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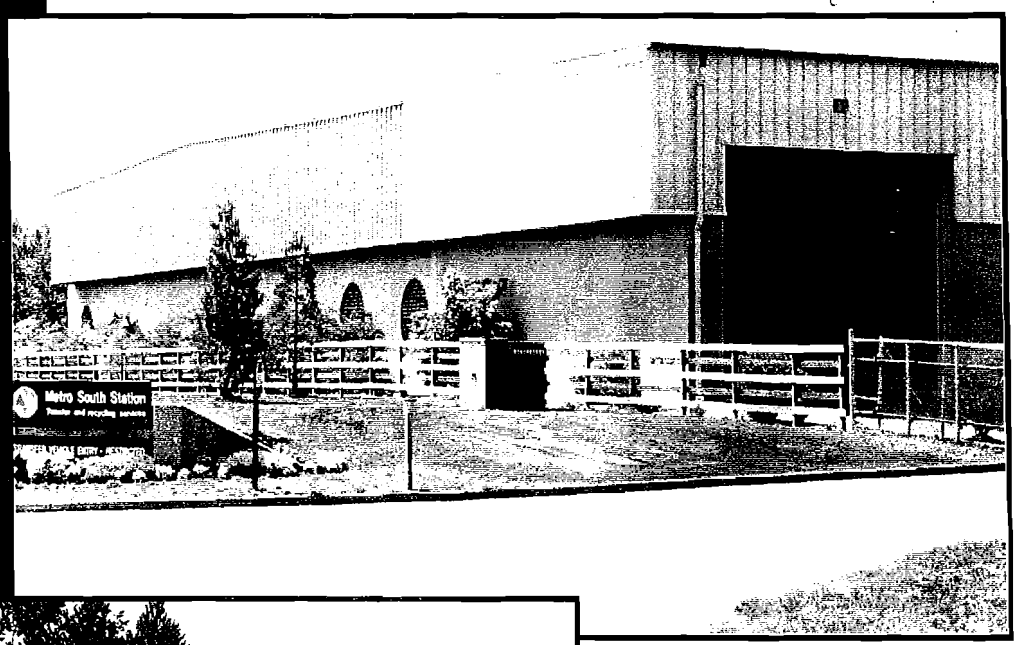
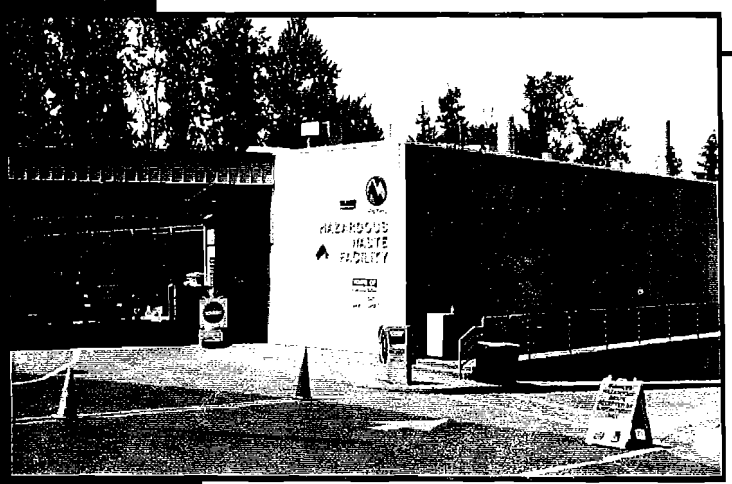
METRO

Master Plan for Solid Waste Facilities at Metro South Station and Metro Central Station





Prepared By:

URS

2001

DISCLAIMER

This document has been prepared under the supervision and direction of a registered Professional Engineer.

Some of the background information and data has been furnished to URS Corporation by Metro and the separate Station operators, and has been used in preparing this Plan. URS Corporation has relied on this information as furnished and, in some cases, has not confirmed the accuracy of this information.

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

Metro is responsible for the disposal of solid waste generated by the residents and businesses within the Urban Growth Boundary that includes Multnomah, Washington and Clackamas counties. This responsibility includes meeting the region's state-mandated recycling and materials recovery goals.

The Regional Environmental Management Department (REM) within Metro manages the agency's solid waste disposal and recycling programs. The document that guides the department's work is known as the Regional Solid Waste Management Plan (RSWMP).

The original RSWMP, adopted in 1974, was revised in 1988 and 1996. The current plan established goals and objectives to be achieved by 2005. One of the key goals of the 1996 RSWMP was to eliminate the need to build a new publicly owned, regional transfer station. The plan recommends that the region can avoid the cost of a new facility by improving its waste reduction, recycling and operations of the existing transfer stations.

An important result of the 1996 RSWMP was a decision by Metro to develop a Master Facility Plan for its existing transfer stations. The plan, written in 1999, provided a guide for the growth and operation of:

- Metro South Station (MSS) in Oregon City, and
- Metro Central Station (MCS) in Northwest Portland.

This 2001 Master Facility Plan is an update of the 1999 Plan. Improvements completed since the 1999 Plan and proposed improvements to meet growing demands of each station are presented in this 2001 Plan.

2.0 GOALS OF 2001 MASTER FACILITY PLAN

The 2001 Master Facility Plan provides Metro with the information and recommendations necessary to meet the growing demands for managing the region's solid waste. This plan, like the one developed in 1999, is based on the following goals to:

- Improve waste recovery and recycling.
- Reduce traffic congestion and improve traffic circulation.
- Maximize station efficiencies.
- Improve facilities for Metro and Station operator personnel.
- Reduce energy consumption.

These goals, essential in the 1999 plan, remain the fundamental factors in 2001. The region's growth and DEQ mandates for material recovery provide an important context for how Metro's facilities will operate in the new century. The increasing costs of recovery, congestion and energy define the value of a Master Facilities Plan update.

The following assumptions guide the 2001 plan development:

- There will be no restrictions on the public self-haul to the transfer stations.
- The region will not build a new, publicly owned transfer station.
- The public use of the transfer stations will continue to grow.
- The commercial use of the transfer stations will decrease slightly.

The 2001 plan was developed through research of facility histories and current activities. The URS team met with Metro managers and operators, as well as private sector representatives, to review facility operations, requirements and possible improvements. These meetings provided important ideas and information that assisted the development of the 2001 Master Facility Plan.

3.0 DEVELOPMENT RESTRAINTS

Each transfer station site has restraints that define their respective development options. Neither site is large (Metro South is11.47 acres; Metro Central is 6.0 acres) and the existing facilities limit the opportunities for innovative changes to accommodate growing waste and traffic volumes.

The Metro South Station has a further restraint in that much of the site is below the 100-year flood plain. The 1996 flood demonstrated the site's vulnerability to flooding and the concern for new developments below the 100-year flood plan.

4.0 METRO SOUTH STATION (MSS)

Nine different improvements were proposed and are included in this Master Facility Plan Update. Their advantages and costs are summarized as follows:

Description	Drawing	Advantages	Construction Cost
Maintenance Facility	MSS-07	• Improves maintenance capability • Improves personnel facilities	$472,000
New Personnel Facilities	MSS-05 MSS-05A MSS-06	• Improves personnel facilities • Provides space for meetings and conferences • Provides storage space	West end: $902,000 Control room: $219,000
Transfer Building Addition	MSS-03	• Increases recycling opportunities • Increases station capacity • Improves operations	$744,000
Baler Addition	MSS-04	• Provides more flexibility for recycling	$775,000
Sanitary Sewer Improvements	MSS-10	• Provides more reliability • Reduces need for mechanical pumping	$166,000
Energy/Lighting Improvements	--	• Reduces energy consumption	$32,000
Wood Processing Addition	MSS-08	• Provides more flexibility for wood processing • Reduces cost for overall wood processing	$804,000
Perimeter Sidewalk Addition	MSS-01 MSS-07	• Provides pedestrian safety • Meets Oregon City requirements	$52,000
Compactor Addition	MSS-09	• Provides flexibility for transfer operations • Increases capacity of station	$1,504,000

5.0 METRO CENTRAL STATION (MCS)

Thirteen different improvements were proposed and are included in this Master Facility Plan Update. Their advantages and costs are summarized as follows:

Description	Drawing	Advantages	Construction Cost
Woodroom Improvements: Alternate 1: Modify Existing System	MCS-02 MCS-03	• Simplifies system at reduced cost	$194,000
Alternate 2: New Wood Processing	MCS-04 MCS-05	• More efficient system • Reduces labor and energy costs	$832,000
Alternate 3: Alternate Location for New Wood Processing System		• Increases floor space	$872,000
Alternate 4: Increase Floor Space		• Increases storage capacity	$236,000
SSI No. 1 Conveyor Relocation	MCS-08	• Improves operations • Increases transfer capacity	$396,000
Column Removal	MCS-09	• Provides more flexibility for waste movement • Improves operations	$305,000
Addition to Metro Office	MCS-11	• Improves traffic circulation • Provides more flexibility for operations	$124,000
Relocation of Scale House C: Revised Traffic Patterns	MCS-06 MCS-07	• Improves traffic circulation • Provides more flexibility for operations	$277,000
Truck Wash Improvements	MCS-12	• Reduces water usage	
Energy/Lighting Improvements	MCS-10	• Improves lighting • Reduces energy consumption	$207,000
Ventilation Improvements	--	• Improves personnel	Study: $15,000 Sound Attenuators: $94,000
Chimney Removal	--	• Reduces seismic risk	$175,000
Relocation of Scale House B	MCS-01	• Improves operations • Allows for HHW expansion	$126,000
Miscellaneous Improvements	--	• Improves operations	Water Lines: $15,000 Push Wall Repair: $10,000 U-Drains: $34,000

1.1 HISTORY OF METRO

The Metropolitan Service District, now known as Metro, was formed in 1979 as a directly elected regional government with a range of responsibilities and funding authority for its obligations through user fees, bond measures, property taxes, and mapping services.

In 1992, voters approved a home-rule charter that granted Metro the primary responsibility for regional land-use and transportation planning. The charter also describes Metro's role in solid waste management, arts and cultural facilities, parks and the zoo.

The history of Metro's growth as a regional agency is essential to its future. Its early assignments, including the St. Johns Landfill and zoo, were difficult but important management roles. These examples demonstrate the value of a multi-jurisdictional approach to managing resources and facilities that cross government boundaries in serving citizens and businesses.

Today, Metro serves 1.3 million residents in Clackamas, Multnomah, and Washington counties, and the 24 cities within its Urban Growth Boundary. These relationships are important to the agency's success. Local decisions affect regional policy on solid waste, land use, and transportation. These issues provide the rationale for why Metro was given the responsibility of providing long-range regional solid waste, growth management, and transportation planning in the tri-county metropolitan area. A regional approach can assist cities and counties coordinate services with their neighbors.

The growth and importance of regional facilities is reflected in the following list of what Metro owns, operates or manages:

- The Washington Park Zoo
- The Oregon Convention Center
- The Exposition Center
- The Metro South Transfer Station in Oregon City
- The Metro Central Transfer Station in Northwest Portland
- The St. Johns Landfill
- Blue Lake, Oxbow and Chinook Landing Parks, Gleason Boat Ramp, Glendoveer Golf Course, Pioneer Cemeteries, Smith and Bybee Lakes
- The Portland Center for the Performing Arts

Metro's facilities serve millions of people each year. All of these services are part of a regional system that supports Metro's mission: to manage growth. This mission is defined by a set of regional values identified by its citizens that reflect the importance of growth management:

- Access to Nature

- Clean Air and Water
- Safe and Stable Neighborhoods
- Resources for Future Generations
- A Strong Regional Economy
- The Ability to Travel Safely Throughout the Region

1.2 METRO'S ROLE IN THE SOLID WASTE SYSTEM

Metro has regional authority for the disposal of solid waste and achieving state-mandated recycling and recovery goals. The Regional Environmental Management Department (REM) is responsible for implementing Metro's solid waste disposal authority and recycling goals. REM provides the following specific services:

- Oversees the operation of two Metro-owned regional solid waste transfer stations, under contract to a private company, and one privately owned transfer station.
- Operates two Metro-owned hazardous waste facilities and offers free household hazardous waste disposal events.
- Negotiates long-term contracts for the transport and disposal of the region's solid waste.
- Oversees a system of franchises and licenses to regulate privately owned and operated solid waste disposal sites in the region.
- Oversees the closure of the St. Johns Landfill.
- Operates the Metro Recycling Information Hotline, which provides information on recycling, composting, waste prevention and other environmental practices to over 100,000 callers each year.
- Offers waste prevention and reduction education to 10,000 school students each year.
- Provides information on composting, recycling and waste prevention to private citizens and business groups.
- Develops and administers the **REGIONAL SOLID WASTE MANAGEMENT PLAN**, which includes policy direction for meeting waste prevention and reduction goals to the year 2005.

Metro's Regional Environmental Management Department has completed important solid waste responsibilities including the:

- Successful closure of the St. Johns Landfill and a purchase agreement for landfill gas.
- Design, construction and modification of two, regional, state-of-the-art transfer stations.
- Completion of a long-term solution for the safe disposal of the Metro region's solid waste at the Columbia Ridge Landfill near Arlington, Oregon.

- Re-negotiation of large service contracts with private operators for the processing, transfer and disposal of the region's waste to provide savings for the citizens and businesses.
- Achievement of a 56 percent recycling rate in the Metro region.

1.3 THE REGIONAL SOLID WASTE MANAGEMENT PLAN

Metro, then known as the Metropolitan Service District (MSD), adopted the first Solid Waste Management Plan in 1974. A formal revision of the 1974 Plan was adopted in 1988 and the new document was called the Regional Solid Waste Management Plan (RSWMP).

Since 1988, there have been specific revisions to chapters which addressed yard debris, hazardous waste, special wastes, waste reduction, and facilities. In 1996, a formal revision was made to the RSWMP that emphasized waste prevention and reduction.

The 1996 RSWMP was developed as a comprehensive approach to achieve a solid waste system that is regionally balanced, environmentally sound, cost effective, technologically feasible, and acceptable to the public. It established goals and objectives for 2005 to:

- Increase the region's recycling rate to 56%.
- Exceed the state's mandated recovery goal of 50%.
- Recycle an additional 200,000 tons of waste annually by establishing targets and programs for increased source separation, diversion of food wastes and public education.
- Eliminate the need for a new publicly owned transfer station through waste reduction and the development of privately owned solid waste facilities.

A primary objective of the 1996 RSWMP is that the region will not require a new publicly owned transfer station. This important policy consideration is supported by the continued development of privately owned materials recovery facilities that will reduce the volume of recyclable materials and commercial collection companies at the Metro stations.

A factor of equal importance, however, is that waste volumes and traffic counts continue to increase at Metro's transfer station through their growing use by public customers and private contractors. This trend allows Metro to commit its resources and this Master Facility Plan for the long-range development of its existing transfer stations.

The 2001 Master Facility Plan specifically addresses the development of these facilities:

- Metro South Station (Oregon City)
- Metro Central Station (Northwest Portland)

1.4 METRO FACILITIES

Today, the following three transfer stations provide waste transfer services for the entire Metro region:

- Metro South Station (MSS)
- Metro Central Station (MCS)
- Forest Grove Station

Metro South and Metro Central are publicly owned facilities. They were built by Metro and are operated by private firms under contract to the agency. The Forest Grove Station is a privately owned and operated facility.

These facilities accept waste from public customers and private firms, which is transferred to tractor/trailer units and delivered to landfills. The wastes from Metro South and Metro Central are sent to the Columbia Ridge Landfill, 150 miles east of Portland, near Arlington, Oregon. The Forest Grove Station wastes are delivered to the Riverbend Landfill, 40 miles west of Portland, near McMinnville, Oregon.

Metro's publicly owned facilities process and transfer about 50% of the solid waste generated by the region. As a result, the 2001 Facilities Master Plan Update focuses on the Metro South and Metro Central stations.

A summary of the total tonnages delivered to these two facilities over the last five years is as follows:

	Metro South (tons)	Metro Central tons)
1996	385,524	376,818
1997	376,850	392,508
1998	370,700	388,900
1999	350,800	378,200
2000	334,200	342,800

The amount of recycled materials historically recovered from the waste streams is 7% to 8% at Metro Central and 2% at Metro South.

1.5 ADDITIONAL REGIONAL FACILITIES

The opportunity for private sector innovation in the solid waste system has created a diverse array of other facilities that can respond to rapidly changing technologies, fluctuating markets, and local conditions.

A number of private facilities, before or after the 1996 RSWMP, have been developed in response regional to solid waste system needs in the region. Figure 1.1, obtained from the RSWMP, provides a list of many of these facilities. This list, which reflects the 1996 data, is incomplete because more Materials Recovery Facilities (MRF) have been or are under development. The demand for these facilities will continue to grow throughout the decade.

Metro reviews applications for private processing facilities and monitors the solid waste system to determine if the region has sufficient and accessible dry waste processing capacity.

1.6 MASTER FACILITY PLAN OBJECTIVES

The objectives of the 2001 Master Facility Plan Update are to assess the current facilities and operations at the Metro South and Metro Central Stations, consider future needs, develop concepts for facilities improvements, and present these improvements in a plan that allows development to meet expected demands.

This Master Facility Plan provides Metro with the proper tools for the development and renovation of its existing stations to meet the ever-changing solid waste management needs of the Tri-County region.

The additions and modifications proposed in this Master Facility Plan have been developed based on the following goals agreed upon with Metro:

- To improve waste recovery and recycling
- To maximize operation efficiencies
- To reduce traffic congestion and improve circulation
- To improve facilities for both metro and operation personnel
- To improve energy efficiency

These goals are based upon the following key assumptions:

- The region will not construct a new, publicly owned regional transfer station.
- The region will place no restrictions on public self-haul to the transfer stations
- The region will serve the growing use of the transfer stations by private citizens and contractors.
- Private material recovery facilities (MRFs) may reduce the volumes of recoverable materials and commercial customers at the transfer stations.

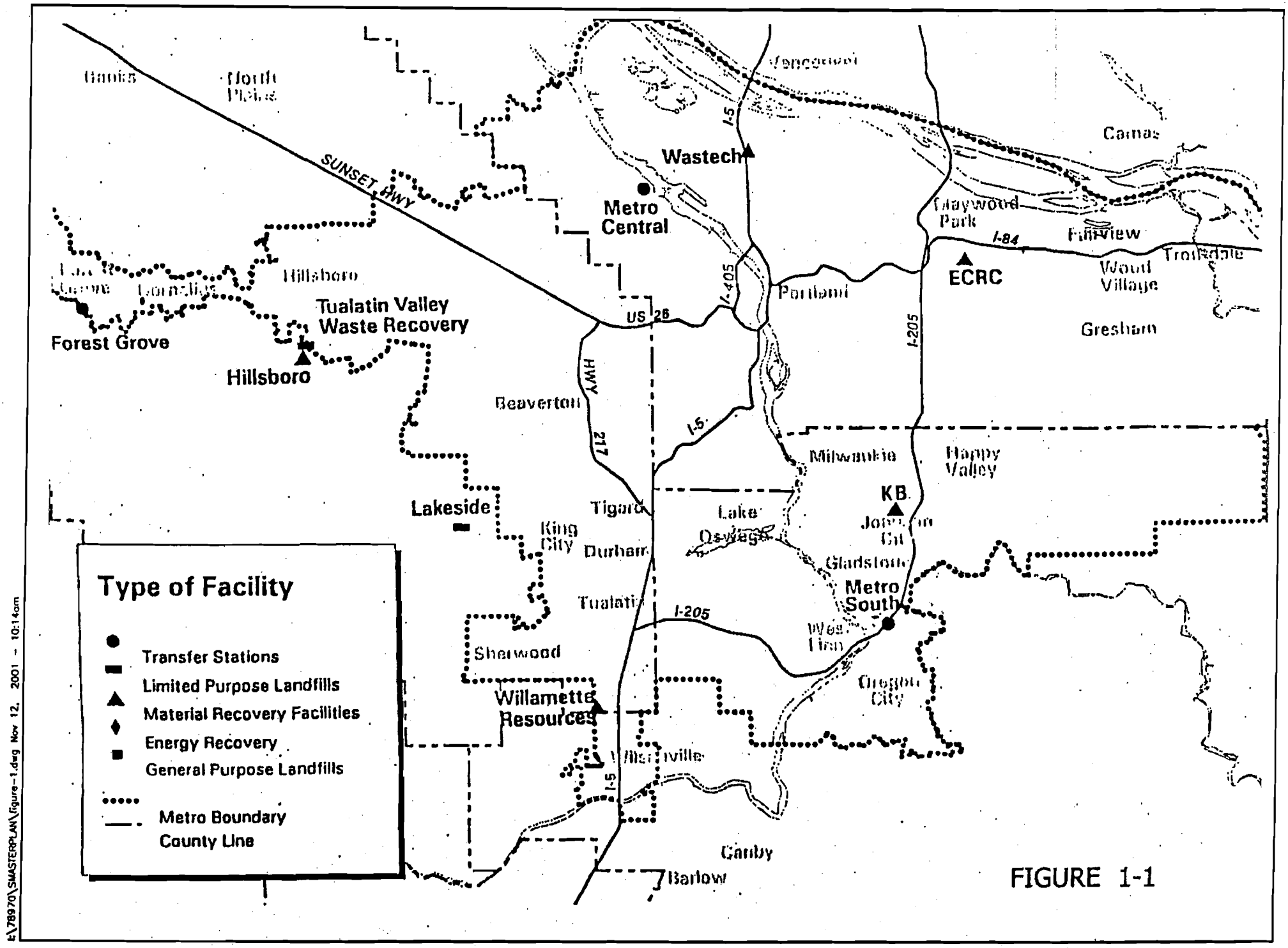


FIGURE 1-1

1.7 METHODOLOGY

This report, in the sections that follow, provides an overview of the existing facilities and their respective developments since original construction, describes the constraints on site development, and presents alternatives for facility improvements that meet the objectives of station planning.

The URS team used the following methods in developing alternatives for this plan:

- Collected all available drawings and data on the existing facilities.
- Conducted a series of site visits to review existing operations, facilities and constraints.
- Met with Metro and transfer station operators to identify needs, concerns, and first-hand knowledge of operating issues.
- Developed and present alternatives, with drawings, to Metro and the Station operators for their comments.
- Prepared order-of-magnitude cost estimates for recommended facility improvements.
- Prepared a draft Master Facilities Plan Update for review and comments by Metro and all applicable stakeholders.

2.1 FACILITY OVERVIEW

A. Location/Access

The Metro South Station (MSS) is on an 11.47-acre site in Clackamas County and within the jurisdiction of Oregon City. The site is bound on the north by a Southern Pacific Railroad line and Interstate Highway 205, on the south by Washington Street, on the east by State Highway 213, and on the west by property owned by Oregon City. The address is 2001 Washington Street, Oregon City, Oregon.

Site access is through an entrance off Washington Street that is 1,000 feet west of Highway 213. Most vehicles approach this site from I-205 or Highway 213 and proceed to Washington Street. It is possible to reach the transfer station from Oregon City via Washington Street. This is the route used by most local public and private collection companies.

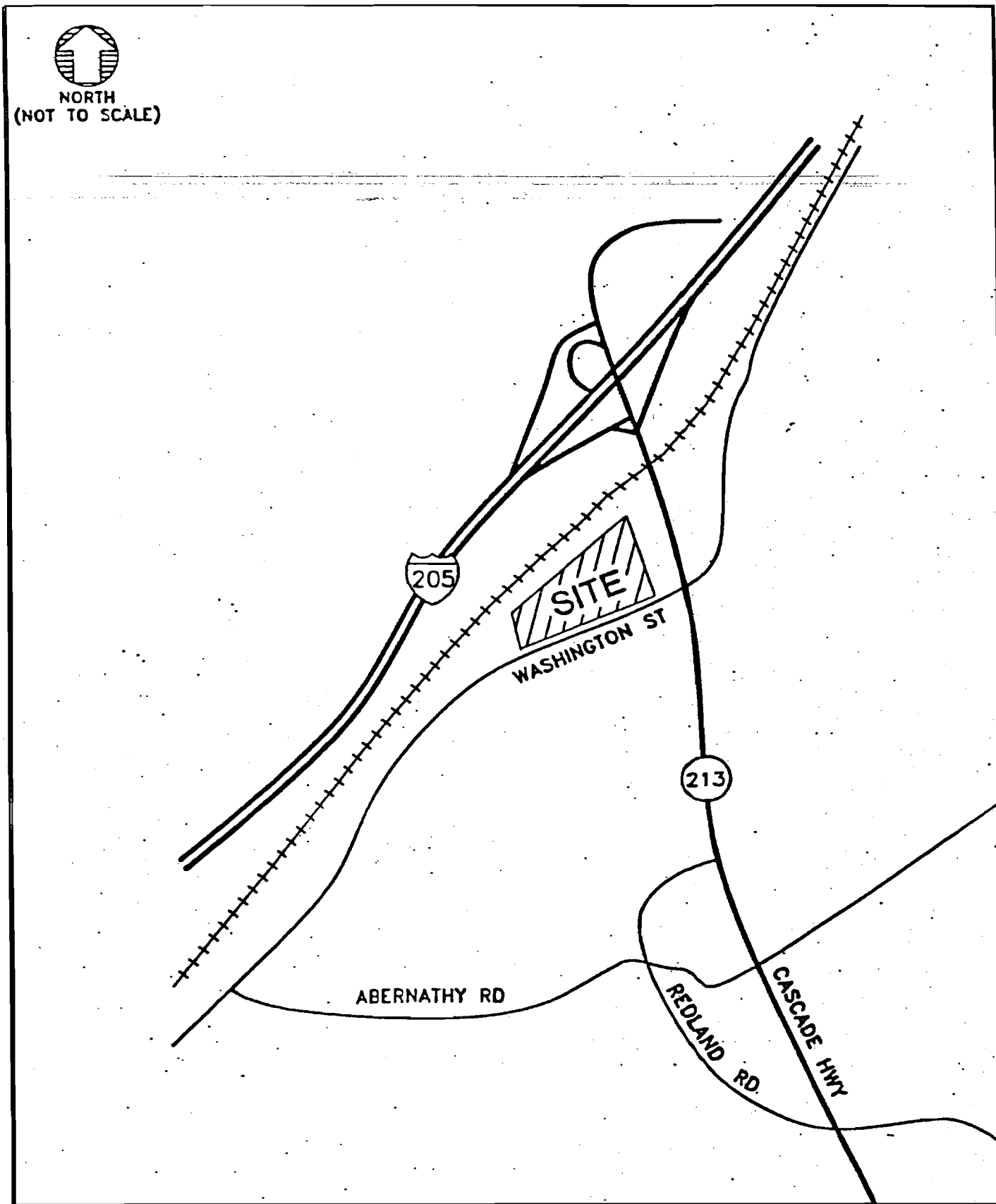
The site is divided into the following sections:

- The westerly 1.4+ acres include a nature park area constructed by Metro for the mitigation of wetland removal.
- The central 4 acres consists of the household hazardous waste (HHW) building, commercial transfer building, scalehouses, and truck wash.
- The easterly 6 acres include the new public unloading facility, latex building, contractor's maintenance area, paved area for staging loaded and empty transfer trailers, and roadways for access to the compactors.

