all of the transfer stations fail the criteria 15b on weekends.

Table 4
Criteria 15b – Queue Capacity Analysis Summary
All Days in 2004

Facility	Days of Week Analyzed	Total Hours Analyzed	No. of Hours Queue Exceeds Capacity	Percent of Hours Queue Exceeds Capacity	Meets Criteria?
Factoria	Weekday	4,010	35	1%	YES
	Weekend	1,018	415	41%	**NO**
	All Days	5,028	450	9%	**NO**
Houghton	Weekday	2,485	15	1%	YES
	Weekend	1,014	171	17%	NO
	All Days	3,499	186	5%	YES
Renton	Weekday	2,658	1	0%	YES
	Weekend	1,022	81	8%	**NO**
	All Days	3,680	82	2%	YES

It should be noted that at the Bow Lake transfer station, the analysis for Criteria 5, which evaluated the on-site capacity of each transfer station, indicated that station has adequate capacity (LOS C) in 2005 on site to handle existing traffic flows. Therefore, the fact that Bow Lake does not meet the off-site queue criteria would indicate that the off-site queue is not related to the on-site capacity for this station. Rather, the constraint is the process time at the scale.

King County implemented new operating hours and made some functional changes at all of the transfer stations in the latter half of 2004, specifically July to December. As a result, the queue data was re-analyzed using data from only the latter half of the year to determine if the hours of operation and functional changes would have made a difference with respect to off-site queuing. **Table 5** summarizes the queue analysis results for data represented by July to December 2004. Both Renton and Houghton meet Criteria 15b, when only the latter half of 2004 is analyzed. as well. Similar to the data analysis for the full year, all of the sites meet Criteria 15b on a weekday, while none of them meet the criteria on a weekend. With the exception of the Algona transfer station, all of the transfer stations experienced fewer occurrences of the queue spilling over onto City streets or impeding traffic flow.

Table 5
Criteria 15b – Queue Capacity Analysis Summary
July to December in 2004

Facility	Days of Week Analyzed	Total Hours Analyzed	No. of Hours Queue Exceeds Capacity	Percent of Hours Queue Exceeds Capacity	Meets Criteria?
Factoria	Weekday	1,786	26	1%	YES
	Weekend	490	184	38%	**NO**
	All Days	2,276	210	9%	**NO**
Houghton	Weekday	1,199	14	1%	YES
	Weekend	489	69	14%	**NO**
	All Days	1,688	83	5%	YES
Renton	Weekday	1,326	1	0%	YES
	Weekend	493	29	6%	**NO**
	All Days	1,819	30	2%	YES

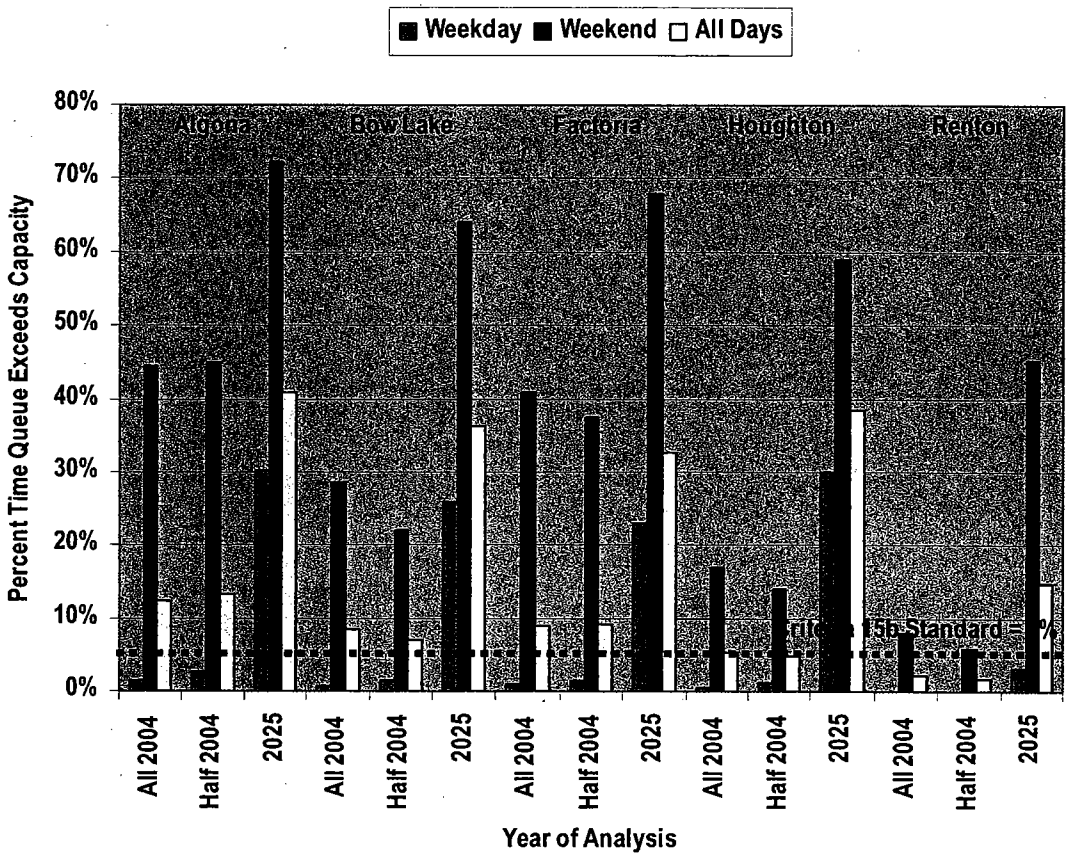
Table 6 summarizes the queue analysis based on 2025 projections of transfer station use. By 2025, none of the facilities will satisfy Criteria 15b, with queues extending off-site between 15 and 41 percent of the time, depending on the location. In fact, even weekdays will experience queue failure at all the transfer stations, with the exception of Renton.