Figure 2-1 is a site vicinity map. Drawing MSS-01 illustrates the current site layout and recent improvements.

B. Adjacent Land Uses

The MSS site is located within industrial and transportation corridors. No private residential properties exist within several hundred yards of the property. The site is bound by railway and interstate traffic on the north, a new Home Depot store on the south across Washington Street, on the east by Highway 213, and on the west by light industrial facilities along Washington Street. The End of the Oregon Trail Museum, a regional attraction, is also west of the transfer station.



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DRAWN BY: MLJ	APPROVED BY:	111 S.W. Columbia, Suite 900 Portland, Oregon 97201 (tel) 503-222-7200 (fax) 503-222-4292	PORTLAND, OREGON	VICINITY MAP	CAD FILE NUMBER: FIGURE 2-1
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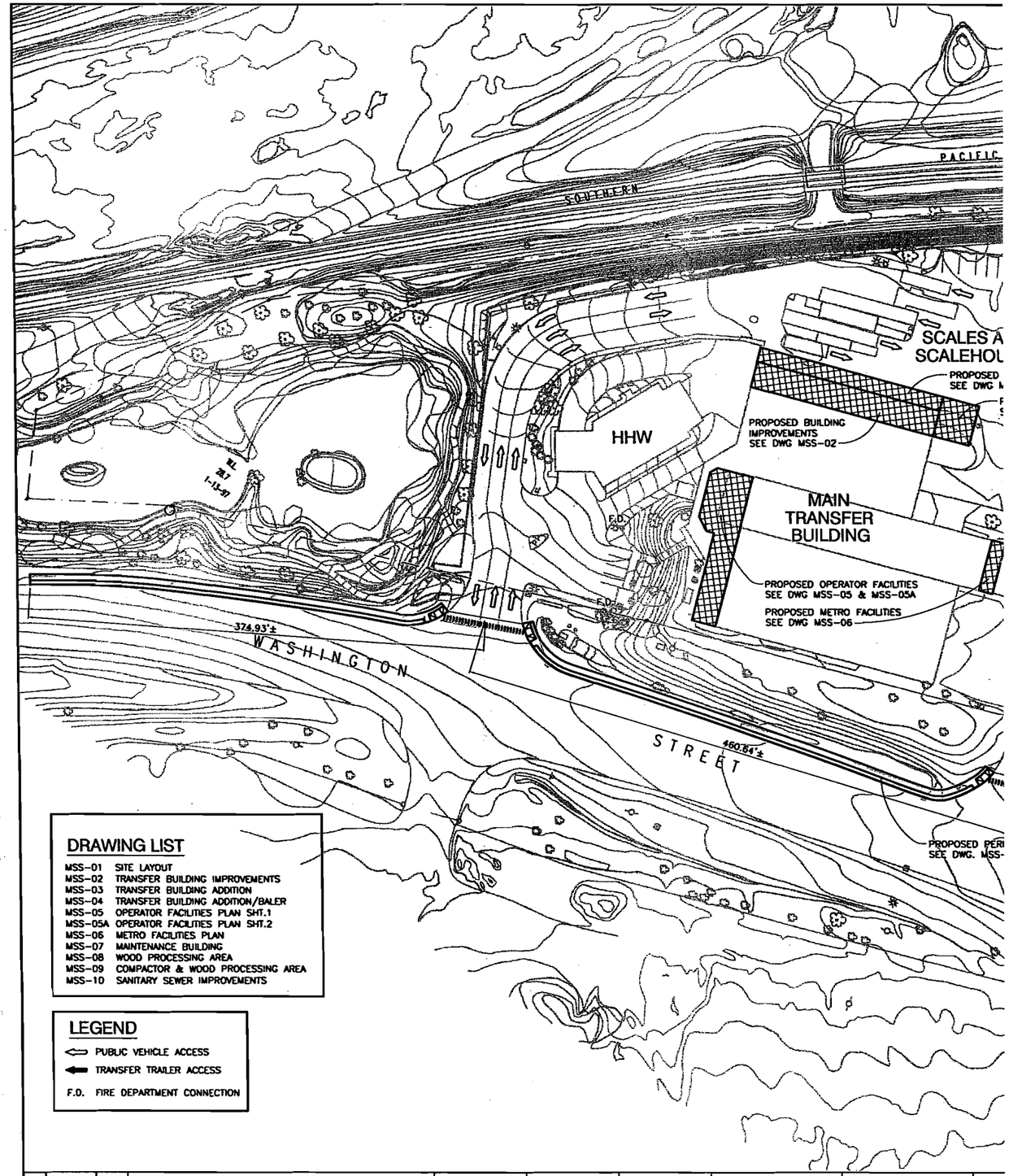

DRAWING LIST

MSS-01 SITE LAYOUT
MSS-02 TRANSFER BUILDING IMPROVEMENTS
MSS-03 TRANSFER BUILDING ADDITION
MSS-04 TRANSFER BUILDING ADDITION/BALER
MSS-05 OPERATOR FACILITIES PLAN SHT.1
MSS-05A OPERATOR FACILITIES PLAN SHT.2
MSS-06 METRO FACILITIES PLAN
MSS-07 MAINTENANCE BUILDING
MSS-08 WOOD PROCESSING AREA
MSS-09 COMPACTOR & WOOD PROCESSING AREA
MSS-10 SANITARY SEWER IMPROVEMENTS

LEGEND

⇦ PUBLIC VEHICLE ACCESS
⬅ TRANSFER TRAILER ACCESS
F.D. FIRE DEPARTMENT CONNECTION

No.	DATE	BY	REVISION
A	8/27/01	PCF	FOR CLIENT REVIEW

JOB No. 52-00140015.00	DESIGNED: VCH/PCF	PROJ. ENGINEER: RWC
SCALE: AS NOTED	DRAWN BY: PCF	APPROVED BY:
	CHECKED BY: RWC	DATE: 8/22/01

WARNING
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IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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C. Zoning/Permitting

The MSS is on 11.47 acres that is zoned M-2 Heavy Industrial and is designated I. Industrial in the Oregon City Comprehensive Plan. The station operates through a Conditional Use Permit (CUP), which is subject to periodic review by the Oregon City Planning Commission.

Metro has a Solid Waste Disposal Permit issued by the Department of Environmental Quality (DEQ) in accordance with the provisions of the Oregon Revised Statutes (ORS) Chapter 459.

D. Environmental Issues

1. Flood Plain

The MSS site in Oregon City is vulnerable to flood events. The site is one-half mile east of the confluence of the Willamette and Clackamas Rivers, and one-half mile west from Abernethy Creek.

The Federal Emergency Management Agency (FEMA) established the one percent (1%) chance flood and the 100-year flood elevation is at 45.0 feet National Geodetic Vertical Datum (NGVD). Portions of the MSS site are below elevation 45.0 feet. Some facilities are in these areas, including the original transfer tunnel, which is utilized for storage and HHW activities, the HHW facility, the compactors, and some service utilities.

The February 1996 flood demonstrated that this area is vulnerable. High floodwater from the Willamette and Clackamas Rivers inundated much of Oregon City. Abernethy Creek's flow into the Willamette River was constrained by a highway-crossing culvert that caused additional flooding. In general, this flood event was over 2 feet higher than the 100-year flood elevation.

The February 1996 flood affected MSS. The water crested at elevation 47.2 feet NGVD. Some of the facilities discussed below elevation 47.2 feet were under water. The station was closed briefly while a temporary sandbag wall was constructed along the west entrance road. The Washington Street access road was under water.

A permanent flood protection wall was constructed along the west entrance road in 1997 and serves to protect the MSS site to elevation 42.0 feet NGVD and delay flood waters from entering the lower levels of the site.

2. Wetlands

Metro created a wetland at the west end of the site and turned it into a nature park with walkways and pedestrian facilities, and features, which promote the growth of wetlands vegetation and inhabitants. This nature park is a valuable addition to the region and has been

accepted by the public and governing agencies. The area north of the site up to I-205 is also a wetland.

3. Geology

The original ground surface elevation at the site prior to construction of the transfer station in the early 1980's was at elevation +22.0 ft. to +27.0 ft. NGVD. For the station construction, it was decided to raise the site grade to the 100-year flood level of elevation +45.0 ft. NGVD as determined by the Corps of Engineers. Consequently, engineered structural fills up to 23.0 ft. in thickness were required.

The original site soils consisted of some man-made fills (sand, gravel, concrete debris) and soft, slightly organic clayey sandy silts, underlain by a distinctive layer of sand, gravel, and cobbles with occasional boulders. Hard clays were observed below the gravel layer at depths of 20.0 ft. to 25.0 ft.

Groundwater was observed at elevations varying from 16.0 ft. NGVD to 21.0 ft. NGVD. However, during the winter months, water was observed at elevations above 22.0 ft. NGVD. The original site was wetlands that were filled in excess of 23 ft. for the station construction. The sand-gravel-cobble layer was also identified as a probable aquifer that acts as a groundwater discharge area for the site.

The soft silty soils, large structural fills, and the underlain gravel aquifer or groundwater discharge areas, present important site factors including:

- All high load areas, such as the station building columns, are supported on pilings driven to the hard clays.
- Areas of the site that are still at elevation +20.0 to +25.0 ft. NGVD (HHW and compactor areas) are subjected to groundwater discharge that must be managed properly.

E. Title 3 – Urban Growth Management Functional Plan

Metro has amended Title 3 of the Urban Growth Management Functional Plan that impose additional criteria for development at Metro South. These Plan amendments will protect water quality and floodplain areas.

The primary impact at Metro South will be to include significant portions of the site that are currently above the FEMA established 100 year flood level in a Flood Management Area. This will require excavation to balance fill and cut volumes for all development below 47.2 feet mean sea level, the elevation of the February 1996 floods, rather than the current 45-foot elevation.

Title 3 will not impact development at Metro Central.

F. Utilities

On-site utilities include electrical, water supply, storm and sanitary sewer. Modifications have changed the utilities throughout the operating life of MSS.

1. Electrical

Power is supplied to the site from Portland General Electric (PGE) power lines along Washington Street. A review of the existing service indicates that a maximum of 900 amps is available through the 750-kVA transformer with on-site voltages of 480V, 220V and 110V.

In 1997, the average monthly demand was about 277 kW. Based on the size of the service transformers, proximity of the PGE system, and the ability to locate conduits and additional transformers on site, there are no apparent obstacles for future development.

Major power requirements include lighting for all structures, the two compactors in the transfer operation, miscellaneous equipment for the household hazardous waste and scalehouse operations. Future development will include additional structures and equipment with requirements that can be met by the present power system.

2. Water Supply

The MSS is served by an 8-inch water main, which runs along the north side of the site within a 15-foot easement. Connections exist to this main line to provide water for facility washdown, truck wash facilities, hydrants and sprinkler system, and restrooms for Metro and station operators. The current estimated maximum demand is 10,000 gallons of water per day, with the truck wash consuming over 85% of this supply. The existing water supply system should be able to support future development.

3. Storm Sewers

Storm water is managed by two methods on the site. At the site's West End, some surface drainage is collected and drained through manholes and lines directly into the wetlands. The other areas are collected in a sump near the HHW facility and pumped up to lines draining to the wetland.

At the East End, most surface/subsurface water is collected and drained by gravity to a storm sump in the roadway in the lower compactor area. From there, the water is pumped to a drainage ditch located along the south edge of the site. The water drains by gravity through a compost filter, and then a pipeline, into the water retention ponds in the west-end wetland.

All of the MSS site available for future development is paved. As a result, the storm drainage system receives the maximum amount of surface drainage. Any future development should not add any substantial flows to the current system.

4. Sanitary Sewer

All sanitary sewer wastes are removed in a 4-inch force main system which pumps the wastes to a regional treatment plant 1.5 miles from the site. All storm/sanitary wastes generated at the west end of the site by the HHW operation and personnel washroom facilities drain to a sanitary lift pump station for transfer to the force main system. This pump station, with two 7.5 horsepower (HP) pumps and the force main system, is west of the transfer building.

Sanitary sewer wastes from the scalehouse washrooms, public unloading building and latex building are drained by gravity to the sanitary sump located in the roadway in the lower compactor area. The wastes are pumped to a manhole south of the bridge over the compactor area. From this manhole, the wastes are drained by gravity through manholes and pipelines to the sanitary pump station located at the west side of the transfer building. The wash waters from the truck wash are drained by gravity through a grease/oil trap and then by gravity through the same manholes and pipelines to the sanitary pump station. The wastes are pumped from this station into a force main system for transport to the regional treatment plant.

2.2 HISTORY OF STATION DEVELOPMENT

A. Original Operations (Drawing MSS-1)

The transfer station began operations in 1983. The station was originally designed to receive and transfer 400 to 500 tons per day (TPD) on an average, with peak tonnages up to 700 TPD and vehicle counts in the range of approximately 80 commercial vehicles per day and 200 public vehicles per day. The transfer building, a 30,000 square foot structure (150 ft. x 200 ft.) was designed with a 40 ft. wide x 12 ft. deep surge pit for the full length of the building. The Station served both commercial and general public vehicles with the following circulation, unloading and transfer operations.

- Commercial packer trucks, drop box vehicles, long vehicle/trailer units were weighed on the inbound scale, entered the transfer building through the east wall on the south side of the surge pit, reversed, and then unloaded the wastes into the surge pit. These vehicles left the site after going through the truck wash (optional) and over the exit scale.
- The general public vehicles were charged a flat fee and then entered the transfer building through the east wall on the north side of the surge pit, reversed, and then unloaded the wastes into the surge pit. Drop boxes were installed along the north side of the building for the public to place source-separated recyclables.

FREEWAY I-205

STATE HIGHWAY 213

TRUCK WASH

SCALE

SCALE

PUBLIC

RAMP UP

RAMP DN

TOP LOAD

WASTE FLOW

PIT

DOZER RAMP

COMMERCIAL

ENTRANCE/EXIT

WASHINGTON STREET

50 0 50 100
SCALE IN FEET

I:\78970\SMASTERPLAN\Mss-1.dwg Nov 12, 2001 - 9:14am

URS Greiner

111 S.W. Columbia Street
Portland, Oregon 97201

METRO
PORTLAND OREGON

METRO SOUTH STATION
MASTER PLAN
ORIGINAL LAYOUT-1983

SHEET

CAD FILE NUMBER: MSS-1

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REV.

SHT.__OF__

- All wastes placed in the surge pit were moved by track-mounted dozers and top-loaded into transfer trailers through openings located at the west end of the surge pit. These top loaded wastes were then transported to the existing landfill located in North Portland.

The "surge pit" concept in the transfer building provided a definite separation between the unloading operations of commercial and public vehicles for safety and efficient operations, plus it also provided the "surge" capacity to accommodate the peak arrival rates of commercial vehicles and the random arrival of transfer trailers. This "surge pit" concept also allowed the Station to be able to accommodate the continued increase in traffic and waste volumes during the 1980's.

However, due to the surge pit operations and the limited space in both the commercial and public unloading areas, there was very limited capability to recover recyclables from the incoming waste streams.

B. Major Modifications/Additions from 1983 to 2001

The MSS has experienced steady and significant growth in traffic and waste volumes since the 1983 start-up. Examples of these changes are:

	Waste Volumes (TPD)	Traffic Volumes (VPD[1])
Original Station Design Criteria	500 (avg.) 700 (peak)	80 commercial 200 public
2000 Volumes	1,285 (avg.) 2,000 (peak)	300+ commercial 600+ public

(1) VPD = Vehicles Per Day

As a result of this growth and closure of the St. Johns Landfill, Metro has made some major modifications to the Station. Drawing MSS-01 illustrates the present layout. A description of the major modifications is as follows:

1983-1996

There were a few major changes to the Station and operations from 1983 up to 1996.

- In the mid-1980's, Metro installed a 3-bay truck wash facility and associated wash water collection and treatment facilities.
- In 1989, Metro installed a compactor at the west end of the transfer building in the location where the top load operation had previously occurred. The wastes were compacted and loaded into transfer trailers for transfer to the St. Johns landfill.
- Due to the fact that the St. Johns landfill was to close, Metro contracted with a private landfill operator and a transportation company to haul compacted wastes from the station to a new out-of-region landfill located in Eastern Oregon about 150 miles east of Portland. As a result, in 1990 the Station was modified to install two compactors at the east end of the transfer building. One of the compactors was new, and the other compactor was relocated from the previous top load area over to the new location at the east end of the transfer building. This modification also included a new control room and extensive modifications at the east end of the transfer building.

The traffic patterns and unloading operations for commercial vehicles and general public vehicles remained the same as the original operations. However, the transfer trailer traffic circulation and loading operations were revised as follows:

- The new compactors were installed at the east end of the transfer building at an elevation approximately 29 feet below the transfer building slab. The compactors are top loaded by a track-mounted dozer like the original trailer top load operation. The wastes are compacted and then pushed into the rear end of the transfer trailers.

- The MSS site was extensively revised to provide an access ramp for the transfer trailers to travel from the main site level down to the compactor level, approximately 29 feet lower. The transfer trailers travel down the ramp, turn and then reverse up to the compactors for loading.
- The transportation contractor occupies the east end of the site where he stores both empty and full transfer trailers.
- A second scalehouse and scale were installed to handle the increased traffic volumes.
- Another major change to Metro South was in 1991 when a new 4,000 sq. ft. household hazardous waste (HHW) facility was constructed. This facility was placed in the area where the transfer trailers originally circulated down to the west end of the transfer building for top loading. In addition, a latex processing system was established in the former transfer trailer loading tunnel. Since 1991, this HHW and latex processing facility has been successful.
- As part of their contract with the transportation contractor it was agreed that Metro would provide a trailer staging area at the east end of the site. The staging area was designed to allow for the storage of over 100 loaded and unloaded trailers, plus sufficient space for the trailers and tractors to travel to and from the compactor area. This staging area encompasses about 5 acres and is completely paved for efficient traffic circulation and storm water drainage. This staging area was constructed at the same time as the two compactors were installed at the east end of the transfer building.

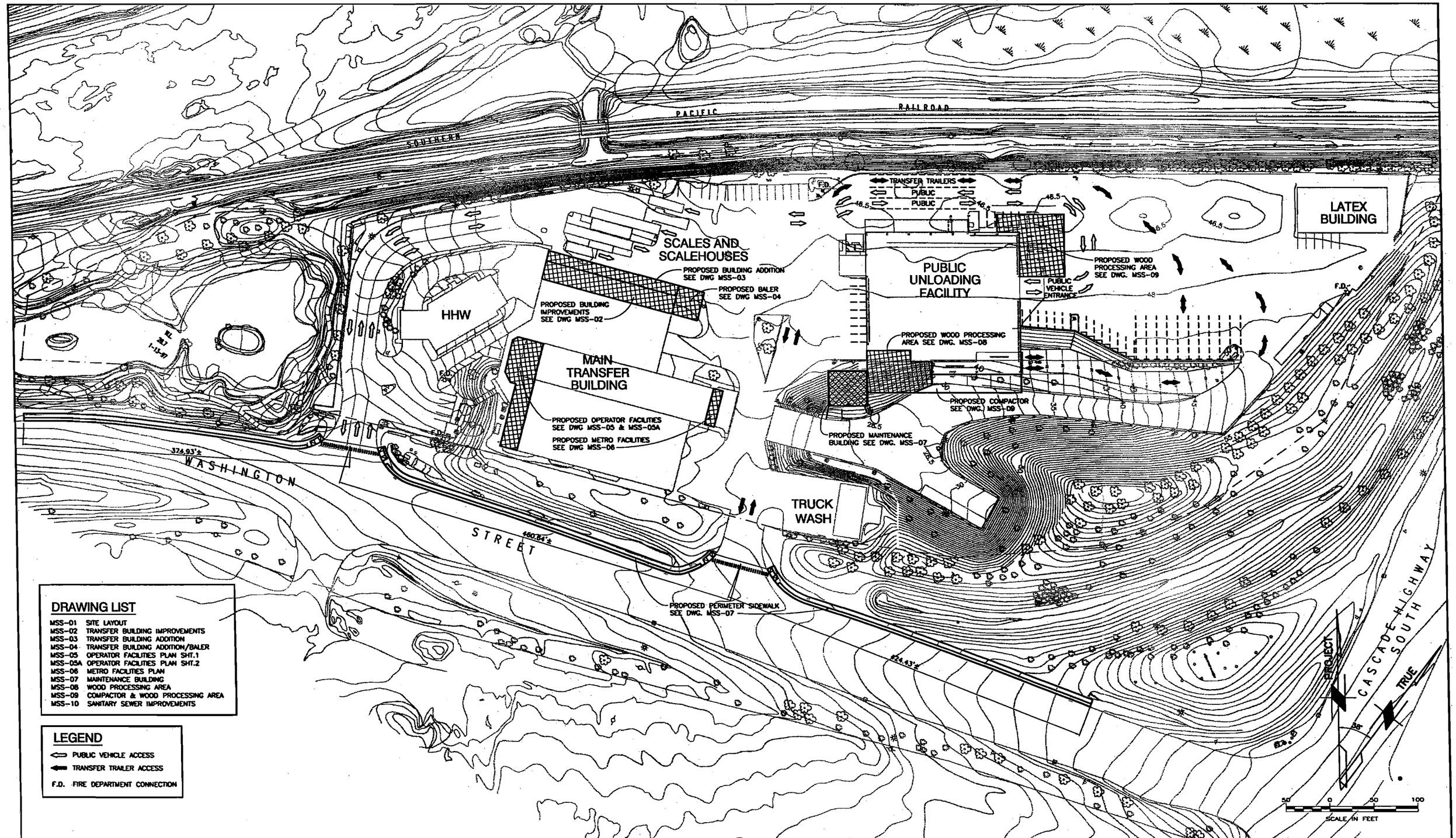
1996-2001

Even with the improvements made up to 1996, there were still some design and operations deficiencies which affected the daily operations. The station's vulnerability to flooding as discussed in Section 2.1 D became even more apparent in February of 1996 when flood waters rose to elevation 47.2 NGVD resulting in major damage to the HHW and latex processing facilities.

In 1996, Metro's amendment to the RSWMP mandated that improvements be made to the station to eliminate the need for any future stations. This amendment, plus the flooding problems, all resulted in Metro's REM Department starting the planning process for possible improvements. These improvements were to be limited to options which improved waste recovery and recycling, reduced traffic congestion and circulation, reduced energy consumption, and improved personnel facilities. As a result, the following major improvements have been completed since 1996:

- Widened the entrance roadway and changed the traffic pattern to accommodate two inbound lanes all the way from the start of the entrance -- one for commercial trucks and one for public vehicles. This alternative separated these two types of vehicles sooner resulting in safer and more efficient traffic circulation.

- Added a new scalehouse and new scale. With this addition, there are now two entrance and two exit scales. This increases the overall scalehouse capacity, and allows for the separation of public and commercial traffic.
- Due to the flood problems which occurred in 1996, Metro decided to construct a flood protection wall along the west side of the main entrance road. The objective of this flood wall is to provide additional time before any flood waters enter the site. The new wall was constructed to Elevation 42.0-ft. and runs from the north end of the site down to Washington Street, a total length of approximately 228-ft.
- Constructed a new 5,000 sq.ft. latex processing building in the northeast corner of the site. This addition has allowed Metro to become one of the nation's leading producers of recycled latex paint.
- Constructed a new truck wash facility at a location on site which would not interfere with future developments. The new truck wash with its associated oil-water separator was also a major improvement over the existing system.
- Constructed a 4,000 sq.ft. addition to the main transfer building at the southeast side. This added space improved the transfer operations.
- Constructed a new 28,000 sq.ft. public unloading building. This addition reduced traffic congestion and increased capacity at the main transfer building since both sides of the pit are now available to the commercial vehicles. The new facility also increased the opportunities to recover recyclables from the waste stream at the existing transfer building and at the new building.
- Installed a new transfer trailer scale at the east end of the site.
- Installed an automated weighing system.



DRAWING LIST

MSS-01	SITE LAYOUT
MSS-02	TRANSFER BUILDING IMPROVEMENTS
MSS-03	TRANSFER BUILDING ADDITION
MSS-04	TRANSFER BUILDING ADDITION/BALER
MSS-05	OPERATOR FACILITIES PLAN SHT.1
MSS-05A	OPERATOR FACILITIES PLAN SHT.2
MSS-06	METRO FACILITIES PLAN
MSS-07	MAINTENANCE BUILDING
MSS-08	WOOD PROCESSING AREA
MSS-09	COMPACTOR & WOOD PROCESSING AREA
MSS-10	SANITARY SEWER IMPROVEMENTS

LEGEND

- ⇦ PUBLIC VEHICLE ACCESS
- ⇦ TRANSFER TRAILER ACCESS
- F.D. FIRE DEPARTMENT CONNECTION

No.	DATE	BY	REVISION
A	8/27/01	PCF	FOR CLIENT REVIEW

JOB No. 52-00140015.00
SCALE: AS NOTED
DESIGNED: VCH/PCF
DRAWN BY: PCF
CHECKED BY: RWC
PROJ. ENGINEER: RWC
APPROVED BY:
DATE: 8/22/01

WARNING
1/2 1
IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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Portland, Oregon 97201
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METRO
PORTLAND, OREGON

METRO SOUTH MASTER PLAN

SOUTH STATION
SITE LAYOUT

DRAWING NUMBER: MSS-01
CAD FILE NUMBER: MSS-01
SHEET: OF
REV. A

2.3 EXISTING FACILITY DESCRIPTION

A. Commercial Transfer Building

1. Structure

The structure is a steel-framed building with concrete driving surfaces, concrete and metal wall panels, and metal roof deck. The original building, constructed in 1983, is approximately 150 feet x 200 feet (30,000 square feet) with an additional 2,600 square feet added in the 1990's. A 4,000 square foot addition was completed in 2000.

2. Transfer Building Operation

The transfer operation consists of commercial vehicles delivering an average of 1,285+ TPD (2000) of MSW. The waste, a combination of residential, commercial, industrial materials, is compacted and moved into transfer trailers for delivery to the Columbia Ridge Landfill in Arlington, Oregon.

MSS is open seven days per week from 7:00 a.m. to 6:00 p.m. in the winter and from 7:00 a.m. to 7:00 p.m. in the summer. The station is closed for Christmas and New Years Day.

The transfer building design, which incorporates a surge pit operation, can now, with the opening of the new public unloading building, unload selected commercial loads on the tipping floor north of the pit to further recycling efforts. The pit is 40-ft. wide, 12-ft. deep and runs the building's 200-ft. length. The commercial vehicles are weighed on the inbound scales, then proceed to the east side of the building, enter the building through doorways on each side of the pit, reverse and unload their wastes into the pit. After unloading, the vehicles exit the building, proceed to an exit scale, or if their tare weight is recorded, they can directly leave the site without weighing.

With the opening of the public unloading building, operations can be revised in the transfer building to improve the recovery of recyclable materials. In a designated area, the commercial vehicles can unload their wastes onto the tipping floor rather than directly into the pit. Recyclables can be sorted out of the wastes and then the remainder pushed by dozer into the pit.

A track-mounted bulldozer moves the waste to one end of the pit where it is top-loaded directly into the compactors. A walking floor conveyor system and the compactors were installed at the same time.

This system was designed to receive solid wastes from the bulldozer and transfer it to the compactors. Operations, however, have shown that this walking floor system provided a smaller loading rate than the bulldozer. As a result, the walking floor system is not used except to clean the pit each day.

Drop boxes are located along the north face of the building for the storage of recyclables sorted from the wastes. The solid waste disposal permit requires the following collection categories:

- Ferrous scrap metal
- Non-ferrous scrap metal (including aluminum)
- Motor oil
- Old newspaper (ONP)
- Corrugated containers (OCC) and kraft papers
- Container glass
- Tin cans
- High-grade office papers
- Mixed papers
- Used tires

The transfer station equipment includes the following:

- **Track-mounted bulldozers operating in the surge pit.** These machines are owned or leased by the MSS operator.

- **Walking-floor conveyor.** This conveyor is used for a short time each day. As a result, other than minor maintenance, it is in good working condition.

- **Compactors.** These compactors receive loose waste (8-12 lbs. per cubic foot), compact it into a dense bale (30+ lbs. per cubic foot), and move it to a transfer trailer. There are two compactors at Metro South. Metro replaced the compactors in 2000 with the new equipment supplied by Shredding Systems, Inc., in Wilsonville, Oregon.

B. Public Unloading Facility

The new public unloading facility was placed into operation in 2001. It is a 28,000 sq.ft. building with two bays for top loading of transfer trailers. The general public is weighed at the scale, then proceed to the east side of the building for entry. Once inside the building, the public are directed to specific areas for unloading their recyclables and/or wastes.

The new public unloading facility receives and manages the following materials:

Newsprint	Glass	Aluminum
Steel (tin) cans	Mixed ferrous	Mixed non-ferrous
White goods	Corrugated cardboard	Tires
Used motor oil	Oil filters	Car batteries
Anti-freeze	Yard debris/wood	Plastic bottles/milk jugs
Scrap paper	Phone books	Magazines

Metro has the right to add or delete materials from this list at any time.

All source-separated materials are stored in containers furnished by the station operator, who provides the following services:

- Recovers recyclables from public loads which are source separated by requesting that the materials are placed next to their vehicles or in an identified receptacle;
- Recovers recyclables from public loads which are not source separated, if economically feasible, and informs customers of the discount available if they separate materials;
- Removes source separated and recovered recyclables from public loads in the unloading area and transfers them to containers in the recycling station;
- Recovers white goods for reuse as appropriate.

C. Household Hazardous Waste Building/Latex Processing Building Operations

1. Structure

The Household Hazardous Waste (HHW) building was constructed in 1993. It is a 4,000 square feet structure with steel rigid frames, concrete wall panels, and an insulated metal roof. It has extensive ventilation systems and explosion-proof electrical equipment to meet fire and building codes regulations.

The structure is in good condition. The concern for this facility is because it was built 10 feet below the 100-Year Flood level of elevation 45.0 feet.

The new 5,000 sq.ft. latex processing building was completed in 2000.

2. Operations

The HHW facility, which is open six days per week from 9 a.m. to 4 p.m., has a covered receiving area for the general public to deliver its HHW. The wastes are unloaded by Metro personnel, properly identified and classified, and moved to specific areas in the building for further testing and/or storage.

The latex paint is transferred to the new building for processing, which consists of the following:

- Cans are opened to verify contents. If the product is not latex paint, it is removed for processing at another location.
- If it is latex paint, the color is identified and placed in a container specifically for that color.
- When the specific color containers are full, the paint is placed in 5 or 55-gallon containers for retail sale to non-profit groups, social service organizations, local governments and the general public.

3. Summary

The HHW and adjacent latex recycling operations are very successful. These Metro facilities have become models for other cities, counties and agencies to visit and observe due to their success.

D. Scale/Scalehouses

There are five scales and three scalehouses at the MSS. The fourth scale and third scalehouse were installed in 1998. The new scalehouse is approximately 600 square feet (12 feet x 50 feet) and contains washrooms and records storage space.

The fourth scale provides Metro with more flexibility in weighing the inbound and outbound vehicles. Under normal operating conditions, two scales are available for inbound traffic and two scales are available for outbound traffic. Under peak conditions it is possible to use three scales for inbound or outbound traffic. This four-scale system allows Metro to weigh more than 100 vehicles per hour either entering or exiting the site. The fifth scale is for weighing the long-haul transfer trailers and is located in the lower ramp area near the compactors. This scale was installed in 2001.

The scalehouses are in good structural condition and, other than normal maintenance, should provide service for 15 to 20 years.

Metro has installed a new tagging system at the scalehouses. This is a new, state-of-the-art radio frequency (RF) system that operates as follows:

- A unit located at the scalehouse sends a radio frequency to a receiving unit, or a tag, mounted on the commercial vehicle.
- The signal is received, vehicle data collected, and the information is delivered to the sending unit.
- The information is sent to a computer where the vehicle's loaded weight, tare weight, and identification are stored in the database.
- A printer, accessible from outside the scalehouse, delivers a ticket for the vehicle driver.
- The driver then proceeds to the transfer building for unloading.

This radio frequency tagging system provides Metro and the collection companies these benefits:

- The ability to weigh vehicles without attending Metro personnel.
- Better staff utilization and the capacity to weigh more vehicles.
- Allows the station to be open for commercial vehicles 24 hours per day, 7 days per week.

E. Truck Wash

The new truck wash, constructed in 2000, replaced an antiquated facility that served MSS users since the mid-1980's.

This facility serves three trucks simultaneously.

F. Traffic Studies

1997 Study

Metro, to obtain a Conditional Use Permit for the 1997 improvements described in Section 2.2, conducted a study to address traffic issues associated with the entrance roadway and new scale. The complete study concluded the following:

- The proposed two-lane entry configuration to MSS will increase the available vehicle storage for the entry scales from 20 vehicles to 29 vehicles on Saturday and from 16 to 23 vehicles on weekdays, when the proportion of commercial traffic yields a greater average vehicle length.
- Examination of April/May 1997 vehicle queue data indicated that under current conditions, the proposed two-lane entry configuration will eliminate vehicle queuing onto Washington Street during weekdays and Sunday, and reduce it substantially on Saturdays.
- Under existing conditions, both transfer station access intersections function safely at acceptable service levels during the Saturday peak hour and the Monday noon and p.m. peak hours.

2001 Study

With the development of the Home Depot across Washington Street from the station, Oregon City expressed concern over the use of the station's easterly gate for commercial vehicle and transfer trailer traffic. As a result, Metro requested a traffic study to determine the safety of the traffic utilizing the east gate when the Home Depot is open for business. The complete study, which is included in Appendix A, recommended that the east driveway continue to operate with full access turning movements. That is, the east driveway is expected to maintain safe operations following the build-out of the Home Depot site.

2.4 FACILITY NEEDS ASSESSMENT

A. Waste/Traffic Volumes

1. Projections

Table 2.1 presents the waste and traffic volumes collected by Metro from the scalehouse operations for 1993 through 2000. The table also presents projected waste and traffic volumes from 2000 to 2010.

Table 2-1
Metro South Station

Year	Tons of Waste				Vehicles				
	Com'l	Public	Total	Peak Day	Com'l	Public	Total	Peak Day	Peak Hour
1993	332,984	38,865	371,849	1,670	73,959	101,937	175,896	696	98
1994	346,985	40,385	387,370	1,784	78,082	107,965	186,047	711	121
1995	337,806	39,423	377,229	1,760	75,906	109,120	185,026	788	105
1996	341,015	44,507	385,522	2,061	76,278	119,177	195,455	797	109
1997	329,306	47,603	376,902	1,755	71,488	125,169	196,657	805	115
1998	323,090	47,610	370,700	1,572	71,797	128,677	200,474	786	112
1999	301,432	49,368	350,800	1,589	66,985	133,427	200,412	807	115
2000	283,075	51,125	334,200	1,669	62,906	138,177	301,083	841	120
2001	272,117	52,883	325,000	1,705	60,470	142,927	203,397	865	124
2002	276,860	54,640	331,500	1,744	61,524	147,677	209,201	891	127
2003	281,752	56,398	338,150	1,786	62,612	152,427	215,039	917	131
2004	286,745	58,155	344,900	1,828	63,721	157,177	220,898	942	135
2005	291,887	59,913	351,800	1,871	64,864	161,927	226,791	969	138
2006	297,230	61,670	358,900	1,915	66,051	166,677	232,728	995	142
2007	302,590	63,428	366,078	1,960	67,242	171,427	238,669	1,021	146
2008	308,215	65,185	373,400	2,007	68,492	176,177	244,669	1,048	150
2009	313,957	66,943	380,900	2,054	69,768	180,927	250,695	1,075	154
2010	319,800	68,700	388,500	2,102	71,067	185,677	256,744	1,102	157

Note: The 1993 through 2000 numbers are actual data.

Table 2-1 indicates that the annual number of public vehicles will increase substantially from 1997 to 2010. It includes a total increase of 48% based on the projected population growth in Clackamas County. However, as can be seen, the annual number of commercial vehicles is expected to stay fairly constant up to 2010. This difference is due to the number of private, regional Material Recovery Facilities open or scheduled to open during the next five years. These private facilities provide alternatives for commercial vehicles in the material recovery process.

Table 2-1 also provides the data to estimate the peak rates which can be expected from commercial and public vehicles in the year 2010.

Maximum Weekday Count	1,102 vehicles
Peak Commercial Hourly Rate	55 vehicles
Peak Hourly Weekend Rate	125 vehicles
Peak Weekday Public Hourly Rate	54 vehicles

2. Present Station Capacity

The two compactors at MSS each process a maximum of 75 to 100 tons of solid waste per hour. This capacity allows the station to transfer over 400,000 tons per year.

Table 2-1 indicates a total waste volume at MSS of 319,800 tons by the year 2010. This estimate, matched with the facility's processing capacity, indicates that MSS can meet the region's requirements to 2010 and probably up to 2015. The public unloading area can also transfer 60-70 tons of solid waste per hour with the two loadout bays. This capacity allows this public unloading to transfer over 300,000 tons per year which is significantly higher than the 68,700 tons projected for the year 2010. Therefore, as can be seen, the existing transfer building and public unloading building have sufficient capacity to meet the estimated tonnages for at least the next 10-15 years.

This capacity estimate, however, may not correspond to the projected growth in traffic volume. The Metro data indicates that 64% of the traffic, which is public vehicles, represents only 13% of the waste volume. The 48% projected growth rate in public vehicles will compound this problem. As a result, it is important that there are sufficient unloading spaces to accommodate the peak hourly arrival rates.

The following calculations were prepared to compare the existing nominal station capacity with the projected peak arrival rate.

Commercial Vehicles

One stall can handle		6 VPH [1] average
Number of stalls		11 [3]
Hourly capacity	6 x 11 =	66 VPH nominal
Projected 2010 Peak Arrival Rate		55 VPH

Public Vehicles	
One stall can handle	4 VPH [1] average
Number of stalls	
Weekdays	12 [3]
Weekends	30 [2]
Hourly capacity	
Weekdays	12 x 4 = 48 VPH nominal
Weekends	30 x 4 = 120 VPHnominal
Projected 2010 Peak Arrival Rates	
Weekdays	54 VPH
Weekends	125 VPH

[1] Stall capacities are based on past operations experience - Vehicles Per Hour (VPH).
[2] The public vehicles can go to the main transfer building on weekend days due to the limited number of commercial vehicles coming to the Station.
[3] Number of stalls is based on discussions with Station operator and considers the fact that some on-floor sorting will occur which requires more space.

The above calculations indicate that the addition of the public unloading facility has resulted in the ability to handle the commercial traffic up to 2010. However, due to the projected growth in public vehicles, the projected peak arrival rates for the public for the year 2010 are slightly greater than the unloading capacity of the station. However, the differences are small enough that the result should be a minimum of queuing and waiting times.

In summary, the improvements to the station completed in 2001 should allow the station to accommodate the growth in waste and traffic volumes through 2010.

B. Material Recovery

The Regional Solid Waste Management Plan, adopted by Metro in 1996, states that the agency will achieve the following objectives by 2005:

- Increase the regional recycling rate from 43% to 53%
- Eliminate the need for a new regional transfer station through increased waste reduction

Prior to1998, few recyclable materials were recovered from the incoming waste stream. Recovery rates were modest and averaged between 0.5% and 1.0%. However, some operational changes since 1998 have resulted in recovery rates of up to 3%.

The low recovery rates at MSS were due to the lack of tipping floor space in the main transfer building. With the addition of the public unloading building, more space is now available for the commercial vehicles to unload wastes in the tipping floor for hand sorting out recyclables. Hand sorting is a common and acceptable method to improve recovery rates.

The operator, through experience, can identify and segregate vehicle loads that contain a high percentage of recyclables. These loads can then be unloaded onto the tipping floor for hand sorting.

This added floor space could provide Metro with the possibility of a 2% to 4% recovery rate increase. This added space will assist Metro in meeting the region's recycling goals in the RSWMP.

C. Personnel Facilities

1. Existing Facilities

The MSS has the following facilities for Metro and operator personnel:

- Lockers, washrooms and lunchroom in a separate, mobile trailer for the HHW and latex processing personnel. This trailer is adjacent to the HHW building.
- Washrooms for both Metro and operations personnel in the transfer building office area. Visitors can also use the facilities if they are meeting with the operator.
- Washrooms and storage for Metro personnel in two scalehouses, including the new one installed in 1998.
- Washrooms in the latex processing building and in a building adjacent to the new public unloading facility

2. Needs Assessment

An assessment of MSS requirements for operations and personnel identified facility gaps including:

- A lack of meeting or conference room space for both Metro and Operator personnel. A conference room may also be used for training and as a visitor center.
- Improved washroom/locker space is needed for Metro personnel.
- A lack of storage space for the Metro records and files.
- The lunchroom/locker room facilities for the operations personnel are in a small room (15 ft. x 15 ft.), without natural lighting and proper ventilation. This space is also located on the second level in the transfer building.

D. Maintenance Facilities

There are no permanent facilities for the maintenance of all on-site rolling stock and items such as drop boxes or miscellaneous equipment. The station operators have set up temporary

maintenance areas; however, due to expansion, it has been necessary to move these areas. Locating and constructing a permanent maintenance facility is a definite need for the MSS. The size could vary; however, at least two bays for rolling stock maintenance would be needed.

E. Wood/Green Wastes Processing

At present, all wood and green wastes unloaded at the MSS is stored and then reloaded for transfer to the Metro Central Station for processing. Over the last few years, the volume of these wastes has continued to grow and it could increase more with the addition of the public unloading facility.

This method of handling the wastes can be costly due to double-handling and the transportation costs to Metro Central. The possibility of adding a wood processing system at the MSS should be considered in presenting possible facility improvements.

F. Site Development Constraints

The MSS site has important and specific constraints for development. These include:

- Because the 100-year flood level is at elevation 45.0 ft. NGVD, major developments should be restricted to areas above this elevation. Any structures or operations below this elevation should be limited to functions that will not be damaged by a flood.
- Development opportunities for this site are limited. The transfer trailer storage and employee parking areas, totaling 3 acres, remain options and are at or above elevation 45.0 ft. NGVD.
- The station is a vital part of Metro's solid waste management system. MSS must be open to process waste every day. Brief, weekday closures are possible as necessary. Any station modifications must reflect no interruption in transfer station operations.
- The site is bordered by facilities that limit development. Washington Street on the south, wetlands and railroad on the north, wetlands on the west, and a state highway on the east define the site.
- Future improvements must have a positive aesthetic impact on the End of the Oregon Trail Museum, a regional tourist attraction near the site.

2.5 IMPROVEMENTS TO MEET NEEDS

A. General

All of the improvements presented in this Section are based on the following goals and criteria established for this report:

- IMPROVE WASTE RECOVERY AND RECYCLING
- TO MAXIMIZE OPERATION EFFICIENCIES
- TO IMPROVE TRAFFIC CONGESTION AND CIRCULATION
- TO IMPROVE FACILITIES FOR BOTH METRO AND OPERATOR PERSONNEL
- REDUCE ENERGY CONSUMPTION

The following improvements are not necessarily a choice of one or the other type of approach. But instead, are a series of improvements that have been developed to satisfy the goals presented above. Each improvement has been developed to directly address the goals and yet be cognizant of the development restraints.

B. Maintenance Facility

Drawing MSS-07 illustrates the proposed facility for maintenance of on-site rolling stock plus containers/drop box repairs. The South Station has never had a permanent location or facility for general on-site vehicle or equipment maintenance. As the site is developed, both Metro and the operators have recognized a need for such a facility. The entrance to this proposed facility is located at elevation 29'-0" or down in the area where the compactors are located. Based on the experience from 10+ years of operations with the compactors, it has been determined that the location of the maintenance facilities in the compactor area would be the most effective and efficient location to service the on-site equipment.

The location of this maintenance floor is below the 100-year flood level; however, it is still the most practical location due to the following:

- Based on past experience in 1996, this portion of the site should stay "dry" during high water levels.
- Except for the rolling stock which can be removed, there is nothing in the maintenance facility which can be badly damaged from high water.
- The type of construction indicated below (steel and concrete) is proposed to withstand high water situations.

The maintenance facility is a 1,760 sq.ft. structure sufficient for the following:

- 2 bays 22 foot wide x 30 foot (+) in depth, with workbench between the bays
- Parts room
- Office and restroom
- Space for oil storage and air compressor

The new facility will be a steel-framed roof support with concrete walls and a concrete roof. The concrete walls are required because of the proximity of the maintenance facility to the

new public unloading area, and the concrete roof indicated to allow for the future use of this slab as part of the operations.

C. Personnel Facilities

There is a lack of sufficient space, lunchrooms and meeting/training rooms for both the Metro and private operations personnel on the site. The following facilities exist on site:

- Washroom facilities in the transfer building for visitors, Metro and station personnel.
- Washrooms in the scalehouses for Metro personnel.
- Washroom and lunchroom in a trailer next to the HHW building for Metro HHW personnel.
- Washroom in the latex processing building for Metro HHW personnel.
- Washrooms adjacent to the new public unloading building for station personnel and general public.

As can be seen, there are limited washrooms and lunchrooms, meeting or training rooms to serve the on-site operations personnel. A visitors orientation room is also desired, if possible. The Master Plan completed in 1999 identified the possibility of adding washrooms, lunchrooms and meeting rooms at the west end of the existing transfer building. Even with the addition of the public unloading building, this location is still considered the most viable location, for the following reasons:

- They would be located in an area where future expansion for station operations is not practical.
- Construction can be completed with minimal interference with existing operations.
- The location is such that it is close to the main entrance of the South Station. This is more convenient and safer for visitors, and a properly designed facility can serve as a dispatch area for the station operations personnel.
- Modifications in this area will keep all improvements above the 100-year flood level.

Therefore, to completely serve all of the Metro and station operations personnel, it is proposed that the following improvements be made to the facility:

a. Revise the west end of the transfer building to add an office for operations personnel, a reception area, women's restroom, and a new unisex washroom on the main level.

b. On a main level at the west end of the transfer building, add a new storage room. It was decided not to renovate the existing parts and mechanical room on the main level because of the significant amount of existing piping and equipment in this area. The cost to relocate this existing equipment and piping was considered too high for the final results.

c. On the second level at the west end of the transfer building over the existing parts room and the new storage room, construct a new men's locker room and restroom facility and a new operations personnel lunchroom. A new stairway to this level is provided.

d. Expand the existing "control room" at the east end of the transfer building to create an office, meeting and conference room for Metro personnel. This expansion will be to the north and south of the existing room to keep the expansion costs to a minimum. Limited plumbing facilities will be provided because of the location of this "control room" over the compactor area.

Drawings MSS-05, MSS-05A and MSS-06 illustrate the proposed modifications. Modifications a., b. and c. will provide over 2,000 sq.ft. of personnel facilities. The expansion of the "control room" will add another 1,000± sq.ft.

D. Transfer Building Addition

The 1999 Master Plan identified two possible additions to the transfer building. Since that time, the addition to the existing commercial side (50-ft. x 80-ft.) has been completed and is now in use. With the completion of the new public unloading building in 2001, the second addition, which is to the north end of the transfer building, should now be considered.

For the north end of the building, there are three possible alternatives that can be done within the development and operational restraints. Drawings MSS-02, MSS-03 and MSS-04 illustrate these alternates.

Alternate 1 (Drawing MSS-02)

Utilize north end of main transfer building for commercial floor sorting with distribution of recyclables to existing drop boxes. The space would be dedicated to high-graded drop box or commercial waste. No construction costs are associated with this alternate except the possibility of improving the access to the drop box area.

Alternate 2 (Drawing MSS-03)

Extension at the north end of the transfer building. This extension (32+-ft. x 150-ft.) will provide additional space on the north side for commercial vehicle maneuvering and floor sorting.

These modifications could be considered incrementally with no initial cost. Utilization of this space should be reviewed to determine if Alternate 1 has sufficiently increased the commercial recycling effort. If not, Alternate 1 can be implemented, providing additional floor space for storage and sorting of material.

These modifications, together with the public area relocation, are significant in that they provide the Station operator with the ability to increase commercial recycling efforts. That is, there will be space where wastes can be unloaded on the tipping floor and recyclables

removed from the waste stream before it is pushed into the pit. From daily operations, loads can be identified which contain higher quantities of recyclables. These loads would then be directed to an area where they are unloaded onto the tipping floor and recyclables removed. This process is very similar to what is occurring at the Metro Central Station, and has proven to provide increases in recycling quantities.

Based on experience from Metro Central and other similar transfer station operations, it is expected that the increased space within the transfer building from relocating the public and providing the additions described herein, will result in an additional 2% to 3% recovery of recyclables from the delivered waste stream.

Alternate 3 (Drawing MSS-04)

As stated, Alternates 1 and 2 will provide the station operators with the space and flexibility to "dump and sort". However, for this operation to be even more successful, it has been requested by the operators that a baler be installed in this north end. The addition of a baler would allow for baling of papers, OCC, plastics and containers.

Even with the addition presented in Alternate 2, there is still limited area available for "dump and sort" operation. Therefore, with the baler installation, it is recommended that the transfer building be expanded to the east. This building extension would include the new baler and space for bale storage.

E. Improvements to Sanitary Sewer System (Drawing MSS-10)

The existing sanitary sewer wastes from the scalehouse washrooms, latex building and new public unloading facility are drained by gravity down to Sanitary Pump Station #1 east of the compactor area. (See Dwg. MSS-10 for proposed improvements.) This is a level approximately 29 feet below the main site level. The wastes are then pumped up to a manhole on the south side of the bridge over the compactor area, then it drains by gravity, picking up waste from the truck wash to the west end of the site where it is deposited into Sanitary Pump Station #2 and via force main to the local waste treatment plant.