Table 6
Criteria 15b – 2025 Queue Capacity Analysis Summary

Facility	Days of Week Analyzed	Total Hours Analyzed	No. of Hours Queue Exceeds Capacity	Percent of Hours Queue Exceeds Capacity	Meets Criteria?
Factoria	Weekday	1,786	412	23%	**NO**
	Weekend	490	333	68%	**NO**
	All Days	2,276	745	33%	**NO**
Houghton	Weekday	1,199	360	30%	**NO**
	Weekend	488	288	59%	**NO**
	All Days	1,687	648	38%	**NO**
Renton	Weekday	1,326	43	3%	YES
	Weekend	493	223	45%	**NO**
	All Days	1,819	266	15%	**NO**

Figure 3 illustrates the data provided **Tables 4, 5**, and **6**, graphically.

Figure 3
Criteria 15b – Queue Capacity Analysis Summary

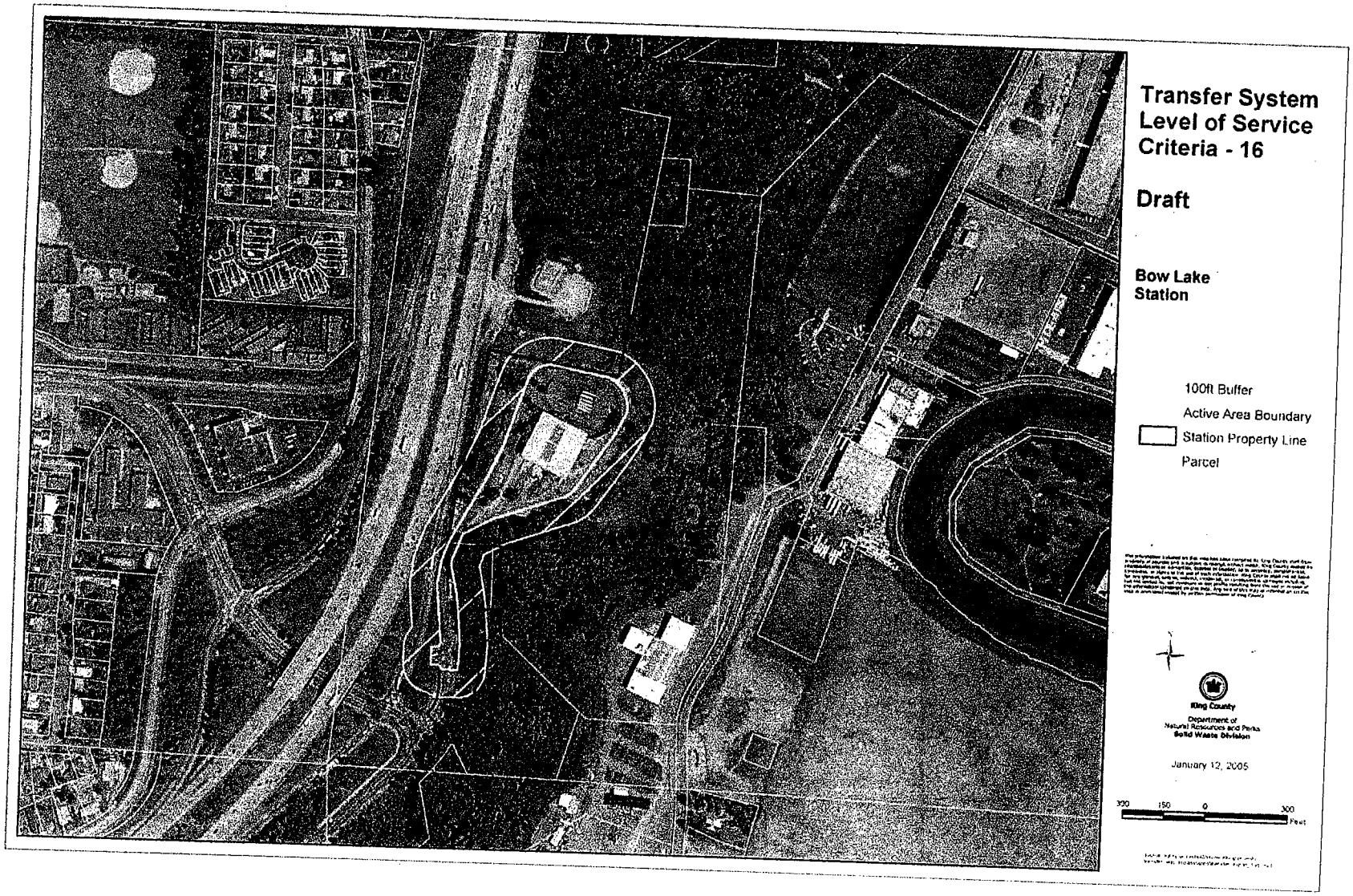


Attachment A

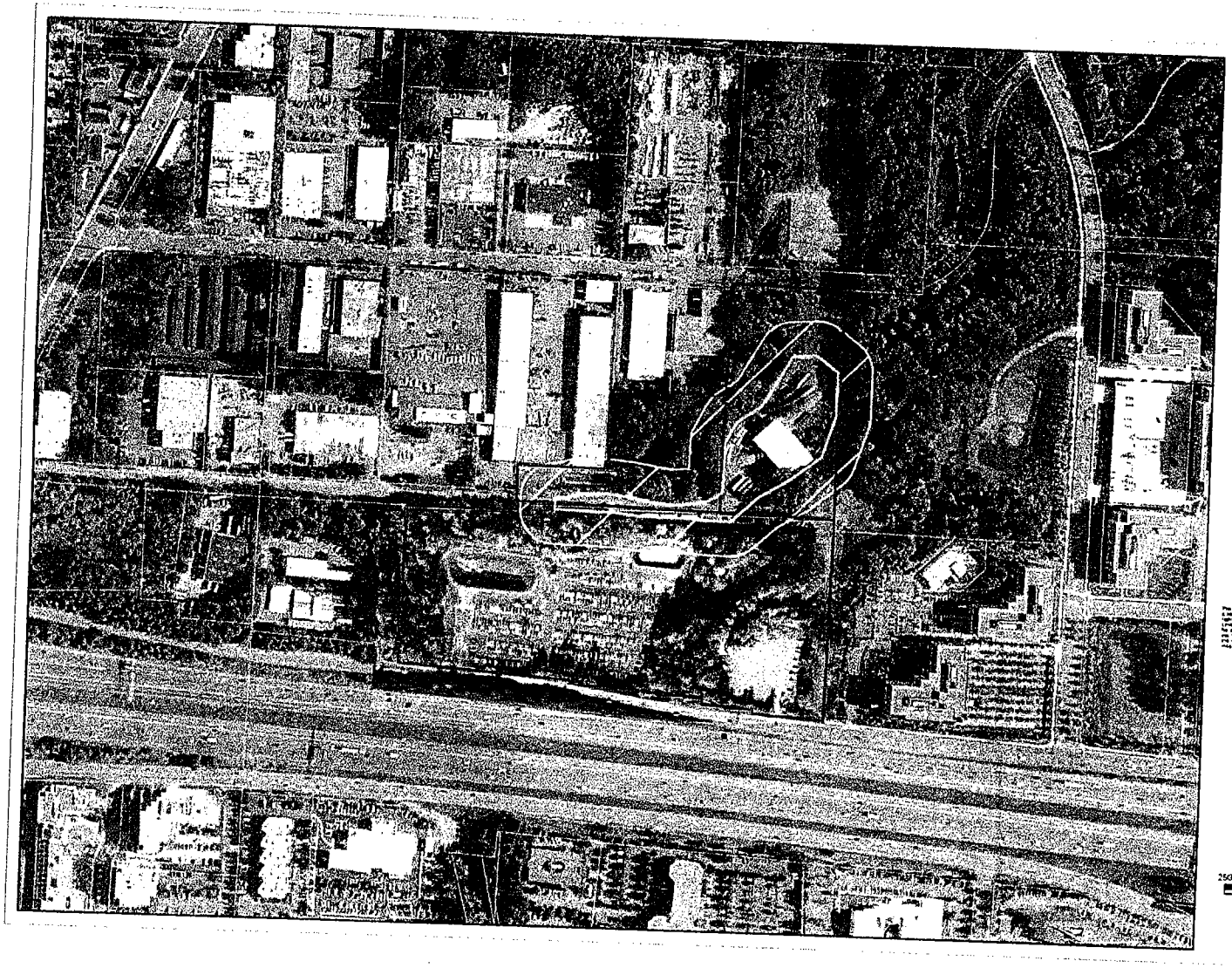
Appendix F

Maps Showing Application of Criterion 16

Attachment A



Attachment A



Transfer System Level of Service Criteria - 16

Draft

Factoria Station

100ft Buffer