At present, Home Depot is in the process of constructing a new store across Washington Street from the Station. As part of this new facility, a new sanitary sewer gravity line is being installed on Washington Street. Home Depot has agreed to provide an 8-inch stub-out from the new system on Washington Street at the main entrance to the Station. All of the sanitary sewer system at the Station could be connected to this gravity system if the following modifications are done (see Dwg. MSS-10):

- Wastes would still be pumped from Sanitary Pump Station #1 to the existing manhole on the south side of the bridge over the compactor area.
- Modifications will be required at this manhole to increase the invert elevation.

- A new Manhole No. 1 should be installed to receive, by gravity, the wastes from the truck wash and from the modified manhole on the south side of the bridge over the compactor area.
- Then, new gravity lines should be installed from the new Manhole No. 1 out to a manhole on Washington Street, and then west to the Home Depot connection on Washington Street at the main station entrance.
- These proposed modifications would significantly reduce the amount of sanitary sewer discharge to Sanitary Pump Station #2 near the HHW building. Therefore, it is proposed to pump this waste from the #2 Station up to the new Manhole No. 1 and into the gravity system.

F. Energy/Lighting Improvements

A review of the lighting fixtures in the main transfer building resulted in the conclusion that this system is in good condition and no recommendations for changes are necessary. However, some daylighting similar to the new public unloading building would enhance the existing conditions and allow for the zoning of fixtures within the building.

By removing 6-ft. high sections of siding around the building, the following benefits are possible:

- Enhance the existing foot-candle intensity within the building.
- The existing lighting system could be recirculated such that the low bay fixtures located near the walls could be de-energized during daylight conditions.
- This re-circulating would affect approximately 12 – 16 400-watt fixtures.

The estimated annual energy savings by recirculating these fixtures is approximately $1,800+, resulting in a return of investment of approximately 18± years based on a construction cost of $32,000.

It should be noted that the actual panels to be removed will be decided in coordination with Metro. The following should be considered when selecting these panels:

- Area on the south wall adjacent to Washington Street should be restricted or translucent panels considered to negate any impacts.
- If the building addition proposed for the north side is considered, then the design of this addition should consider the elimination of some panels.

G. Wood Processing Addition (Drawing MSS-08)

At present, all wood and green wastes received at the South Station are reloaded and transferred to Metro Central for processing. The volumes from South represent at least one-

half of the total volumes processed at Central. In addition, with the opening of the public unloading facility, it is reasonable to expect that the volumes at South may increase.

Based on the above, the possibility of providing wood processing capability at the South Station should be considered. Since the new public unloading building will provide space for storage of this wood and green wastes, locating the processing equipment as close to this area would be preferred.

Consequently, a layout has been prepared which places the equipment near the southwest corner of the new building, and adjacent to the roof of the proposed maintenance building.

The proposed equipment consists of a horizontal feed hammermill capable of processing 15-20 TPH of wood and green wastes, reducing the material down to a 2"(-) size. The shredded material is discharged from the hammermill onto a conveyor and conveyed to a transfer trailer. A magnetic separator is located over this conveyor to remove all ferrous metals.

The installation of the equipment should reduce the overall cost of receiving and processing wood and green wastes for Metro and the private operators.

H. Perimeter Sidewalk Addition (Drawings MSS-01 and MSS-07)

Oregon City has requested that Metro install a sidewalk along Washington Street at the south perimeter of the site. Drawing MSS-01 illustrates the extent of the sidewalk which is 5-feet wide and is located 3-feet off the north curb of Washington Street.

I. Compactor Addition and Alternative Wood Processing Area Location (MSS-09)

In discussions with Metro administrative and operations personnel, the question was raised as to whether a compactor could be added at the new public unloading building. Drawing MSS-09 illustrates a possible location for the new compactor at the southwest corner of the building. The possibility of placing the new compactor in one of the existing loadout bays was considered; however, it is felt that this approach would reduce the overall flexibility of the existing two-bay loadout system.

This compactor addition would involve the following:

- New slab at the Elev. 34'-0" to support the new compactor. Trailers would reverse to the compactor at this level from the existing ramp down to the lower existing compactor area.
- New compactor capable of producing one full (37-ft. ±) compacted waste "slug".
- 32-ft. x 75-ft. building addition including new retaining walls.

If Metro feels that the addition of a compactor is an improvement which could occur in the near future, then the wood processing system should be located in the northeast corner of the

new public unloading building. To provide the necessary space for the wood processing, a 4,000± sq.ft. addition is proposed. This provides the space needed for storage and processing. (See Drawing MSS-09.)

2.6 COST ESTIMATES OF IMPROVEMENTS

The following capital costs are based on quantity take-offs with appropriate unit prices, on Vendors' quotations, and on lump sum estimates where quantity take-offs are not practical. Unit prices and lump sum estimates are based on data from past similar projects, from discussions with Contractors, and industry cost data manuals.

A. Maintenance Facility (Drawing MSS-07)

Excavation	$30,000
Temporary Shoring	10,000
Utility Relocation	20,000
Concrete	
• Slab/Foundations	18,000
• Retaining Walls	45,000
• Elevated Slab/Roof	20,000
• Embedded Steel	5,000
Structural & Miscellaneous Steel	
• Structural Steel	45,000
• Miscellaneous Steel	15,000
Masonry Walls	15,000
Maintenance Area Improvements	25,000
Lighting & Electrical Services	20,000
Plumbing	10,000
Apertures	20,000
Subtotal	**$298,000**
Contingency	75,000
General Conditions	56,000
Engineering	43,000
Total	**$472,000**

B. New Personnel Facilities (Drawings MSS-05, MSS-05A and MSS-06)

a. Addition at West End of Transfer Building Pit

Demolition	$ 20,000
Concrete	
• Slab over pit	15,000
• Concrete modifications	10,000
Interior Wall Modifications – Reception Area	10,000

Interior Finishing (650± sq.ft.)	65,000
HVAC	10,000
Lighting and Electrical Services	10,000
Plumbing	15,000
Doors/Windows	20,000
Furnishings/Cabinets	15,000
Premium Due to Restricted Working Area	10,000
Subtotal	**$200,000**
Contingency	50,000
General Conditions	30,000
Engineering	28,000
Total	**$308,000**

b. New Storage Room

Demolition and Equipment Removal	$ 10,000
Slab Repair	3,000
Elevated Slab	10,000
Masonry Walls	15,000
Interior Finishing (existing walls)	10,000
Ventilation	4,000
Lighting and Electrical Services	5,000
Doors	3,000
Premium Due to Restricted Working Area	10,000
Subtotal	**$ 70,000**
Contingency	18,000
General Conditions	10,000
Engineering	10,000
Total	**$108,000**

c. Men's Restroom and Lunch Room – 2nd Level

Demolition	$ 5,000
Concrete	
• Elevated slab	10,000
• Concrete modifications	5,000
Structural Steel	10,000
Masonry Walls	15,000
Roof Deck	15,000
New Interior Walls (west and south sides)	15,000
Interior Finishing (800+ sq.ft.)	10,000
HVAC	10,000
Lighting and Electrical Services	12,000
Plumbing Including Fixtures	15,000
Furnishings/Cabinets/Lockers	20,000
Miscellaneous Steel Stairways	15,000
Premium Due to Restricted Working Area	30,000

Subtotal	**$187,000**
Contingency	47,000
General Conditions	25,000
Engineering	25,000
Total	**$284,000**

d. Addition to the "Control Room"

Demolition	$ 15,000
Excavation and Fill	5,000
Concrete	
• Foundations/Slab	10,000
New Ramp	10,000
New Structures	50,000
HVAC	15,000
Lighting and Electrical Services	15,000
Plumbing	5,000
Interior Finishing	15,000
Windows/Doors	5,000
Subtotal	**$145,000**
Contingency	36,000
General Conditions	18,000
Engineering	20,000
Total	**$219,000**

C. Transfer Building Addition (33-ft. x 150-ft.) – Alternate 2 (Drawing MSS-03)

The costs for this addition are higher than normal due to the limited access available for construction.

Revisions to Existing Structure @ Roof and Wall Removal	$ 35,000
Tie-in to Existing Structure	20,000
Backfill/Compaction	15,000
Retaining Wall/Foundations/Slab	65,000
Structural Steel	150,000
Siding and Roof Deck	70,000
Miscellaneous Steel	20,000
Relocation of Existing Equipment	5,000
Lighting and Electrical Services	30,000
Ventilation	10,000
Extra Due to Site Restrictions	50,000
Subtotal	**$470,000**
Contingency	118,000
General Conditions	88,000
Engineering	68,000
Total	**$744,000**

D. Baler Addition (Alternate 3) (Drawing MSS-04)

Demolition	$ 10,000
Excavation and Fill	5,000
Building Addition (1,300+ sq.ft.)	100,000
Concrete	
• Conveyor Pit	10,000
Baler Feed Conveyor	100,000
Baler	300,000
Power Supply and Distribution	10,000
Premium Due to Limited Area (included in C. above)	-0-
Subtotal	**$535,000**
Contingency	130,000
General Conditions	60,000
Engineering	50,000
Total	**$775,000**

E. Improvements to Sanitary Sewer System (Drawing MSS-10)

Modifications to Existing Manhole @ South Side of Bridge Over Compactor Area	$ 5,000
New Manhole No. 1	20,000
New 8-inch Line from Truck Wash	5,000
New 8-inch Line from Existing Manhole to New Manhole No. 1	10,000
New 8-inch Line From Manhole No. 1 out to Manhole in Washington Street	10,000
New Manhole in Washington Street	10,000
New 8-inch Line Along Washington Street to Home Depot Tie-in	30,000
New 3-inch Force Main	15,000
Subtotal	**$105,000**
Contingency	26,000
General Conditions	20,000
Engineering	15,000
Total	**$166,000**

F. Energy/Lighting Improvements

Remove 6-ft. Siding Panels	$ 9,000
Flashing of Existing Siding	10,000
Re-circuit Fixtures	2,000
Subtotal	**$21,000**
Contingency	5,000
General Conditions	3,000
Engineering	3,000
Total	**$32,000**

G. Wood Processing Addition (Drawing MSS-08)

Foundations/Slab	$ 30,000
Enclosure (2,000 sq.ft.)	60,000
Hammermill Including Feed Table	350,000
Take-Away Conveyor	30,000
Magnetic Separator	20,000
Trailer Load-Level System	25,000
Miscellaneous Steel	10,000
Modifications to Existing Building	10,000
Lighting and Electrical Systems	20,000
Subtotal	**$555,000**
Contingency	139,000
General Conditions	50,000
Engineering	60,000
Total	**$804,000**

H. Perimeter Sidewalk Addition (Drawings MSS-01 and MSS-07)

Excavation/Compaction	$ 8,000
Compacted Fill (4-inches)	1,000
Concrete Slab	18,000
Striping	2,000
Curb Renovations (Handicap Ramps)	5,000
Subtotal	**$ 34,000**
Contingency	9,000
General Condition	6,000
Engineering	3,000
Total	**$ 52,000**

I. Compactor Addition and Alternate Wood Processing Area Location (Drawing MSS-09)

Demolition	$ 10,000
Utilities Relocation	5,000
Concrete	
• Foundations and Grade Slab	32,000
• Upper Grade Slab	15,000
• Retaining Walls	80,000
Building Addition	150,000
Push Walls	45,000
New Compactor	600,000
Power Supply and Distribution	50,000
Subtotal	**$ 987,000**
Contingency	247,000
General Conditions	150,000
Engineering	120,000
Total	**$1,504,000**

Alternate Wood Processing Area

Demolition	$ 10,000
Concrete	
• Foundations and Slab	92,000
• Piers	10,000
Enclosure (4,000 sq.ft.)	160,000
Modifications to Existing Building	10,000
Push Walls	36,000
Hammermill Including Feed Table	350,000
Take-Away Conveyor	30,000
Magnetic Separator	20,000
Trailer Load-Level System	25,000
Miscellaneous Steel	10,000
Lighting and Electrical Services	20,000
Miscellaneous Site Improvements	10,000
Fire Protection	10,000
Ventilation	5,000
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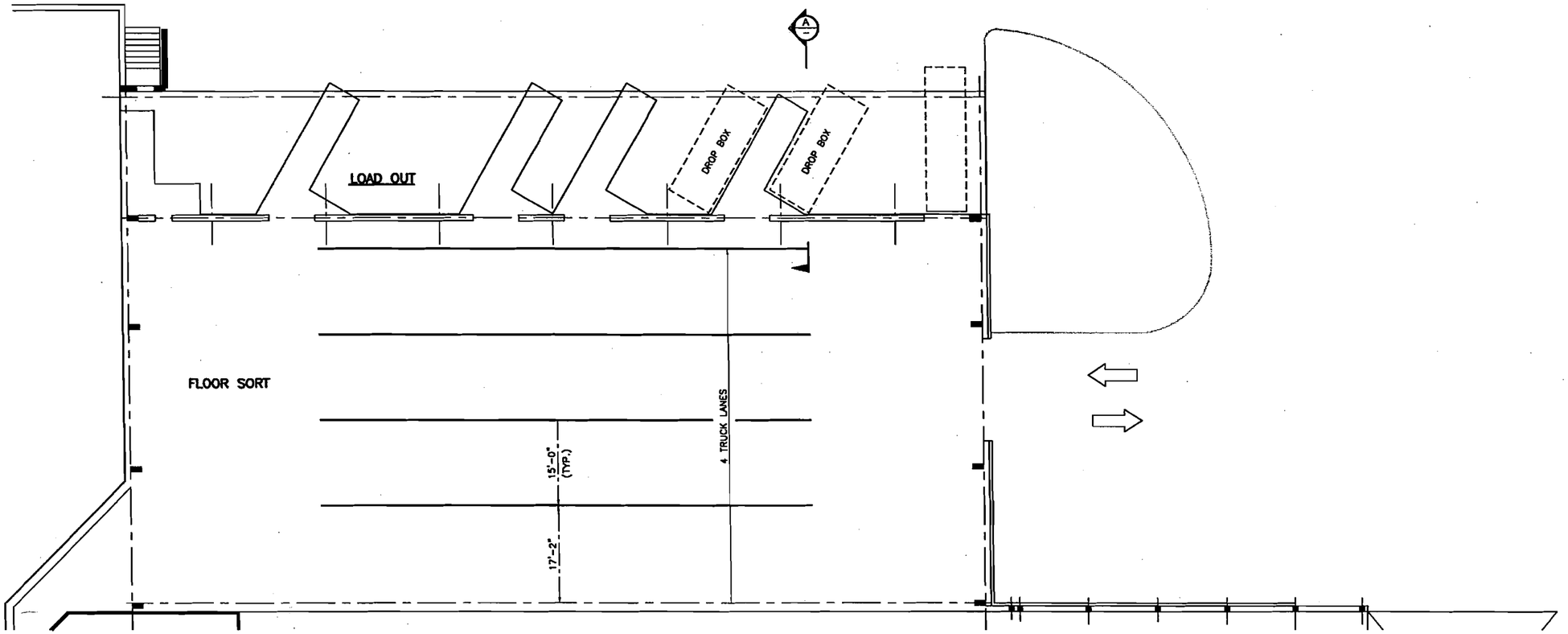
Contingency	200,000
General Conditions	100,000
Engineering	100,000
Total	**$1,198,000**

COMMERCIAL ONLY SCALE



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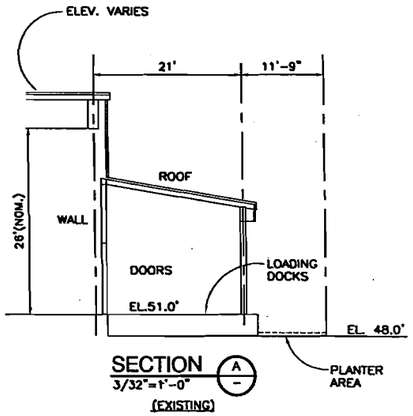

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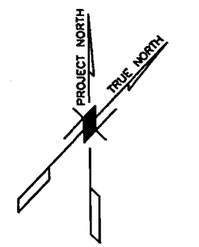

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A	8/27/01	PCF	FOR CLIENT REVIEW

JOB No. 52-00140015	DESIGNED:	PROJ. ENGINEER: RWC
SCALE: AS NOTED	DRAWN BY: MLJ/PCF	APPROVED BY:
	CHECKED BY: RWC	DATE: 8/1/01

WARNING
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IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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METRO SOUTH

PORTLAND, OREGON

METRO SOUTH MASTER PLAN

TRANSFER BUILDING IMPROVEMENTS
PLAN & SECTION

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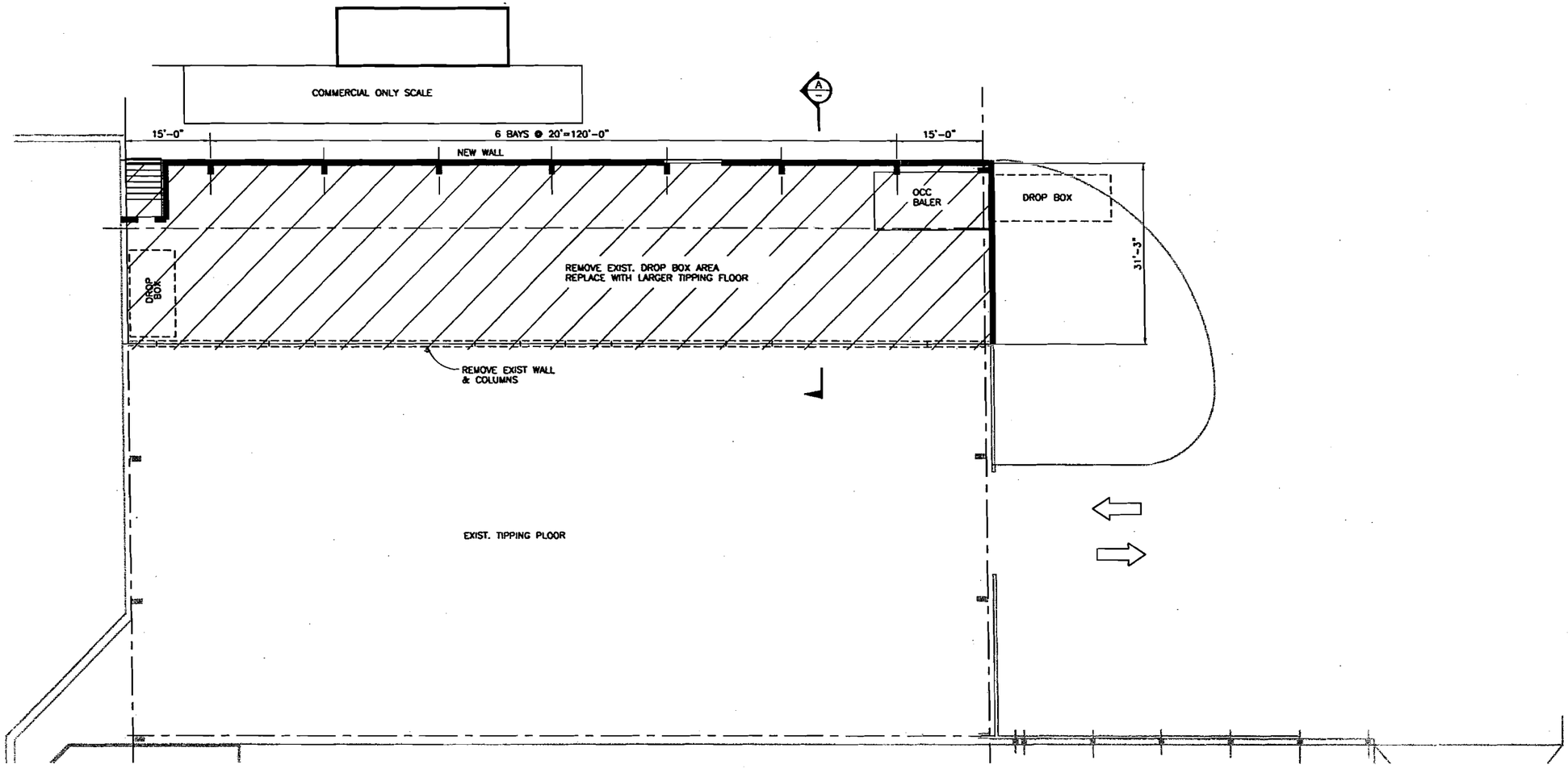
CAD FILE NUMBER:	MSS-02
SHEET: OF	REV. A



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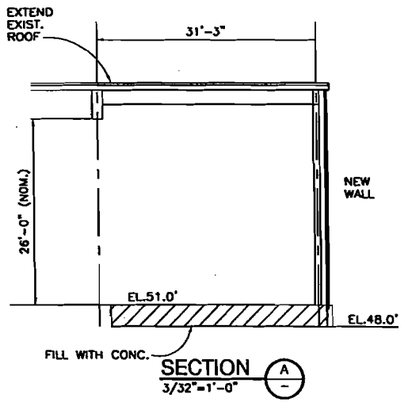

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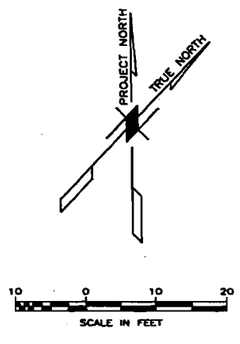

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METRO SOUTH

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METRO SOUTH MASTER PLAN

TRANSFER BUILDING ADDITION
PLAN AND SECTION

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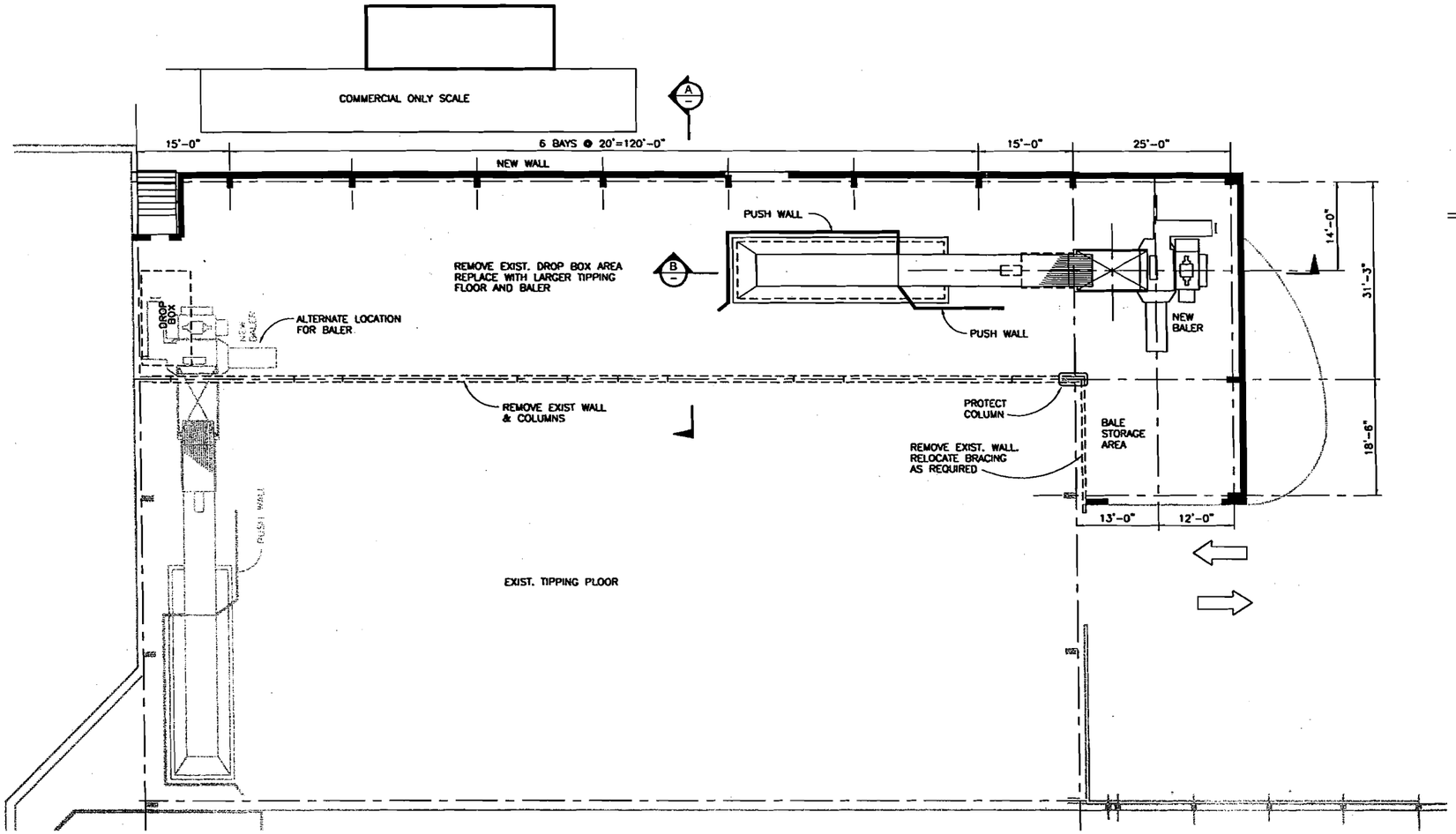
CAD FILE NUMBER:	MSS-03
SHEET: OF	REV. A



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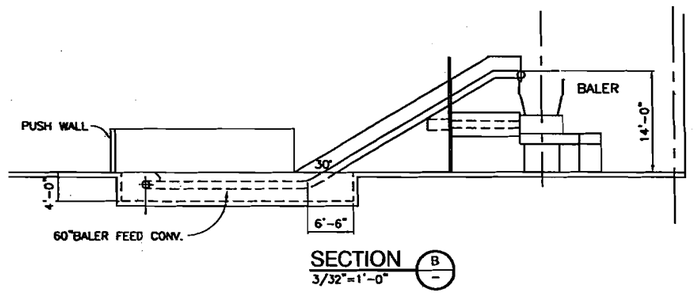

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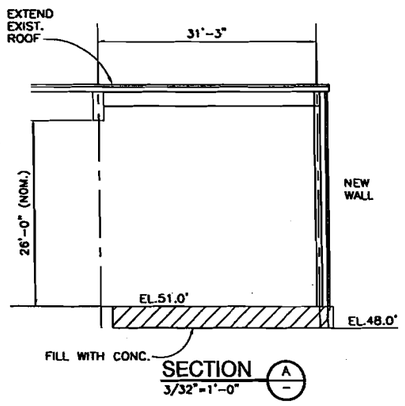

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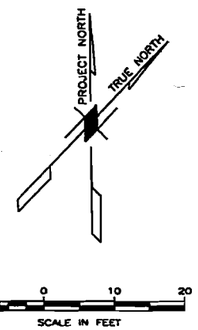

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A	8/27/01	NT	FOR CLIENT REVIEW

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	CHECKED BY: RWC	DATE: 8/21/01

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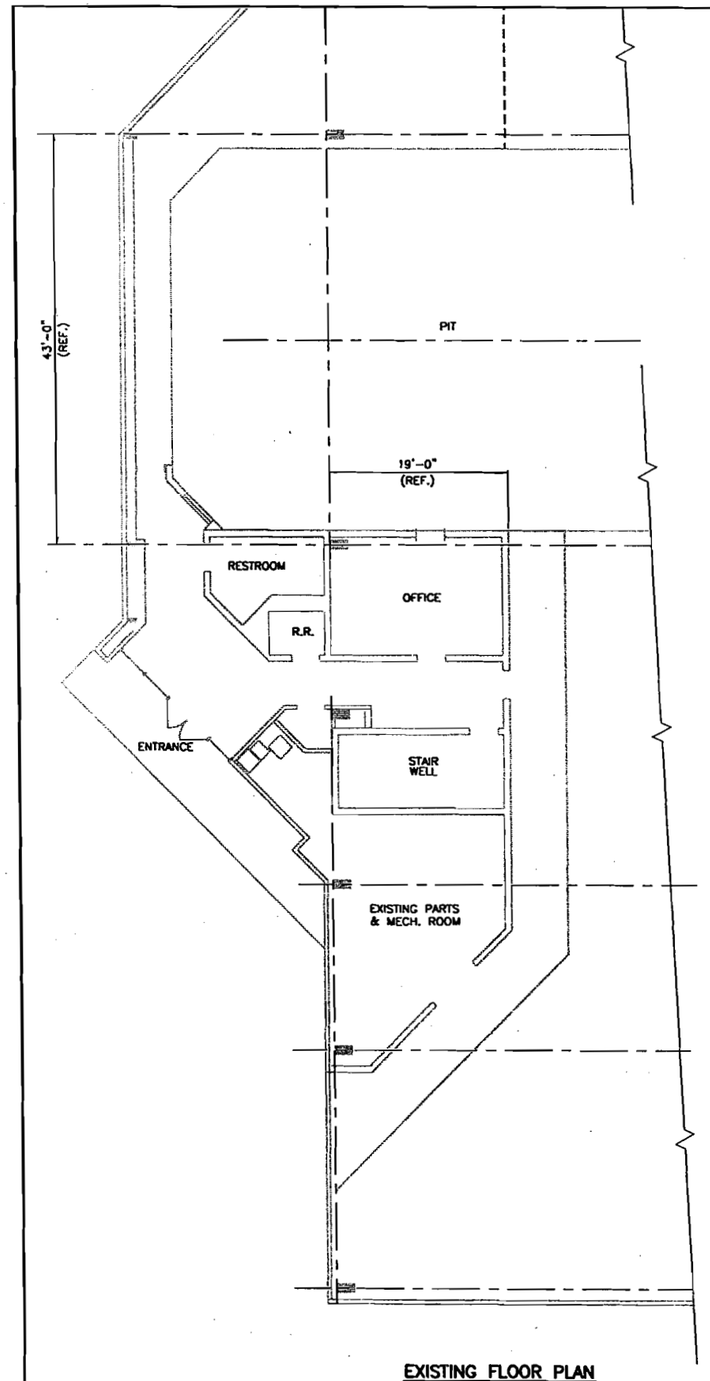
METRO SOUTH

PORTLAND, OREGON

METRO SOUTH MASTER PLAN

TRANSFER BUILDING ADDITION WITH BALER
PLAN AND SECTION

DRAWING NUMBER:	
MSS-04	
CAD FILE NUMBER:	
MSS-04	
SHEET: OF	REV. A



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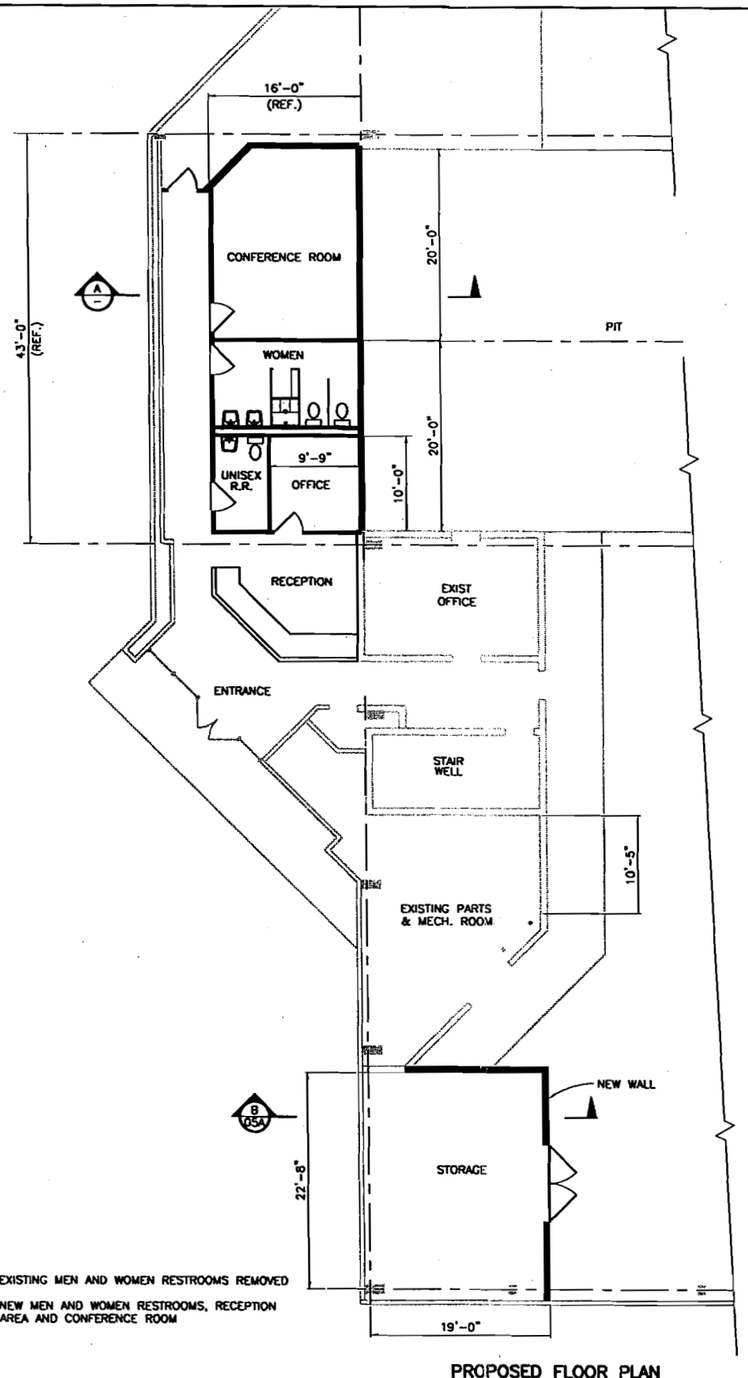
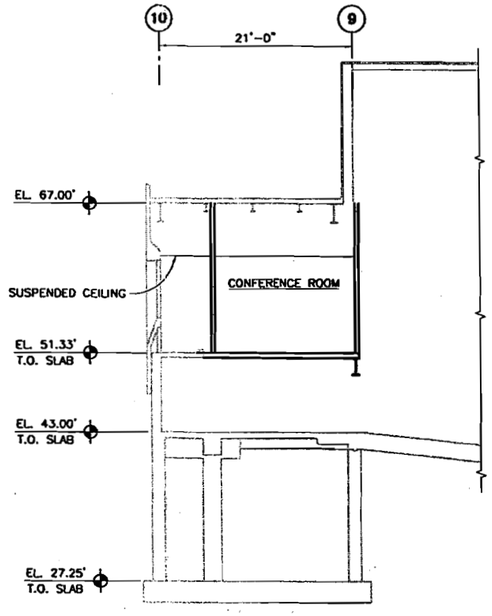


- EXISTING MEN AND WOMEN RESTROOMS REMOVED
- NEW MEN AND WOMEN RESTROOMS, RECEPTION AREA AND CONFERENCE ROOM

PROPOSED FLOOR PLAN
1/8"=1'-0"



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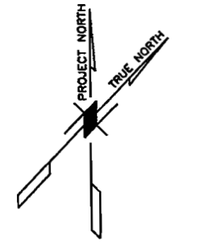

No.	DATE	BY	REVISION
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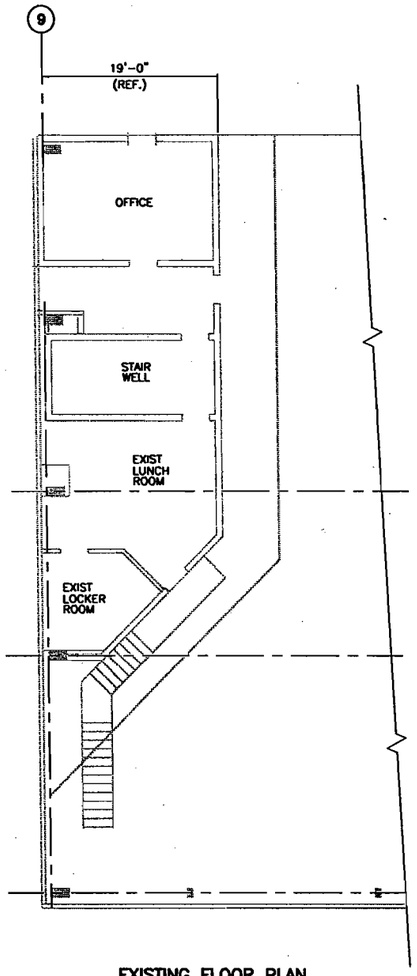
METRO

PORTLAND, OREGON

METRO SOUTH MASTER PLAN

TRANSFER BUILDING ADDITION
OPERATOR FACILITIES PLAN SHT.1

DRAWING NUMBER:	MSS-05
CAD FILE NUMBER:	MSS-05
SHEET: OF	REV. B



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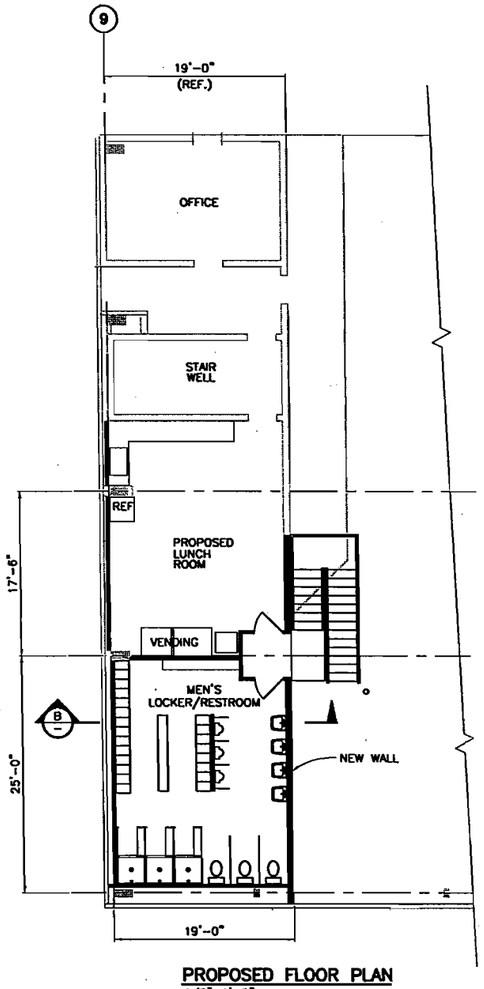

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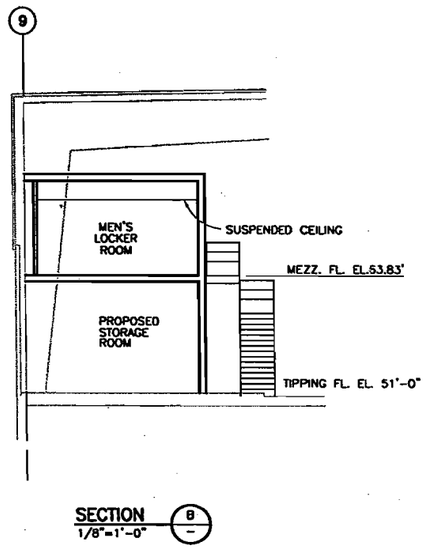

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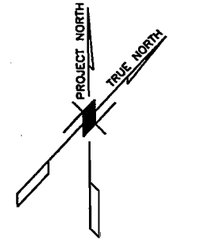

8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	08/27/01	NT	FOR CLIENT REVIEW

JOB No. 00140015.00	DESIGNED: VCH	PROJ. ENGINEER: RWC
SCALE: 1/8"=1'-0"	DRAWN BY: MLJ	APPROVED BY:
	CHECKED BY: RWC	DATE: 9/6/01

WARNING
0 1/2 1
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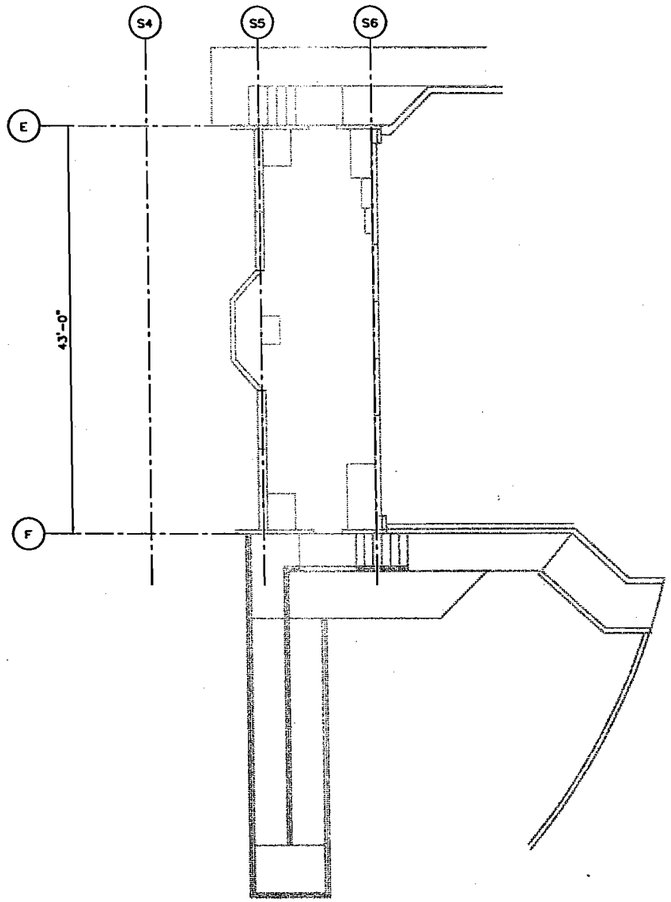
METRO SOUTH MASTER PLAN
TRANSFER BUILDING ADDITION
OPERATOR FACILITIES PLAN SHT.2

DRAWING NUMBER:	
MSS-05A	
CAD FILE NUMBER:	
MSS-05A	
SHEET: OF	REV. A



EXISTING CONTROL ROOM FLOOR PLAN
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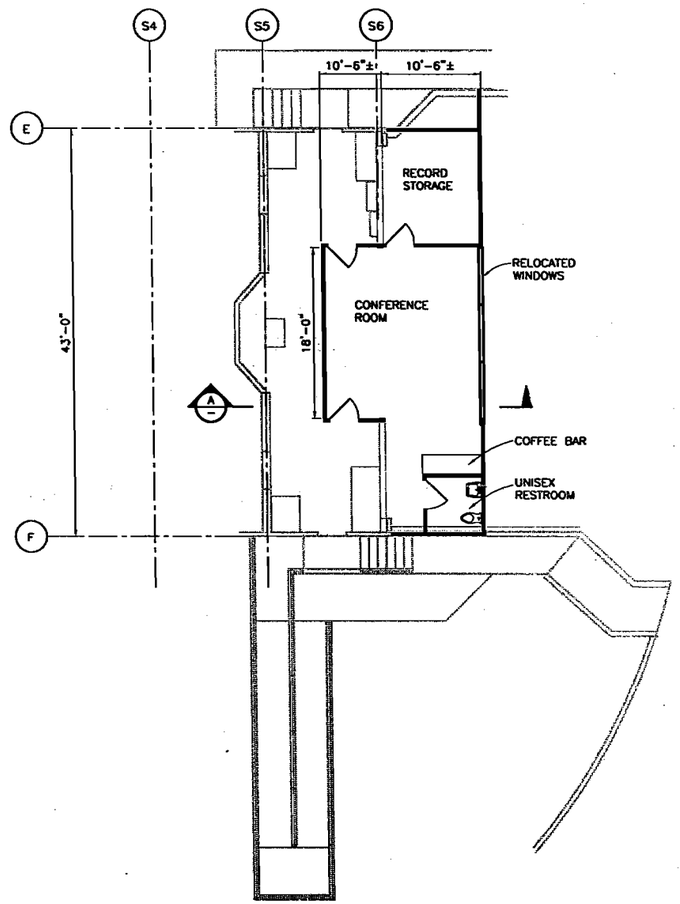

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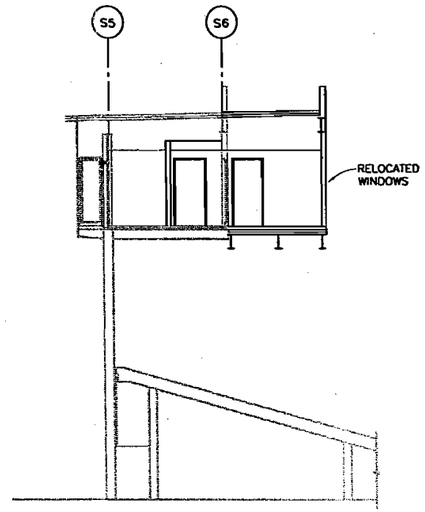
1/8"=1'-0"



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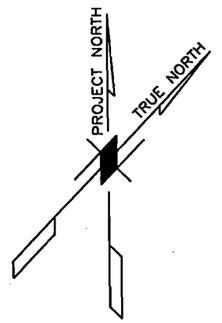

No.	DATE	BY	REVISION
A	08/27/01	PCF	FOR CLIENT REVIEW

JOB No. 52-00140015.00
SCALE: 1/8"=1'-0"
DESIGNED: VCH
DRAWN BY: MLJ
CHECKED BY: RWC
PROJ. ENGINEER: RWC
APPROVED BY:
DATE: 8/22/01

WARNING
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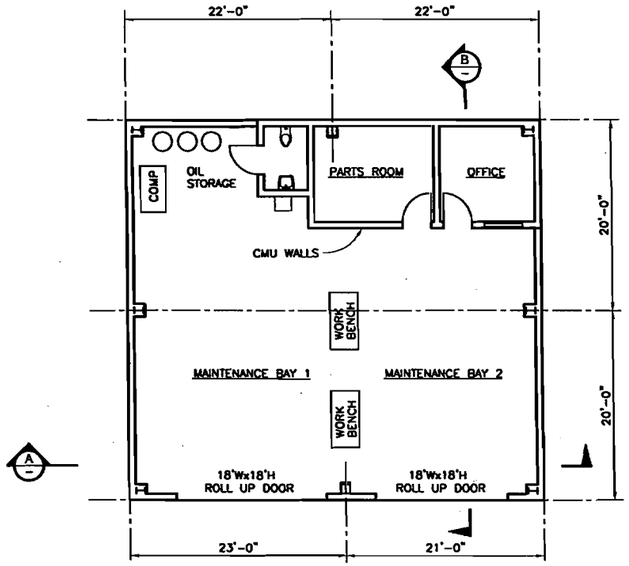
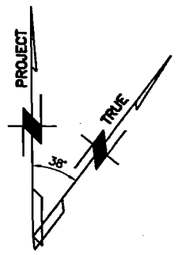
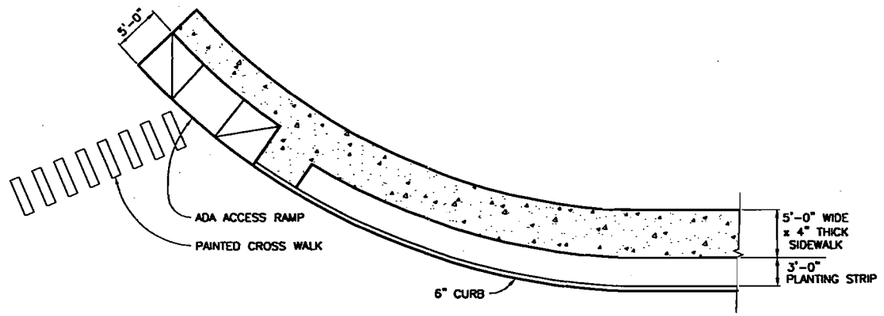
METRO SOUTH MASTER PLAN
TRANSFER BUILDING ADDITION
METRO PERSONNEL FACILITIES

DRAWING NUMBER: MSS-06
CAD FILE NUMBER: MSS-06
SHEET: OF
REV. A

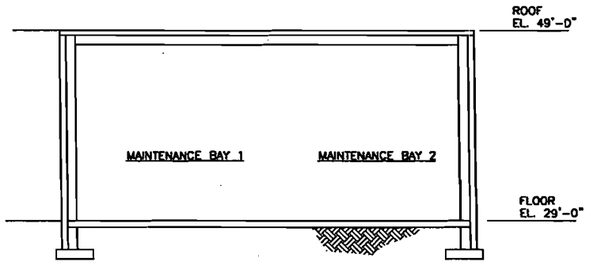


FLOOR PLAN
1/8"=1'-0"





PERIMETER SIDEWALK DETAIL
N.T.S.



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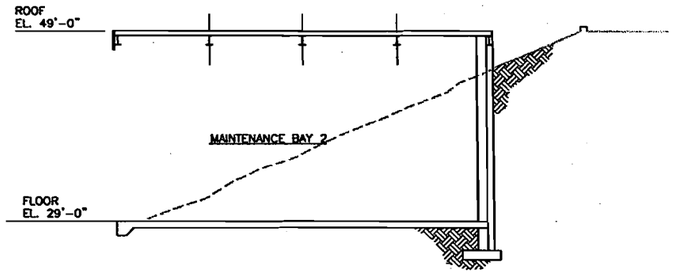
1/8"=1'-0"



SECTION B
1/8"=1'-0"

8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	PCF	FOR CLIENT REVIEW

JOB No.	52-00140015
SCALE:	AS NOTED
DESIGNED:	
DRAWN BY:	PCF
CHECKED BY:	RWC
PROJ. ENGINEER:	RWC
APPROVED BY:	
DATE:	8/21/01

WARNING
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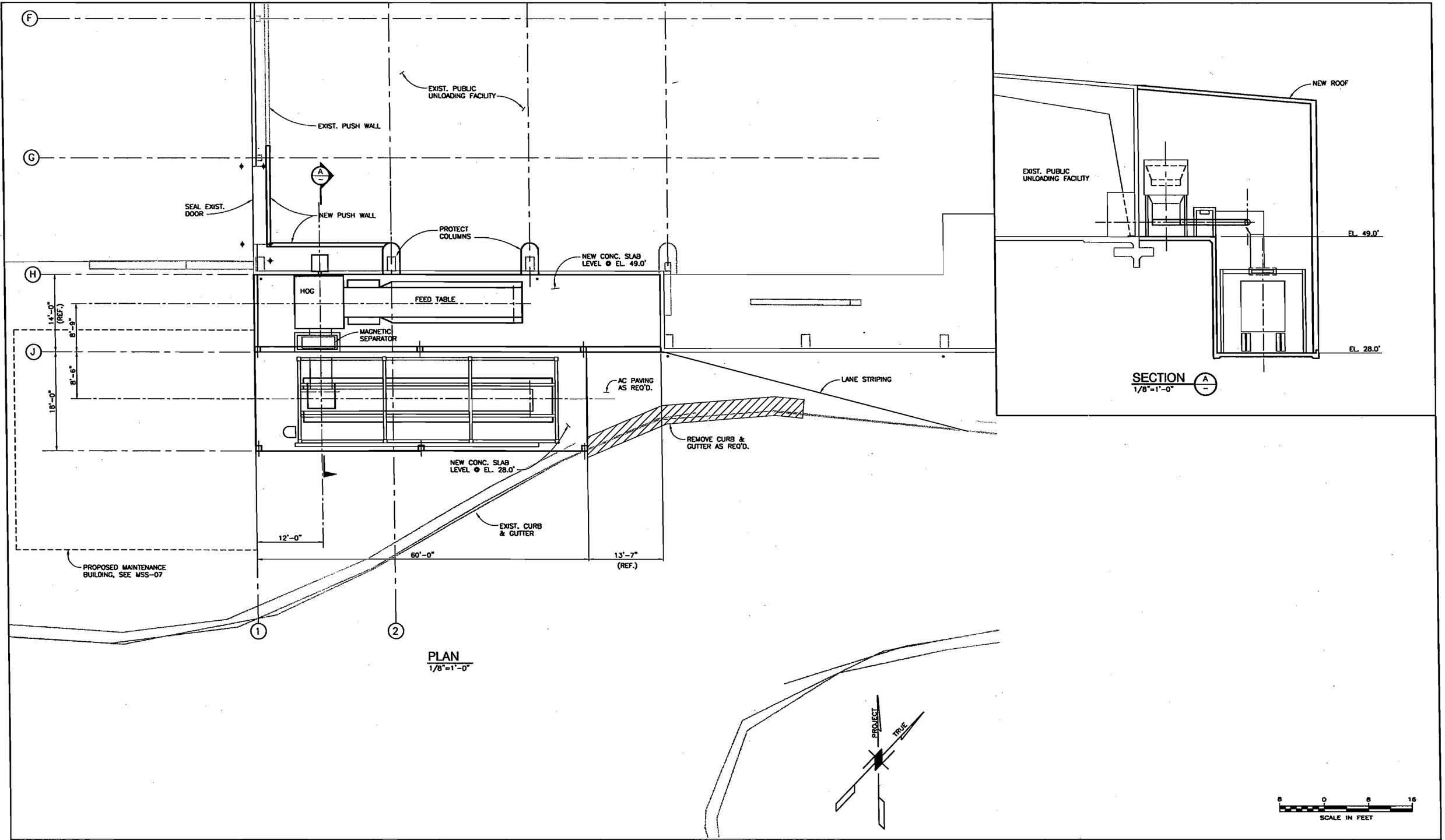
METRO SOUTH MASTER PLAN
MAINTENANCE BUILDING
PLAN, SECTIONS & DETAIL

DRAWING NUMBER:	MSS-07
CAD FILE NUMBER:	MSS-07
SHEET:	OF
REV.	A



PLAN
1/8"=1'-0"

SECTION A
1/8"=1'-0"

8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	PCF	FOR CLIENT REVIEW

JOB No. 52-00140015	DESIGNED: PCF/VCH	PROJ. ENGINEER: RWC	WARNING: IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.
SCALE: AS NOTED	DRAWN BY: PCF	APPROVED BY:	
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METRO

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METRO SOUTH MASTER PLAN

PUBLIC UNLOADING FACILITY ADDITION
WOOD PROCESSING ADDITION PLAN & SECTION

DRAWING NUMBER:	
MSS-08	
CAD FILE NUMBER:	
MSS-08	
SHEET: OF	REV. A

PACIFIC RAILROAD

SCALES AND SCALEHOUSES

HHW

MAIN TRANSFER BUILDING

SANITARY PUMP STATION #2

SANITARY PUMP STATION #1

PUBLIC UNLOADING FACILITY

TRANSFER TRAILERS

PUBLIC

PUBLIC

LATEX BUILDING

F.D.