Active Area Boundary

Station Property Line

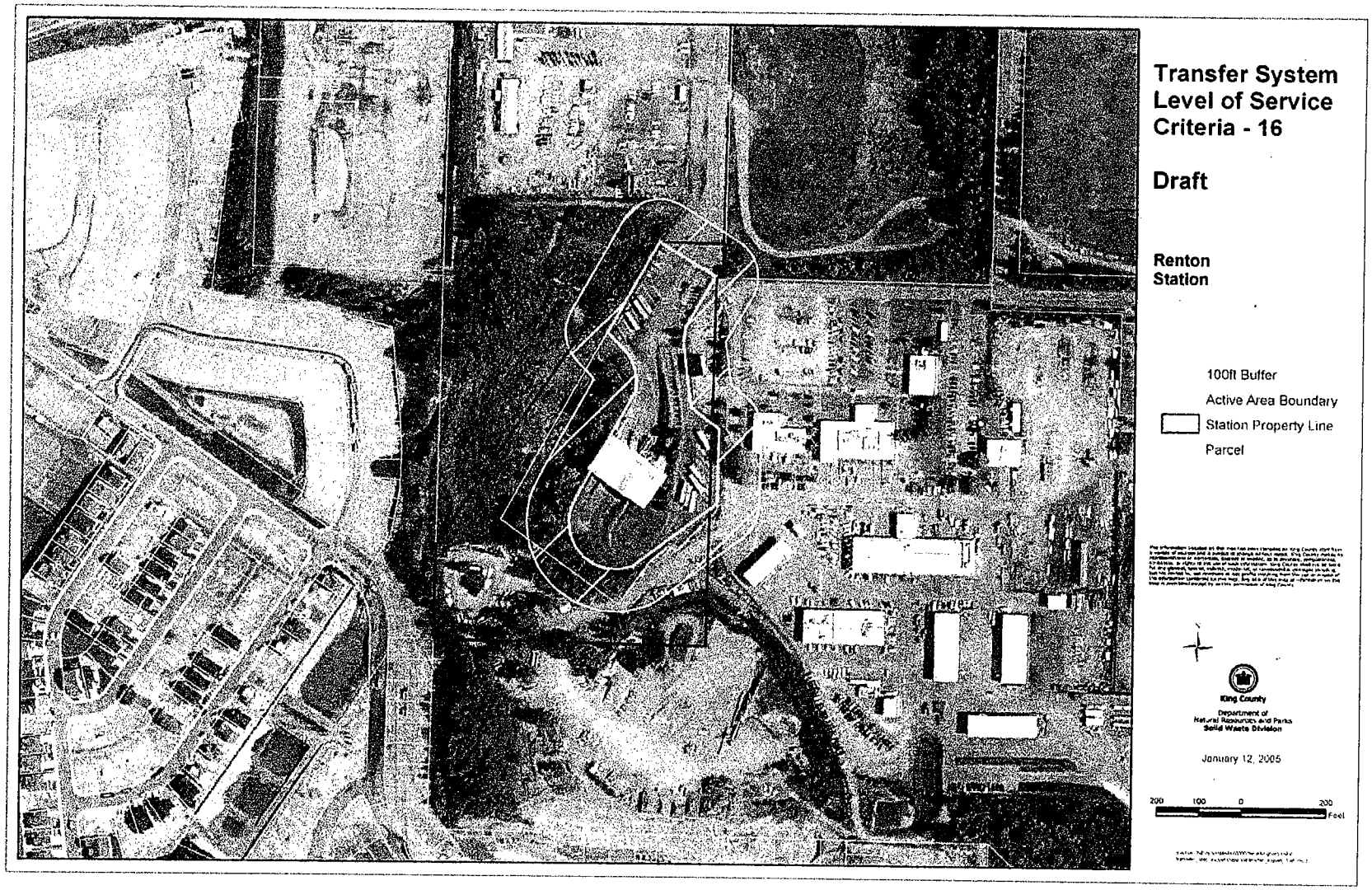
Parcel

King County
Department of
Natural Resources and Parks
Solid Waste Division

January 12, 2005

250 125 0 250
Feet

Attachment A


Transfer System
Level of Service
Criteria - 16
Draft
Renton
Station
100ft Buffer
Active Area Boundary
Station Property Line
Parcel
King County
Department of
Natural Resources and Parks
Solid Waste Division
January 12, 2005
200
100
0
200
Feet