F.D.

F.D.

IN (NE) = 40.07
IN (E) = 40.07
OUT (SW) = 30.87

IN = 43.75
OUT = 43.52

IN = 42.65
OUT = 42.45

288'-0"
3" PVC FORCE MAIN

87'-0"

M.H. 1

72'-8"

TRUCK WASH

OUT = 44.00

8" 400'-0"

WASHINGTON STREET

8" 145'-0"

IN = 41.87
OUT = 41.67

HIGHWAY

PROJECT

TRUE

36°

50 0 50 100
SCALE IN FEET

LEGEND

⇦ PUBLIC VEHICLE ACCESS

⬅ TRANSFER TRAILER ACCESS

F.D. FIRE DEPARTMENT CONNECTION

No.	DATE	BY	REVISION
A	8/27/00	CAS	FOR CLIENT REVIEW

JOB No.: 52-00140015.00	DESIGNED: TA	PROJ. ENGINEER: RWC	
SCALE: 1"=50'	DRAWN BY: MLJ	APPROVED BY:	
	CHECKED BY: RWC	DATE: 7/30/01	

WARNING
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METRO

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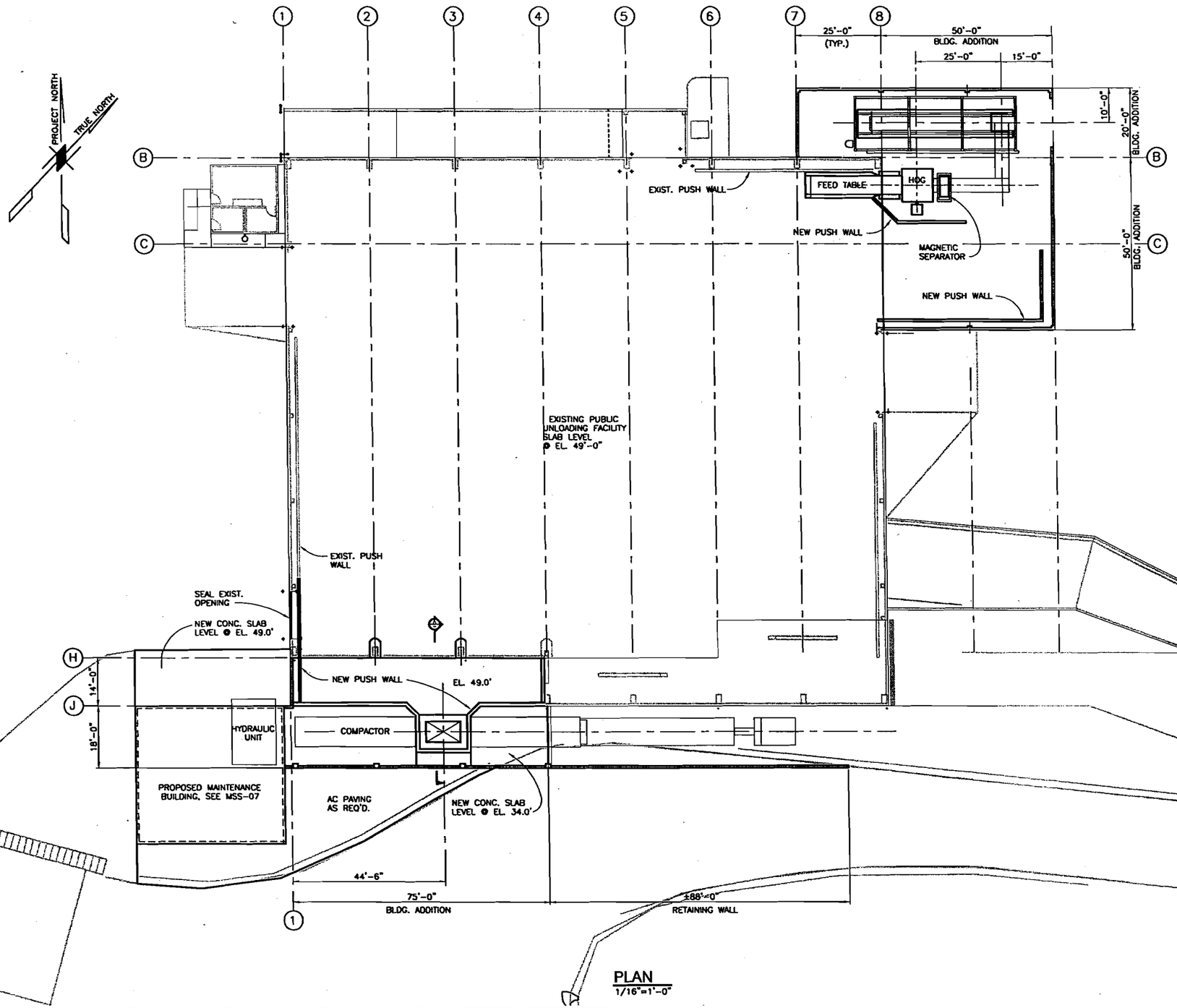
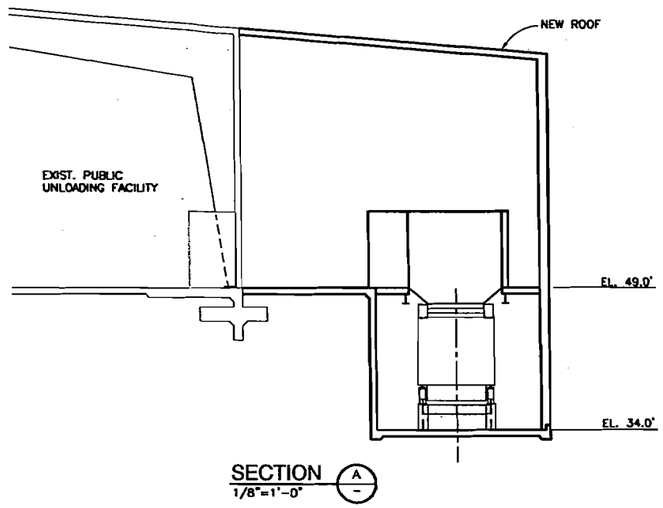
METRO SOUTH MASTER PLAN

SOUTH STATION
SANITARY SEWER IMPROVEMENTS

DRAWING NUMBER: MSS-10
CAD FILE NUMBER: MSS-10
SHEET: OF
REV.: A



PLAN
1/16"=1'-0"



SECTION A
1/8"=1'-0"

16 0 16 32
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	PCF	FOR CLIENT REVIEW

JOB No. 52-00140015	DESIGNED: VCH/PCF	PROJ. ENGINEER: RWC	WARNING 0 1/2 1 IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.
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	CHECKED BY: RWC	DATE: 8/23/01	

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METRO SOUTH MASTER PLAN
PUBLIC UNLOADING FACILITY ADDITION
COMPACTOR & ALTERNATE WOOD PROCESS'G AREA

DRAWING NUMBER:	
MSS-09	
CAD FILE NUMBER:	
MSS-09	
SHEET: OF	REV. A

3.1 FACILITY OVERVIEW

A. Location/Access

The Metro Central Station (MCS) is located on a 6-acre site in Northwest Portland and Multnomah County. The address is 6161 N.W. 61st Avenue, Portland, Oregon 97210. The site is bounded by 61st Avenue on the south, an industrial compressed gas manufacturer on the east, and on the north and west by property which was originally utilized for heavy industrial manufacturing and is designated as Superfund sites by the Federal Environmental Protection Agency (EPA).

Access to the site is available off of N.W. 61st Avenue. Vehicles access the site by proceeding north on Front Avenue to 61st Avenue, then turn left onto 61st and proceed to the Station entrance which is a distance of approximately 500 feet west from the intersection of Front Avenue and N.W. 61st Avenue. It is possible to approach the MCS site from St. Helens Road (Highway 30), located about 1,000 feet to the west of the site; however, this route is not recommended by Metro due to railroad crossing, road conditions and neighborhood complaints.

A site vicinity map is shown in Figure 3-1. Drawing MCS-01 illustrates the present site layout.

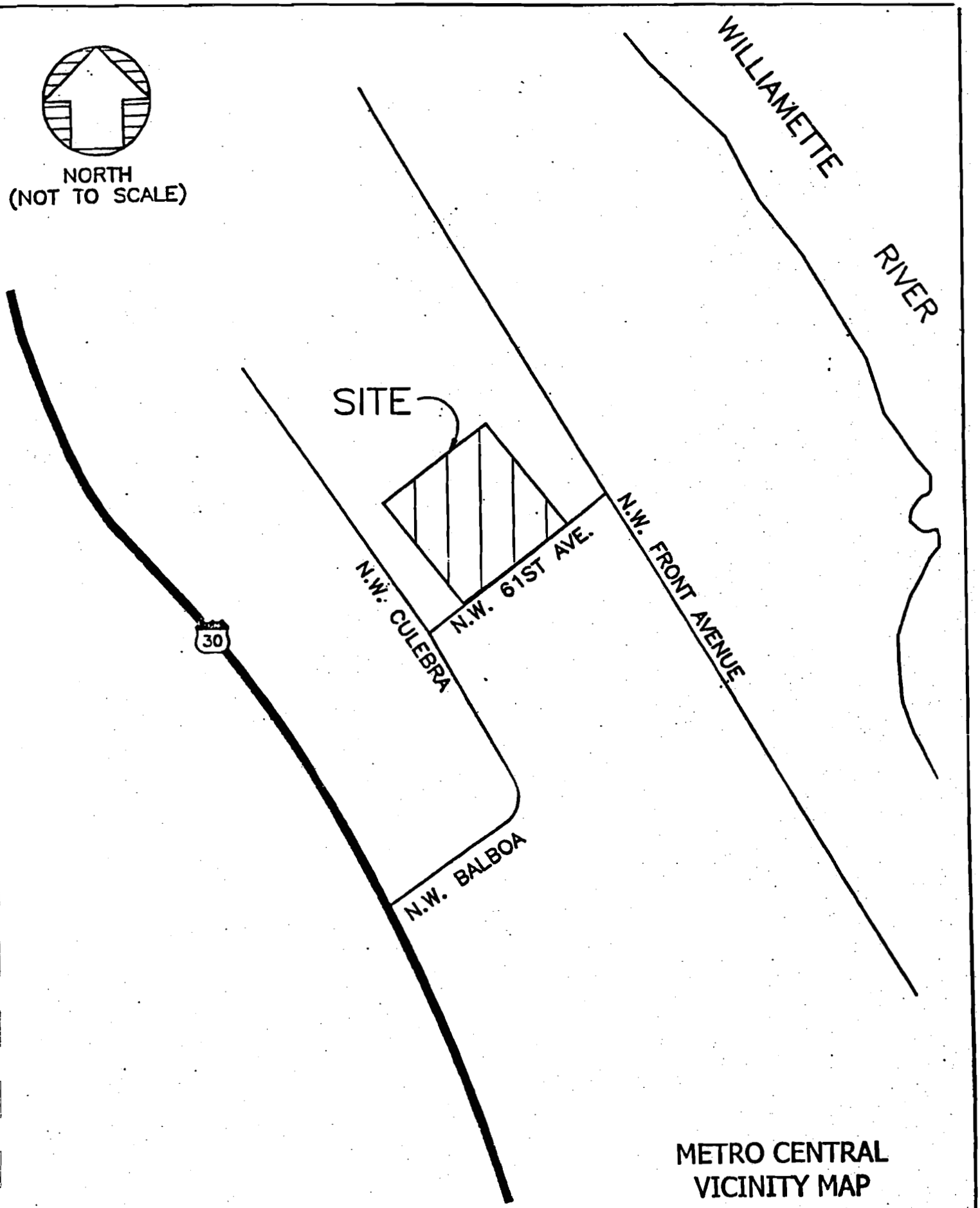
B. Adjacent Land Uses

MCS is located on a site zoned as heavy industrial. The site is bounded on the north by property that is designated by the Environmental Protection Agency (EPA) as a Superfund site due to lead contamination, and on the west by another Superfund site due to pesticide contamination. On the south across 61st Avenue, there are petroleum storage and transfer facilities, and on the east there is an industrial company that produces various industrial gases.

There is a limited number of private residences within the vicinity of those sites, with the closest being about one-half mile to the west.

C. Zoning/Permitting

MCS is on 6 acres of property that is zoned for Heavy Industrial Use. The property is above the 100-Year Flood Plain. The Station operates under a Solid Waste Disposal Permit (No. 408) issued by DEQ in accordance with provisions of ORS Chapter 459, and subject to the land use compatibility statement from the City of Portland dated November 13, 1989. The present Solid Waste Disposal permit expires on August 31, 2005.



METRO CENTRAL
VICINITY MAP
FIGURE 3-1

D. Environmental Issues

There are no significant environmental issues that exist on the MCS site. There is one issue that should be monitored on a regular basis. This is:

- EPA has designated the property to the west and north of the site as Superfund sites. The property to the north is contaminated with lead and the property to the west is contaminated with pesticides. This has no direct effect on the MCS site; however, Metro should keep informed of any future plans for either of these sites.

E. Utilities

On-site utilities include electrical, water supply, storm sewer and sanitary sewer. In general, since the Station began operations in 1991, there have been few revisions made to the existing systems.

Electrical: Power is supplied to the site from Portland General Electric (PGE) power lines on N.W. 61st Avenue. There is sufficient power to handle all of the developments proposed for the Station.

Water Supply: Water is supplied from the City of Portland water line along N.W. 61st Avenue. Water is required for facility washdown, truck wash facilities, hydrants and sprinkler system, and restroom facilities for Metro and Station operators. Daily usage averages in the range of 5,000 to 8,000 gallons per day with the truck wash accounting for the major portion of the water usage. The present system is capable of supporting any future developments.

Storm Sewers: All storm waters are collected and routed by gravity to the east side of the site into an existing system which drains to the Willamette River. There are 26 storm drains on the site that drain to the takeaway gravity line. The Station operator tests and pumps the system about once a month. As a result, the storm system is adequate for the site.

Sanitary Sewer: All sanitary wastes are drained to the City of Portland sanitary pipeline system on 61st Avenue. Here, flows are tested on a regular basis by the City of Portland and the Station Operator. These tests have indicated some violations in water quality, mostly from the truck wash water. These violations are due to high pH caused by decaying of organic matter in the oil-water separator.

3.2 HISTORY OF STATION DEVELOPMENT

A. Original Operations (Drawing MCS-01)

1. Waste Receiving

In 1989, Metro awarded a contract to a private contractor for the design, construction and operation of the Metro Central Station. The operation was based on a seven-year contract. In early 1991, Metro Central began operations as a transfer station. The materials recovery operations of the Station were placed in operation in late 1991 after an extended start-up and testing period. The design criteria was to receive and transfer in excess of 2,000 tons per day (TPD), and to process mixed wastes to recovery recyclables. The recovery rate was to be in the 20% range.

The Station serves both commercial and general public vehicles with the following circulation, unloading, transfer and recycling operations:

- The general public vehicles are weighed on the first scale (Scalehouse A) upon entering the site. They then proceed to the public unloading area at the southeast corner of the transfer building to unload their wastes onto the tipping floor. Drop boxes are installed along the edge of the building for the public to place source-separated recyclables. After unloading, the public vehicles must return to the same scale for weighing and payment.

- Commercial packer trucks and drop box vehicles are weighed at Scalehouse A or the second scale (Scalehouse B) upon entering the site; they then proceed to the north face of the building to unload the wastes onto the tipping floor. After unloading, the vehicles return to Scalehouse A if a tare weight is required, or exit the site at the southwest corner after going through the truck wash (optional).

Separate inbound scales are utilized to separate the public and commercial vehicles for efficiency and safety. A third scale (Scalehouse C) is utilized when traffic volumes necessitate its use. However, in general, this scalehouse has had very limited use.

2. Transfer Operations

All wastes not placed into the wastes processing system must be moved by rubber-tired dozers over to the transfer area. The transfer area and operations consist of the following:

- Three compactors were installed in the original construction, and are located near the south end of the building.

- Wastes are loaded into the compactors by conveyors. That is, wastes are pushed by loaders onto the in-floor conveyors that then convey the wastes up to and into the top of the compactors.
- Wastes are compacted and then transferred into the rear of the trailers for transfer to the out-of-region landfill located in Eastern Oregon.

Each compactor is capable of compacting and transferring 75 to 100 tons per hour (TPH).

3. Waste Recovery Operations

The Metro Central Station differs significantly from the Metro South Station in that there were complete processing systems installed at Metro Central to remove recyclables from the waste stream. When the Station began the materials recovery operations in late 1991, the following equipment was operating:

- A processing line for mixed solid wastes (MSW) called the MSW No. 1 line. This line, in general, consisted of the following:
  - A stationary grapple hook to place the mixed wastes from the tipping floor onto the system feed conveyor.
  - Two disc screens (one small and one large) to remove residue (2-inch and smaller) and separate the waste stream down into more efficient processable waste streams.
  - Two rotary air separators to separate the light paper fractions from the heavier waste fractions.
  - One magnetic separator for removal of ferrous metals.
  - One air knife for additional separation and removal of light papers and heavier wastes.
  - A series of conveyors to move the wastes between the various pieces of equipment.
  - An area where sorters could manually sort recyclables off the waste stream.
  - A conveyor to move the residue from the MSW line over to the tipping floor where it could be loaded into a compactor.
  - A series of conveyors to transfer the papers from the MSW line over to an area for baling.
- A second processing line for mixed solid wastes called the MSW No. 2 line. This MSW No. 2 line had the same equipment as the MSW No. 1 line.
- A third processing line called the commercial line for the processing of clean commercial paper loads. This line consisted of the following:

- A conveyor to receive and elevate the papers up to a manual sorting line.
- A manual sorting conveyor line where sorters could remove residue and/or recyclables from the waste stream.
- A conveyor to transfer the papers over to an area for baling.

- A baler feed system and baler which consisted of the following:
  - A single conveyor which starts in-floor to receive the recovered papers, and then conveys them up to the baler feed hopper.
  - A single ram baler which produced marketable bales of papers.
- A processing line for wood and yard wastes which consisted of the following:
  - A stationary grapple to place the wood and yard wastes from the tipping floor onto the system feed conveyor.
  - One slow speed and one high-speed shredder to reduce the wastes down to the proper size for marketable use.
  - A water screen to remove the heavy materials from the waste stream.
  - A magnetic separator for removal of ferrous materials.
  - A sequencing loading system to place the overs or chips into the top of a transfer trailer for removal to markets.
  - A series of conveyors to move the wood and yard wastes between the various pieces of processing equipment.

These three waste processing lines, baler line, and wood and yard wastes line provided the MCS with the apparent capability to remove large quantities of recyclables from the waste stream. It was estimated that recovery rates of 20% to 25% could be obtained.

However, due to a variety of reasons, the projected high recovery rates were never obtained. The reasons were:

- Due to very successful curbside collection programs for source-separated recyclables, the waste composition of the mixed solid wastes is such that low amounts of recyclables are available.
- Due to other private processing facilities in the region, the amount of clean commercial loads which come to the MCS are minimal.
- The mixed waste processing lines (MSW No. 1 and No. 2) were not simple layouts and, as a result, were difficult to maintain and costly to operate.
- The markets and price for recyclable materials has constantly varied resulting in times where the low price did not justify the costs to recover.

B. Major Modifications up to 1998

No major changes have been made in the wastes receiving and transfer operations since the 1991 start-up. However, the materials recovery operations have changed significantly as follows:

- The MSW No. 1, MSW No. 2 and commercial processing lines have been completely removed.
- The Station operator installed a Fiber Based Fuel (FBF) line where mixed waste paper was compacted into pellets for sale to local pulp companies for use as fuel in their power boilers. This FBF line operated for about 2 years; however, it has now been completely removed from the Station. Lack of available markets could not justify continued operations.

The materials recovery operations at MCS now consists of the manual sorting of recyclables from the waste stream on the tipping floor and the wood and yard wastes line which is still operational. These two methods and systems result in a recovery rate of 7% to 8% at the MCS. The baler feed conveyor and baler are still operational. At present, old corrugated cardboard (OCC), newspaper (ONP), plastics and carpet are baled.

In 1993, a new household hazardous waste facility was completed and placed into operation. This facility was located in the northeast corner of the site. This facility is similar in layout and operations to the HHW at Metro South except that there is no latex paint processing. All latex paint is received, placed in storage, and then transferred over to Metro South for processing.

Drawing MCS-01 illustrates the present layout of the MCS site.

C. Major Modifications Since 1998

As was stated in Section 2, Metro completed a Master Plan for the MCS in 1999. This plan identified several items which should be considered for the site to improve operations. A total of ten identified improvements were presented in the Plan. Since that time, two of the items have been completed at the Station. These are:

- Public unloading area expansion.
- Addition of a spare parts room in the maintenance area.
- Some improvements were recommended for the HHW area. These recommendations have not been completed; however, Metro continues to study possible improvements to the HHW area.

3.3 EXISTING FACILITY DESCRIPTION

A. Transfer/Materials Recovery Building

1. Structure

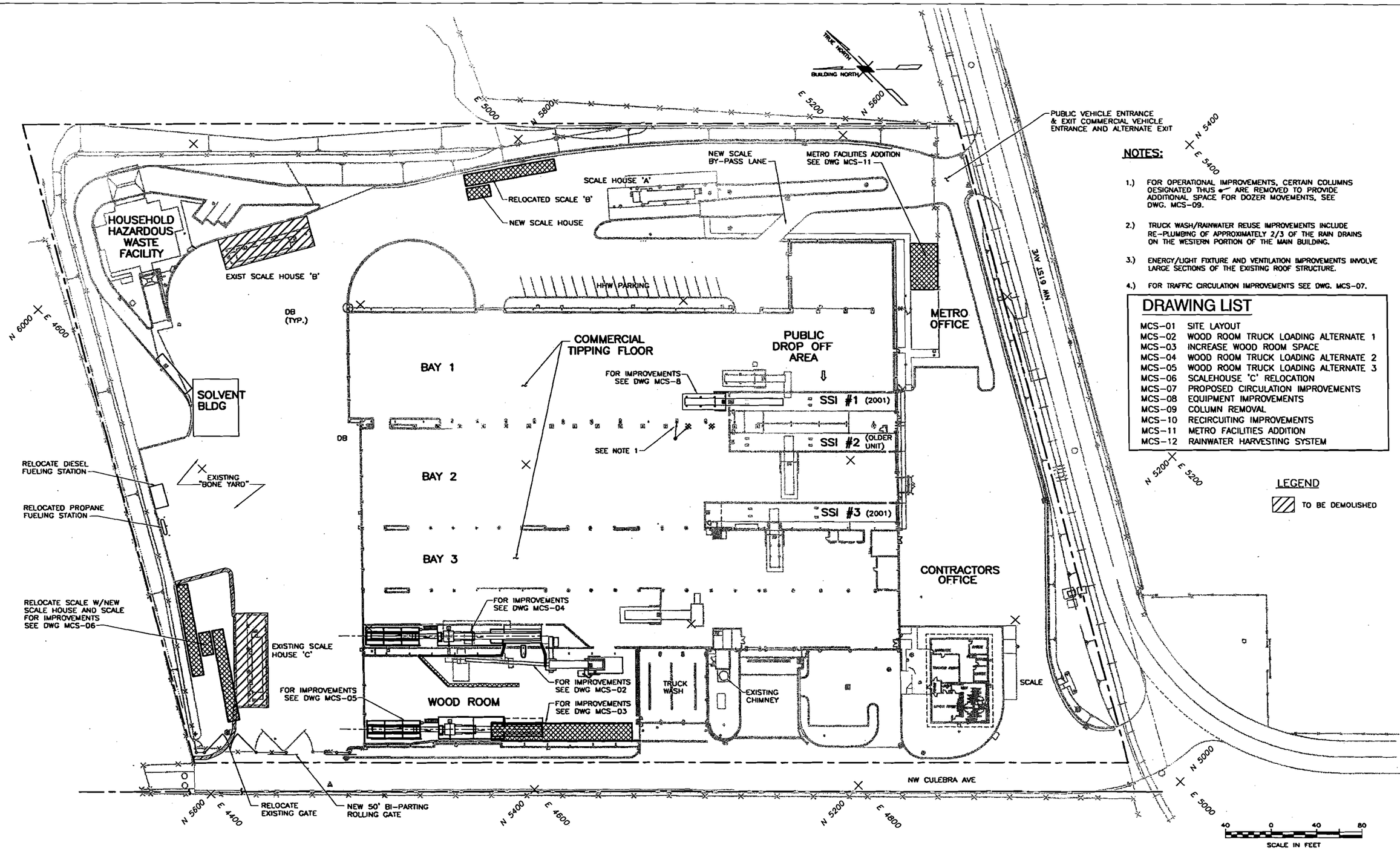
The building was construction in 1924 and from 1936 to 1973, there were several expansions. The facility was operated as a steel fabrication plant until the 1970's. The building is a steel-framed structure with metal siding and roof deck. Steel columns exist to support large bridge cranes that were needed for steel fabrication operations. However, the bridge cranes are no longer operational. As part of the rehabilitation for the transfer station, the following changes were made:

- An addition was added to the west side of the building for the wood and yard wastes processing in 1990.
- Cast-in-place walls were added to provide push walls.
- Floor slabs were improved throughout the building to accommodate the tractor/trailer and dozer traffic.

This rehabilitated building provides 168,000 sq. ft. in total enclosed space to handle all of the transfer materials recovery operations including the wood and yard wastes receiving and processing.

There is no dust suppression installed within the building except at the wood and yard waste area. As part of the building renovations, an extensive dust collection system in combination with roof ventilators was installed to control dust emissions during waste processing. However, the ventilation system was very noisy and not efficient. Therefore, the system has not been utilized for the last few years.

The building is large enough to accommodate the vehicle and waste volumes presently coming to the Station. It also has sufficient space to accommodate the projected growth in vehicle counts and waste volumes up to the year 2010. An inspection of the building indicates that the main structure is in good condition except for the roof deck which is in need of replacement.



NOTES:

1.) FOR OPERATIONAL IMPROVEMENTS, CERTAIN COLUMNS (DESIGNATED THUS ✓) ARE REMOVED TO PROVIDE ADDITIONAL SPACE FOR DOZER MOVEMENTS, SEE DWG. MCS-09.

2.) TRUCK WASH/RAINWATER REUSE IMPROVEMENTS INCLUDE RE-PLUMBING OF APPROXIMATELY 2/3 OF THE RAIN DRAINS ON THE WESTERN PORTION OF THE MAIN BUILDING.

3.) ENERGY/LIGHT FIXTURE AND VENTILATION IMPROVEMENTS INVOLVE LARGE SECTIONS OF THE EXISTING ROOF STRUCTURE.

4.) FOR TRAFFIC CIRCULATION IMPROVEMENTS SEE DWG. MCS-07.

DRAWING LIST

LEGEND

▨ TO BE DEMOLISHED

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00 | DESIGNED: | PROJ. ENGINEER: RWC

SCALE: 1=40'-0" | DRAWN BY: MLJ | APPROVED BY:

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METRO CENTRAL STATION

MASTER PLAN
SITE LAYOUT

DRAWING NUMBER: MCS-01

CAD FILE NUMBER: MCS-01

SHEET: OF | REV. A

2. Transfer/Materials Recovery Operations

The transfer and materials recovery operations described in Section 3.2 A, presents an accurate description of the current operations. A total of 1,300+ TPD on an average weekday are unloaded, moved by loaders to the compactors, compacted, and then pushed into trailers for transfer to the out-of-region landfill in Eastern Oregon. Wastes handled consist of residential wastes, commercial wastes, industrial wastes, and public hauled wastes.

The MCS is open from 7:00 a.m. to 7:00 p.m. 7 days per week, for public haul vehicles. For commercial vehicles, the Station is actually open for 24 hours a day, 7 days per week. This is due to the radio frequency tagging system that is now fully operational at the MCS. This system is described in Section 3.3 C.

All wastes are unloaded onto the tipping floor and then moved by rubber-tired dozer(s) to the in-floor conveyors for loading into the compactors. Sorters are located on the tipping floor to remove any recyclables from the waste stream before the wastes are pushed onto the conveyors. There is sufficient space on the floor to allow vehicles to maneuver, wastes to be stored, and manual sorting to occur before the wastes are moved to the in-floor compactor feed conveyor.

The equipment utilized in the transfer operations consists of the following:

- **Front-end loaders:** These loaders are utilized to move the wastes around the tipping floor. These loaders are owned or leased by the Station operator.
- **In-floor and elevating conveyors to the compactors:** These are 72-inch wide fully supported, chain driven rubber belt conveyors.
- **Compactors:** These compactors receive the loose wastes (8-12 lbs. per cubic foot), hydraulically compacts them into a dense bale (30+ lbs. per cubic foot), and transfers the compacted bale into the rear of a transfer trailer. There are three compactors at Metro Central. The compactors are designated as SSI No. 1, which is the easterly compactor; SSI No. 2, the middle compactor; and SSI No. 3 which is the westerly compactor. SSI No. 1 and SSI No. 3 are new compactors installed in 2000. SSI No. 2 is the original compactor installed in 1991.

At present, the Station operator utilizes SSI No. 1 and SSI No. 3 compactors for load-out of residential wastes. SSI No. 2 is used for miscellaneous wastes, and as a back-up to the other two compactors. However, it is possible for the operator to change uses of each compactor depending upon breakdowns, volumes, or any other items that affect everyday operations.

B. Household Hazardous Waste Building

The household hazardous waste (HHW) building was constructed in 1993. It is a 4,000 sq. ft. structure with steel framing, concrete wall panels and an insulated metal roof. As per the Metro South HHW, there is an extensive ventilation system, and explosion-proof type equipment is used throughout. The structure is in excellent condition.

The operations within the building are exactly as described for the Metro South HHW facility except that no latex recycling operations are done at Metro Central. The latex paints are received, properly identified, and then placed in storage for transfer over to Metro South for processing.

C. Scale/Scalehouses

There are three scalehouses on the site for the processing of waste vehicles coming to the site. These are designated as follows (see MCS-1):

- **Scalehouse A:** Located at the entrance to the site. This scalehouse has two scales, and is primarily utilized for processing public vehicles entering and leaving the site. Commercial vehicles can also be weighed at this scalehouse when entering and exiting the site.
- **Scalehouse B:** Located at the northeast corner of the transfer building, and is primarily utilized for receiving commercial vehicles. There is only one scale at this location.
- **Scalehouse C:** Located near the northwest corner of the transfer building, and is used to weigh outgoing commercial vehicles that do not utilize tare weights. There is only one scale at this location.

Each scalehouse is operated by Metro personnel and contains washroom facilities and minimal space for storage. The scalehouses are in good condition.

Metro has installed a radio frequency (RF) tagging system that is now fully operational at the MCS. This system allows the Station to be open for commercial haulers for 24 hours per day, 7 days per week. This tagging system operates as follows:

1. A sending unit located at the scale house sends out a radio frequency to a receiving unit, or tag, mounted on the commercial haul vehicle.
2. Once the signal is received and the vehicle data is collected, a signal is then bounced back to the sending unit.
3. The data is then sent to a computer where the vehicle's loaded weight, tare weight, and identification are compiled.
4. A printer mounted on the outside of the scale house, or accessible from the outside of the scale house, prints out a ticket for the haul vehicle driver.

5. The vehicle can then proceed to the transfer building for unloading.

This radio frequency tagging system provides Metro and the franchise haulers with the following benefits:

- Ability to weigh vehicles through the scales with no attending Metro personnel.
- Better staff utilization and the ability to weigh more vehicles without adding more staff.
- Allows the station to be open for commercial haul vehicles for 24 hours per day and 7 days per week.

There is a fourth scale located immediately south of the Contractor's office at the southwest corner of the site. This scale is utilized to weigh loaded transfer trailers before they exit the site.

D. Truck Wash

The truck wash facility is located along the west wall of the building immediately south of the wood and yard wastes processing area. It is large enough to handle three trucks at one time.

The existing system is working satisfactorily. The operator provides continual maintenance of the oil-water separator and monitors the quality of the effluent from the system. The system is conveniently located for exiting commercial vehicles, and is providing the service for which it was intended.

E. Materials Recovery

With the present operations, there are three areas or activities that facilitate the recovery of recyclable materials from the waste stream. These include:

- Sorters located on the tipping floor to hand sort the recyclables out of the wastes unloaded onto the floor. The sorters are capable of removing all types of mixed papers (MP), old corrugated containers (OCC), old newspapers (ONP), ferrous metals, and plastics. These recovered materials are placed in drop boxes or small containers until they are removed from the site for processing.
- The publicly hauled source-separated recyclables coming to the site for disposal. Drop boxes are located in the public unloading area for the public to utilize.

The solid waste disposal permit requires the following collection categories:

- Ferrous scrap metal
- Non-ferrous scrap metal (including aluminum)
- Motor oil
- Old Newspaper (ONP)
- Corrugated Containers (OCC) and kraft paper
- Container glass
- Tin cans
- High-grade office paper
- Mixed papers
- Used tires

- The wood and yard wastes processing area. This area is capable of receiving up to 100 TPD of wood and yard wastes. Processing consists of breaking the material down into smaller size fragments, removing all ferrous metals and residue, and loading the finished products into trailers for delivery to market. The finished products are utilized for composting or for fuel in boilers at local pulp mills.

Overall, the materials recovery systems that exist on site result in an overall recovery rate of 7% to 8% for the complete station.

F. Metro and Operator Personnel Facilities

There are two other structures located on site that are offices for the Metro personnel and the Station operator. The Metro office is a separate 1,230 sq. ft. structure located just outside the southeast corner of the transfer building, and the operator's office is a separate 3,700 sq. ft. structure located outside the southwest corner of the transfer building. Both of the facilities have adequate office space. However, there is a lack of sufficient space for training, large meetings, washroom facilities and/or visitor orientation area.

G. Traffic Review

As Drawing MCS-01 illustrates, all public and commercial vehicles enter the site near the southeast corner. Public vehicles also exit from this same location, while commercial vehicles can exit from this location or from an exit near the southwest corner of the site. Commercial vehicles can exit from the southwest area if they do not have to weigh on exiting the site. In some cases, commercial vehicles must be weighed when exiting the site to obtain the tare or empty weight of the vehicle.

The public vehicles are weighed at Scalehouse A when entering and exiting the site and, as such, are the predominate users of the scales at this scalehouse. There are two inbound lanes so that the commercial vehicles can bypass Scalehouse A and proceed to Scalehouse B where they are weighed before unloading. If an empty or tare weight is required, the commercial vehicle is weighed at Scalehouse A and then exits the site.

Intersection Observations

Access to the MCS is available off of N.W. 61st Avenue, which is accessible from N.W. Front Avenue. The intersection at N.W. 61st and N.W. Front Avenue is the main intersection for traffic coming to and leaving the MCS; therefore, intersection operations were observed at this location. In addition, the intersection operations at the site access onto N.W. 61st was also observed. Observations were done during the Monday daytime peak period (11:00 a.m. to 1:00 p.m.) and during the Saturday peak period (1:00 p.m. to 3:00 p.m.). Observations were done in late March and early April 1998.

Intersection operations were evaluated for these peak periods using the procedures of the 1994 Highway Capacity Manual. Levels of service were assigned to each intersection based on average delay to the critical turning movement. Level of services range from A to F with A representing the minimal delay, and F representing unacceptable high delays. Table 3-1 illustrates the results of the traffic intersection observations.

Table 3-1
Metro Central Station – Traffic Analysis

Intersection (Time)	Critical Movement	Volume/ Capacity	Avg. Delay (Seconds)	Level of Service
Front Avenue/61st (Monday Peak)	Left turn - Front to 61st	0.12	4.5	B
Site/61st (Monday Peak)	Left turn to 61st	0.16	6.9	B
Front Avenue/61st (Saturday Peak)	Left turn Front to 61st	0.02	4.7	B
Site/61st (Saturday Peak)	Left turn to 61st	0.14	7.3	B

Table 3-1 indicates that access intersection operations are currently acceptable during the peak traffic time periods. A volume/capacity ratio less than 20 percent indicates that queue lengths are normally only one to two vehicles.

Summary

The review of traffic conditions for vehicles entering and leaving the site during peak periods, and passing through the intersection at N.W. 61st and N.W. Front Street indicates that both intersections function at acceptable levels of service. Because the MCS is located in a fairly remote area, it is expected that these acceptable levels of service will not change dramatically when the traffic volumes increase as projected by Metro.

3.4 FACILITY NEEDS/ASSESSMENT

A. Waste/Traffic Volumes

1. Projections

Based on scalehouse operations data collected between 1993 and 2000, Metro has made the following projections (see Table 3-2) for waste volumes and vehicle counts up to the year 2010.

Metro Central Station
Projections of Tonnage and Loads
Table 3-2

	Tons of Waste				Vehicles				
Year	Comm	Public	Total	Peak Day	Comm	Public	Total	Peak Day	Peak Hour
1993	342,619	16,676	359,295	1,658	74,683	41,150	115,833	473	72
1994	343,767	17,950	361,717	1,640	73,836	45,087	118,923	478	72
1995	357,411	18,675	376,086	1,631	72,729	45,786	118,515	488	69
1996	350,960	25,728	376,688	1,776	71,233	53,101	124,334	489	71
1997	362,731	29,859	392,591	1,774	72,916	60,670	133,586	529	76
1998	363,910	24,990	388,900	1,748	73,815	59,501	133,316	536	77
1999	351,866	26,334	378,200	1,776	71,372	62,701	134,073	553	79
2000	315,122	27,678	342,800	1,832	63,919	65,901	129,820	575	82
2001	305,978	29,022	335,000	1,887	62,064	69,101	131,165	597	85
2002	310,634	30,366	341,000	1,946	63,009	72,301	135,310	620	89
2003	315,290	31,710	347,000	2,009	63,953	75,501	139,454	643	92
2004	320,946	33,054	354,000	2,074	65,101	78,701	143,802	666	95
2005	326,602	34,398	361,000	2,141	66,248	81,901	148,149	690	99
2006	332,258	35,742	368,000	2,210	67,395	85,101	147,496	715	102
2007	337,914	37,086	375,000	2,282	68,542	88,301	156,843	739	106
2008	343,570	38,430	382,000	2,356	69,690	91,501	161,191	765	109
2009	350,226	39,774	390,000	3,432	71,040	94,701	165,741	790	113
2010	356,882	41,118	398,000	2,510	72,390	97,901	170,291	816	117

Note: The 1993 through 2000 numbers are actual data.

A review of the table indicates that the amount of public vehicles is beginning to increase at a significant rate (5% in 2000). Conversely, the growth in commercial traffic has changed very little since 1993. In fact, it has decreased slightly. This decrease is considered due to the number of other facilities which are now operating in the tri-county area and which provide alternatives for commercial vehicles to unload.

Table 3-2 also provides the data to estimate the peak arrival rates which can be expected from commercial and public vehicles in the year 2010.

Maximum weekday count	816 vehicles
Peak commercial hourly rate	53 vehicles
Peak hourly weekend rate	66 vehicles
Peak weekday public hourly rate	30 vehicles

2. Present Station Capacity

There are three compactors at the MSS; however, on a regular basis, only two are used for daily transfer. Since each compactor is capable of compacting 75-100 tons of solid waste per hour, the station is capable of processing over 400,000 tons per year.

Table 3-2 indicates a total waste volume at MCS of 398,000 tons by the year 2010. With the third compactor available, the station is capable of meeting the region's requirements up to 2010. The third compactor can provide flexibility in equipment usage and redundancy when required.

The station capacity, however, may be better measured by its ability to handle the traffic volumes. The increases in public traffic, 48% between 2000 and 2010, are significant. As a result, it is important to determine if there are sufficient unloading spaces to accommodate the peak hourly arrival rates.

The following calculations were prepared to compare the existing nominal station capacity with the projected peak arrival rates.

Commercial Vehicles:		
One stall can handle	6 VPH	(1) average
Number of stalls	20	(2)
Hourly capacity	6 x 20 = 120 VPH	nominal
Projected 2010 Peak Arrival Rate	53 VPH	
Public Vehicles:		
One stall can handle	4.0 VPH	(1) average
Number of stalls:		

Weekdays	10	(3)
Weekends	25	minimum
Hourly capacity:		
Weekdays	4 x 10 = 40	vehicles
Weekends	4 x 25 = 100	vehicles
Projected 2010 Peak Arrival Rates		
Weekdays	30	vehicles
Weekends	66	vehicles

(1) Stall capacities are based on past operations experience – Vehicles Per Hour (VPH).
(2) Due to the large (200-ft.) opening to the north end of the building and the length inside the building for vehicles to maneuver, a total of 20 spaces for the trucks to unload is reasonable.
(3) The number of defined spaces in the present public unloading area is difficult to determine. Number is based on site review of unloading procedures.

The above calculations indicate that the station is capable of handling the peak hourly arrival rates for both the commercial and public vehicles. With only one scale utilized for public vehicles entering the site, the peak hourly arrival rate of 66 vehicles on weekends will result in some queuing prior to the scale. If two scales could be utilized, this situation would be significantly improved. As will be discussed in Section 3.5, there may also be alternates to where the public enters the site which could eliminate any queuing back onto N.W. 61st Avenue.

B. Needs Assessment

Since the Station started operations seven years ago, it has operated very efficiently as a transfer station and, in general, there are very few areas where improvements are required. The materials recovery operations have changed significantly in the last 6+ years, and the present operations are very simple and efficient to operate.

The specific improvements identified for Metro Central Station will provide the following:

- Operations improvements
- Personnel facility improvements

In the following sections, proposed improvements are identified. These improvements have been developed through discussions with Metro and Contractor personnel.

The operations improvements that will be discussed in the following sections include:

- Relocation of Scalehouse C and Traffic Circulation Improvements
- Structural Revisions to Building
- Equipment Improvements

- Woodroom Area Improvement
- Energy/Lighting Improvements
- Relocation of Scalehouse B

Personnel facility improvements that will be discussed in the following sections include:

- Addition to Metro's Offices

C. Development Restraints

The MCS site is 6 acres. The transfer and materials recovery building is almost 4 acres. When you add the six other structures on site and the roadways required, there is limited space on the site for expansion of existing facilities. Any additions made to the existing structures must be kept to a minimum or efficient traffic patterns will be affected.

The Metro Central Station is a vital part of Metro's solid waste management system. Therefore, any proposed modifications to the Station must allow daily transfer operation to continue with minimal interruption.

In summary, the site area is a definite restraint. Development alternatives shall be limited to improvements within the existing structures that improve operations and personnel facilities.

3.5 IMPROVEMENTS TO MEET NEEDS

A. General

All of the proposed improvements presented in this section are based on the following criteria:

- IMPROVE STATION OPERATIONS
- IMPROVE TRAFFIC CONGESTION AND CIRCULATION
- IMPROVE FACILITIES FOR STATION PERSONNEL
- REDUCE ENERGY CONSUMPTION

The following proposed improvements are based on a review of site operations and discussions with Station and Metro personnel. These improvements follow the developmental restraints presented in Section 3.4 C.

B. Woodroom Area Improvements

The woodroom area improvements proposed herein present a variety of improvements intended to improve the efficiency and volume of wood wastes which are processed at the Central Station. The alternatives consist of the following:

- Alternate 1: Modify layout of existing conveying system while maintaining the existing shredder and hammermill.
- Alternate 2: Install a new wood processing system utilizing an in-line feed system and new horizontal hammermill. This installation would utilize the existing trailer loading system.
- Alternate 3: Similar to Alternate 2 except the new system would be installed adjacent to the west wall.
- Alternate 4: This involves the filling in of the existing pit and ramps to increase storage space in the woodroom area. This alternate also includes additions to the push walls to increase capacity for wood wastes storage.

Note: If Alternate 3 is considered, some of the details for Alternate 4 will need to be revised since the new conveyor system and hammermill against the west wall will be in the same vicinity as the existing pits/ramp and push walls.

Alternate 1 – Modify Layout of Existing Conveying System (MCS-02)

This alternate would use the existing two main pieces of processing equipment – the SSI shear shredder and Duraquip hammermill. These machines would remain in their existing positions and the discharge system from the Duraquip hammermill would also remain in its current position. This new system would utilize two new conveyors – (1) 60"-72" wide vibrating conveyor discharging from the shear shredder, and (1) 48" wide conveyor transferring material from the vibrating conveyor to the existing hammermill infeed conveyor. These conveyors would be "in-line" and eliminate the right-angle turns that cause the material to hang up.

Alternate 2 – New Processing System – Same Trailer Loading System (MCS-04)

This alternate would assume that the current system is abandoned and replaced with a new and simpler system. This new system is a single-pass grinding system – only one grinder is used to produce the finished size product. This is the method that many wood recyclers are now using – it simplifies the system and reduces the amount of machinery required.

Alternate 3 – New Processing System – Installed on West Wall (MCS-05)

This is the same as Alternate 2; however, it provides some additional benefits such as:

- The costs for Alternate 4 will be reduced since the push wall additions would be reduced.
- Would create more open space and direct communication between the woodroom and the adjacent transfer operations.

- The existing woodroom processing system can remain in operation while construction of the new system is in progress.

Alternate 4 – Increase Woodroom Space (MCS-03)

As the volume of wood and yard wastes continues to grow, there is a need to create additional storage and processing space within the wood processing area. The following is a possibility that should be considered:

- There is an existing 5-ft. deep pit with access ramps in the southwest area of the woodroom. This pit was originally designed for the top-loading of trailers. The pit has not been used for the last few years. Filling in this pit and removing the existing push wall would provide nearly 2,000 sq. ft. of additional space.
- The storage or push walls along the west and south wall of the woodroom area are too low for the volume of wood and yard wastes that need to be stored. It is recommended that these walls be extended up to about 17-18 feet above the tipping floor. This extension would provide an additional 30+ tons of storage within the woodroom.

Energy Conservation

Alternates 2 and 3 have a definite advantage over the present system, and Alternate 1 to a lesser degree, when you consider energy use. A study of energy use and costs has resulted in the following:

	Annual Energy Cost
Existing System	$44,854
Alternate 1	$40,255
Alternates 2 and 3	$31,217

As can be seen, Alternates 2 and 3 can result in annual savings of $13,000+ from the existing system and $9,000 from Alternate 1.

It is our understanding that more personnel are required on a regular basis when operating the existing system to control "plugs" and operating problems. When you consider the possible savings in energy costs, labor costs, and the fact that future cost to renovate the existing shredders would not be expended as budgeted in the Renewal and Replacement Acct., it is recommended that Alternate 2 or 3 be strongly considered.

Results of the energy audit are included in Appendix C.

C. **Relocation of Conveyor to SSI No. 1 Compactor and Column Removal (MCS-08 and MCS-09)**

The conveyor system that is presently conveying wastes up to the SSI No. 1 compactor consists of the following:

- In-floor conveyor, which receives the wastes and conveys it up to a 90-degree transfer point.
- Conveyor receiving the wastes from the 90-degree transfer and conveying it to the compactor load point.

There are operational problems with the 90-degree transfer. Wastes will sometimes "bridge", causing wastes behind the bridge to build up and jam the conveying system. When this happens, employees must manually dig out large amounts of waste, shutting down the compactor operation for hours.

Metro has installed a new compactor (SSI No. 1); however, there are two improvements that are needed to increase the efficiency of the compactor loading system:

a. Relocate the feed conveyor, such that it is in-line with the compactor. This would eliminate the 90-degree transfer and eliminating the jamming problems. (See Dwg. MCS-08.)
b. Due to the location of SSI No. 1 and the building column system, there are some existing columns that would restrict the ability to push wastes onto the new in-floor conveyor proposed in a. above. As a result, it is recommended that at least two existing columns be removed (see Dwg. MCS-09). This project would involve the addition of new steel and the reinforcing of existing steel to transfer the roof loads from the columns to be removed to the existing columns.

Since SSI No. 3 was replaced recently, it is also strongly recommended that the conveyor feeding this compactor be replaced by no later than 2003. The cost is not shown separately; however, it will cost approximately $250,000–$300,000.

D. **Addition to Metro Office Building**

The Contractor's office building provides sufficient space for the operator's personnel. However, the Metro staff is also utilizing this building for meetings and training. Therefore, it is recommended that an addition be made to the Metro office building to provide the following benefits:

- New conference room for up to 25 persons.
- Lunchroom for Metro personnel.

- Visitors orientation center.

Drawing MCS-11 illustrates the new addition which is an area of approximately 1,000 sq.ft.

E. Relocation of Scale House C and Revised Commercial Traffic Patterns (MCS-06 and MCS-07)

At present, all commercial and public traffic enters the site at the southeast entrance and proceeds to scale house A or B, depending on final destination and volume of traffic. Since scale house A is located only 200+ feet from the entrance, there are times when traffic queues back onto 61st Avenue.

Due to the commercial vehicle identification system on site and the tare weight system, many of the commercial vehicles are able to exit the site out the southwest entrance. It is understood that about 50% of the vehicles can exit without weighing. All public vehicles exit the site out the southeast entrance.

After reviewing options to revise the traffic circulation patterns on the site, it was decided that the following are options that should be considered:

- Use the southwest entrance for the entering and exiting of all commercial vehicles. To make this circulation more effective, it is recommended that a new scale house C and an entrance and new exit scale be installed. The new scale house should be relocated to the north to provide more clearance for the commercial vehicles. The existing scale C could be utilized and a new 80-ft. exit scale be installed. The existing scale house could be demolished because it would be difficult to relocate, and a new 10' x 20' modular scale house be installed. The new scale house would have a washroom and space for storage and computer equipment. This traffic pattern would effectively separate the commercial and public traffic resulting in a safer and more efficient on-site traffic flow. (See Drawings MC-06 and MCS-07.)
- Heavy weekend traffic volumes have resulted in the queuing of public vehicles back on 61st Avenue. To alleviate this queuing onto 61st Avenue, it is recommended that, at peak volume periods, the public traffic should enter the site on the southwest entrance and queue along the south side of the site from the Metro office to the Contractor's office. This traffic pattern could be instituted utilizing pavement markings and signage. This traffic circulation would create an additional 300+ feet of queuing length, thus allowing for more than 15+ additional vehicles in queue.

F. Truck Wash Improvements

- **Option A: Nozzle/Closed Circuit Camera**

  The water hose nozzles in the truck wash continue to disappear, which allows the water to flow freely. To prevent this and reduce consumption, install new nozzles and closed circuit cameras to discourage removal of the nozzles. Signage may be placed around truck wash to address water conservation and implications concerning unauthorized nozzle removal.

- **Option B: Key Card/Timer/Regulated Flow Devices**

  Install key card/timer/regulated flow devices to reduce water consumption. Investigate combining the use of tare weight card system with water usage card system. This system would be similar to commercial car/truck.

- **Option C: Rainwater Collection/Reuse (Drawing MCS-12)**

  Currently, Metro Central water usage averages approximately 18,000 gal/day. Assume 65% of this flow is used in the truck wash facility located on the west side of the building. Harvest the rainwater from the roof of the facility for use in the truck wash is environmentally sound and would reduce City of Portland water and stormwater monthly charges. This system would capture, store and re-use the rainwater to wash trucks. Capturing the average storm event on 83% of the facilities roof area should provide approximately 42,000 gallons of water for the truck wash water. The parts of the collection and distribution system include the roof surface, gutters, downspouts, approximately 1,100 feet of piping, roof washers, cisterns (tanks) and pumps. Refer to drawing MCS-12 for a schematic of this system. This project would reduce water consumption and may be eligible for stormwater credits through the City of Portland. The estimated payback on this option is approximately 18 years. However, the payback may be greatly reduced with future increases in water and stormwater charges.

G. Energy/Lighting Improvements (Drawings MCS-10)

The lighting systems at Metro Central were found to be in poor condition. Initial observations indicated the reflectors on most fixtures were contaminated with dirt that severely reduces the effectiveness of the lamp. Thirty-three of the lamps (15% of total lighting) require replacement. The reflective surfaces of the walls and ceiling require cleaning. The combination of burnt-out lamps, dirty reflectors and dirty walls and ceilings resulted in very poor lighting conditions in certain areas. An average of 20 foot-candles of illumination is recommended for visual tasks within large size (general sorting) facilities. Existing conditions found lighting levels as low as 5 foot-candles. This level of lighting corresponds to recommendations for public spaces with dark surroundings such as a park at night or a bus stop.

- **Option A: Remove Siding and Recircuit Existing Fixtures**

  By removing building siding similar to Metro South, a total of 27 400-watt lamps and 34 1000-watt lamps could be turned off for this facility. The effects of daylight would actually improve the illumination conditions. It is more expensive than Metro South primarily due to the amount of siding to be removed and re-wiring the above-mentioned lighting fixtures. The re-wiring was included because the existing lighting contractor and wiring configuration are unknown. For this amount of work, installing new conduit and cable will be less expensive than attempting to re-configure existing lighting layouts and circuits through existing conduit. The estimated annual energy savings by re-circuiting these fixtures is $6,200. This yields a return of investment in approximately 9+ years based on a construction cost of $58,000 shown in 3.6.

- **Option B: Replace Fixtures**

  Upon review of the drawings, it was noted that the majority of fixtures at this facility used 1000-watt lamps in their fixtures. By changing out both 400- and 1000-watt fixtures to a 400-watt, self-cleaning fixture, lighting in the entire facility will become more efficient as the reflectors will remain clean and overall energy usage will be less. The effective lighting for the floor area is calculated to be an average of 22 foot-candles. It is estimated that there will be $22,680 in annual savings by switching to a more efficient light fixture. Estimated return on investment will be in 4.41 years based on a construction cost of $100,000 shown in 3.6. The State of Oregon has low cost loan programs in support of energy savings and the local utility provider may have rebate programs available.

It is recommended that Metro proceed with Option A and then, under a regular maintenance program, replace all of the fixtures over a period of time.

H. Ventilation Improvements

There are two possible options to the Metro Central building which can be done and which should be considered. These are:

- **Option A**

  A ventilation study and modeling would provide the required information for an overall ventilation performance of the facility. With the exhaust fans located 60 feet above the floor, it is doubtful that there is an adequate entrainment velocity to remove dust. This study would indicate if adequate exhaust airflow is being provided to remove dust, odors and contaminates. The study would provide quantifiable information to use with future exhaust fan system design such as:

- Determination if the existing fan type and placement is optimal for exhaust flow.
- Provide information to determine if an exhaust system is required for optimal flow. With fans 50+ feet above the floor, new fans and ductwork may be required to properly ventilate the spaces.
- Identify exhaust fan maintenance costs.

The cost of this ventilation study would be approximately $15,000. Based on this study, Metro would then be able to make some knowledgeable decisions on the type of ventilation that would be most efficient for this transfer station structure.

- **Option B**

There are approximately 24 tubeaxial fans (~20,000 cfm each) in bays 1, 2 and 3, and five centrifugal fans (14,275 cfm) in the public drop off area that exhaust out of the facility. The fans are operated on an as-needed basis, being turned on by site personnel when required. These fans are located at the roof level, which is 60 feet above the floor level. During operation, the centrifugal fans are running quietly and do not appear to be contributing to the sound problem. However, when the tubeaxial fans are operating, they are very loud, generating approximately 100 dB. It should be noted that centrifugal vans are inherently quieter during operation when compared to tubeaxial fans.

To alleve the noise problem with the tubeaxial fans, it is suggested to install a pre-engineered sound attenuator on all of the tubeaxial fans. This sound attenuator can be obtained from *Commercial Acoustics* and will be model XLP – 52" x 52" x 36" long. The sound attenuator will contain multiple baffles and be lined with a perforated galvanized liner. The inner liner will be filled with inorganic glass fiber material and covered with Mylar to eliminate moisture collection and erosion.

I. Chimney Removal

The existing chimney, which was part of the original steel mill facility construction, was not originally designed to withstand forces due to a seismic activity. As a result, the chimney is deficient in overturning resistance. The loads on the foundation due to gravity and overturning forces are such that compressive failures and instability exists.

The chimney could be saved by retrofitting the foundation, bracing the chimney, structural wrapping the stack itself, and a variety of steps to result in a stable structure. However, due to the limited space available, the retrofit of the chimney will be very costly. The best option is to remove the chimney. The cost for this effort is also costly due to the limited space; however, it will be less than retrofitting.

J. Relocation of Scale House B (Drawing MCS-01)

The possibility of relocating scale house B has been discussed for the following reasons:

- Would improve the traffic congestion situation which exists at the northeast corner of the transfer building.
- Would improve security on site in that all commercial vehicles would need to stop at scale A or B before reaching the north end of the transfer building.

The scale would be relocated to an area north of scale A and east of the transfer building as shown on Dwg. MCS-01. The existing scale would be relocated; however, as per scale house C, the existing scale house would be replaced by a 10' x 20' modular scale house.

It should be noted that if the alternative of relocating scale house C, with the new entrance and exit scales, was accomplished, then relocation of scale B should not be required. However, if it is not decided to proceed with the relocation of scale C, then scale B should definitely be considered.

K. Miscellaneous Improvements

In discussions with Metro and operations personnel, there were some items identified at Metro Central which should be improved. These are:

- Provide water lines and hose reels in Bay 3.
- Repair the damage at the push wall on the west side of Bay 3 about 120-ft. south of the north wall.
- Modifications to reduce the movement of wastes by vehicle wheels from the unloading bays to the areas outside the building. For this modification, it is proposed that some heavily grated U-drains be installed near the north entrance to the buildings. These drains would collect the wet wastes and prevent them from exiting the building. The drains could also be easily cleaned.

3.6 COST ESTIMATES OF IMPROVEMENTS

A. Wood Room Area Improvements

Alternate 1 – Modify Layout of Existing Conveyor System

New conveyors	$ 80,000
Upgrade existing shredders	30,000
Upgrade hammermill in-feed chute	20,000
Subtotal	**$130,000**
Contingency	32,000
General Conditions	16,000
Engineering	16,000
Total	**$194,000**

Alternate 2 – New Processing System

Demolition	$ 10,000
Excavation	5,000
Concrete	
• Pit	12,000
• Slab replacement	5,000
• Push walls	20,000
Feed conveyor	120,000
Hammermill including feed table	350,000
Discharge conveyor to truck load	30,000
Magnetic separator	20,000
Miscellaneous steel (plates and stairs)	10,000
Subtotal	**$582,000**
Contingency	140,000
General Conditions	70,000
Engineering	40,000
Total	**$832,000**

Alternate 3 – New Processing System (West Wall)

Demolition	$ 15,000
Excavation	5,000
Concrete	
• Pit	12,000
• Slab Replacement	5,000
• Push walls	30,000
Feed conveyor	120,000
Hammermill including feed table	350,000
Discharge conveyor	30,000
Truck loading system	25,000
Magnetic separator	20,000
Miscellaneous steel (plates and stairs)	10,000
Subtotal	**$622,000**
Contingency	140,000
General Conditions	70,000
Engineering	40,000
Total	**$872,000**

Alternate 4 – Increase Woodroom Space

Demolition	$ 15,000
Compacted fill	10,000
Concrete slab including repair	20,000
Embedded steel	2,000
Structural steel (push wall additions)	100,000
Plywood coverage/flashing	10,000
Subtotal	**$157,000**
Contingency	39,000
General Conditions	20,000
Engineering	20,000
Total	**$236,000**

B. Relocation of Conveyor to SSI No. 1 Compactor and Column Removal

SSI No. 1 Feed Conveyor

Demolition	$ 15,000
Excavation and fill	6,000
Concrete	
• Pit/embedded steel	25,000
• Slab repair	5,000
Remove existing conveyor system	10,000
New compactor feed conveyor	200,000
New chutework	10,000
Subtotal	**$269,000**
Contingency	67,000
General Conditions	30,000
Engineering	30,000
Total	**$396,000**

Column Removal (2 columns only)

Concrete removal	$ 10,000
Structural steel removal	30,000
New structural steel beams, bracing and connectors	90,000
Reinforce existing columns/beams	60,000
Column encasements	10,000
Subtotal	**$200,000**
Contingency	50,000
General Conditions	25,000
Engineering	30,000
Total	**$305,000**

C. Addition to Metro Office Building

Demolition	$ 5,000
Excavation and fill	3,000
Concrete slab/foundations	8,000
Superstructure	30,000
HVAC	10,000
Lighting and electrical services	10,000
Plumbing	8,000
Interior finishing	5,000
Glass/Doors	3,000
Subtotal	**$ 82,000**
Contingency	21,000
General Conditions	10,000
Engineering	11,000
Total	**$124,000**

D. Revision of Scale House C and Revised Commercial Traffic Patterns

Demolition	$ 5,000
Removal of existing scale and scalehouse	10,000
Miscellaneous concrete	5,000
Installation of existing scale including pit	30,000
Supply and installation of new scale house	25,000
Supply and installation of new scale including pit	70,000
Plumbing	10,000
Electrical	5,000
Landscaping	5,000
Gate Relocation	3,000
Relocation of fuel tanks	10,000
Installation of truck laser weigh system	5,000
Subtotal	**$183,000**
Contingency	46,000
General Conditions	23,000
Engineering	25,000
Total	**$277,000**

E. Truck Wash Improvements

Option A

~~Nozzles and Signage~~	$ 1,500
Closed Circuit Camera	8,500
Subtotal	**$10,000**
Contingency	2,000
Total	**$12,000**

Option B

Key Card Stations (3)	$ 3,000
Regulated Flow Devices (3)	3,000
Plumbing	5,000
Subtotal	**$11,000**
Contingency	2,000
General Conditions	2,000
Engineering	5,000
Total	**$20,000**

Option C

Rain Drain Pipes	$ 90,000
Roofwasher (Water Filter)	15,000
Overflow	$ 10,000
Storage Tank (Cistern)	90,000
Pump System	$ 15,000
Water Connection	5,000
Subtotal	**$225,000**
Contingency	45,000
General Conditions	20,000
Engineering	40,000
Total	**$330,000**

F. Energy/Lighting Improvements

Option A

Siding removal	$ 20,000
Flashing of openings	10,000
New conduit and wiring to re-circuit the perimeter fixtures	10,000
Subtotal	**$40,000**
Contingency	8,000
General Conditions	5,000
Engineering	5,000
Total	**$58,000**

Option B

New 400-watt fixtures	$100,000
Contingency	25,000
General Conditions	12,000
Engineering	12,000
Total	**$149,000**

G. Ventilation Improvements

Option A

Costs for Ventilation Study	$ 15,000

Option B

Install sound attenuators	$ 60,000
Contingency	15,000
General Conditions	10,000
Engineering	9,000
Total	**$ 94,000**

H. Chimney Removal

Note: This removal cost is based on URS' recent involvement in the removal of a chimney (125-ft. high) at a public school in Portland.

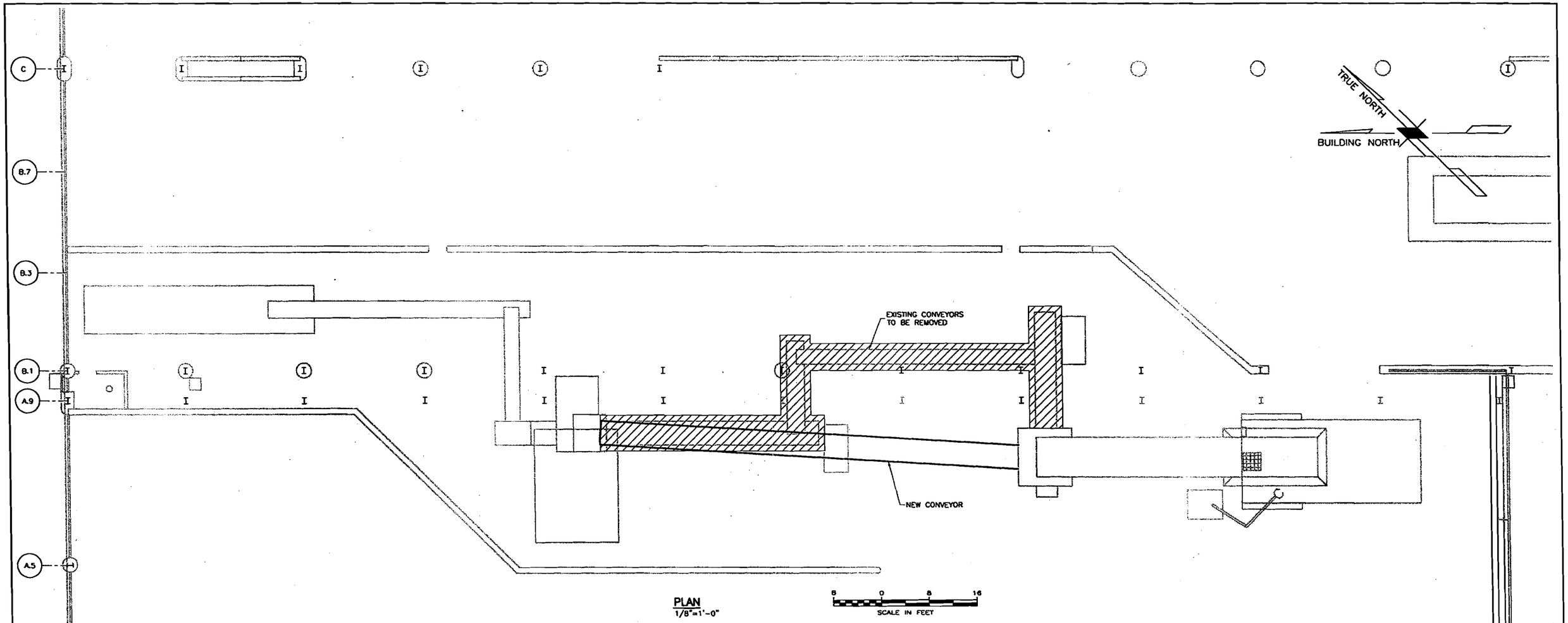
Scaffolding	$ 45,000
Demolition including site removal	80,000
Subtotal	**$125,000**
Contingency	25,000
General Conditions	15,000
Engineering	10,000
Total	**$175,000**

I. Relocation of Scale House B

Demolition	$ 5,000
Installation of existing scale including pit	30,000
Supply and installation of new scale house	25,000
Miscellaneous concrete	5,000
Plumbing	10,000
Electrical	5,000
Installation of truck laser weigh system	5,000
Subtotal	**$ 85,000**
Contingency	21,000
General Conditions	10,000
Engineering	10,000
Total	**$126,000**

J. Miscellaneous Improvements

a.	Water Lines and Hose Reels (Bay 3)	$15,000
b.	Repair Push Wall (Bay 3)	$10,000
c.	U-Drains	
	• Demolition	$ 10,000
	• Concrete including embedded steel	10,000
	• Grating	5,000
	Subtotal	**$25,000**
	Contingency	6,000
	Engineering	3,000
	Total	**$34,000**



PLAN
1/8"=1'-0"

8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00
SCALE: 1/8=1'-0"
DESIGNED:
DRAWN BY: MLJ
CHECKED BY: RWC
PROJ. ENGINEER: RWC
APPROVED BY:
DATE: 8/3/01

WARNING
0 1/2 1
IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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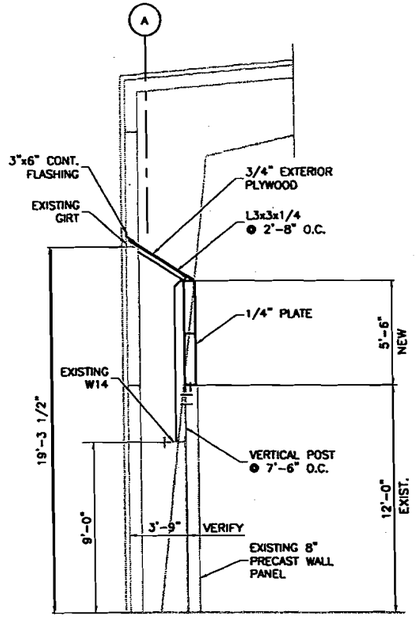
METRO
PORTLAND. OREGON

METRO CENTRAL STATION
MASTER PLAN
WOOD ROOM TRUCK LOADING ALTERNATE 1

DRAWING NUMBER: MCS-02
CAD FILE NUMBER: MCS-02
SHEET: OF
REV. A



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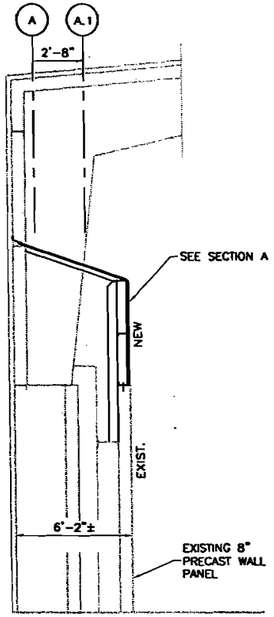

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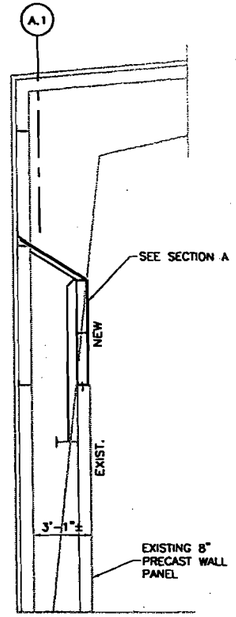

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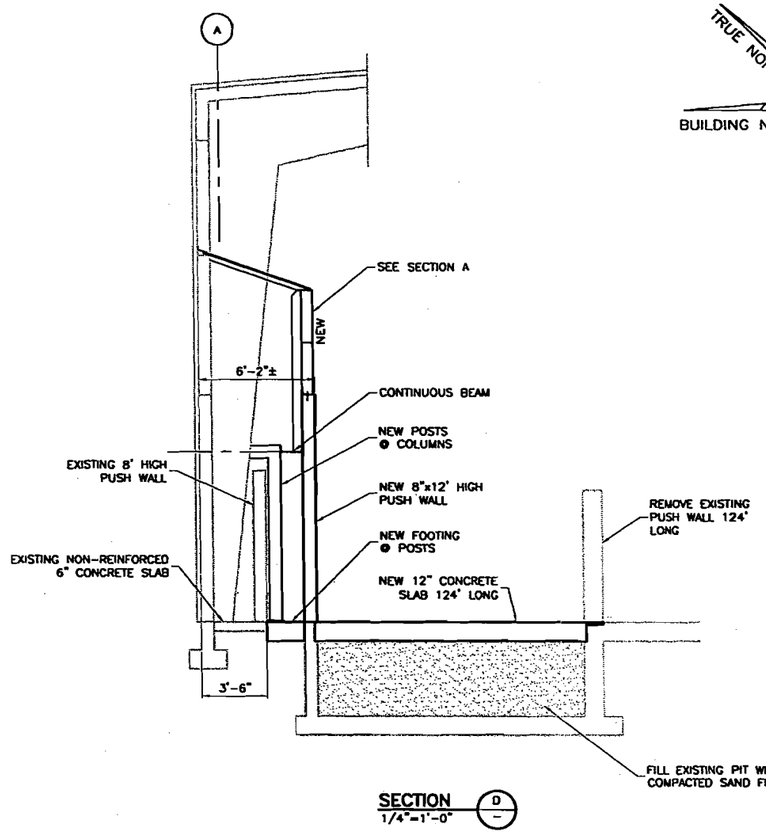

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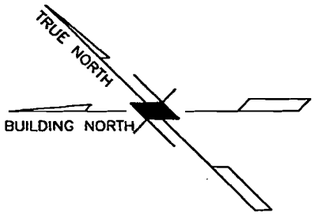

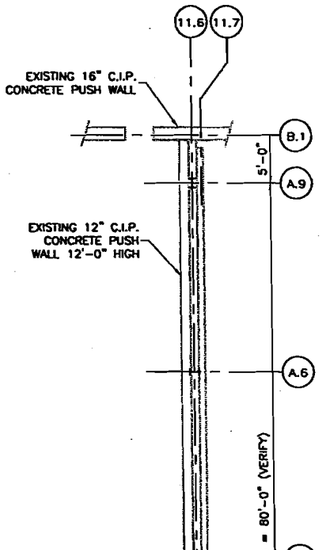

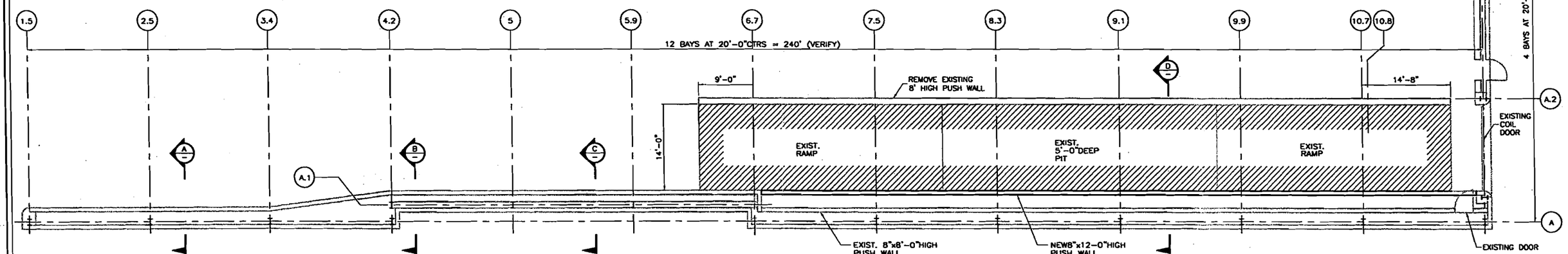

PLAN 1/8"=1'-0"

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SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00	DESIGNED:	PROJ. ENGINEER: RWC	WARNING 0 1/2 1 IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.
SCALE: AS SHOWN	DRAWN BY: MLJ	APPROVED BY:	
	CHECKED BY: RWC	DATE: 7-26-01	

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METRO

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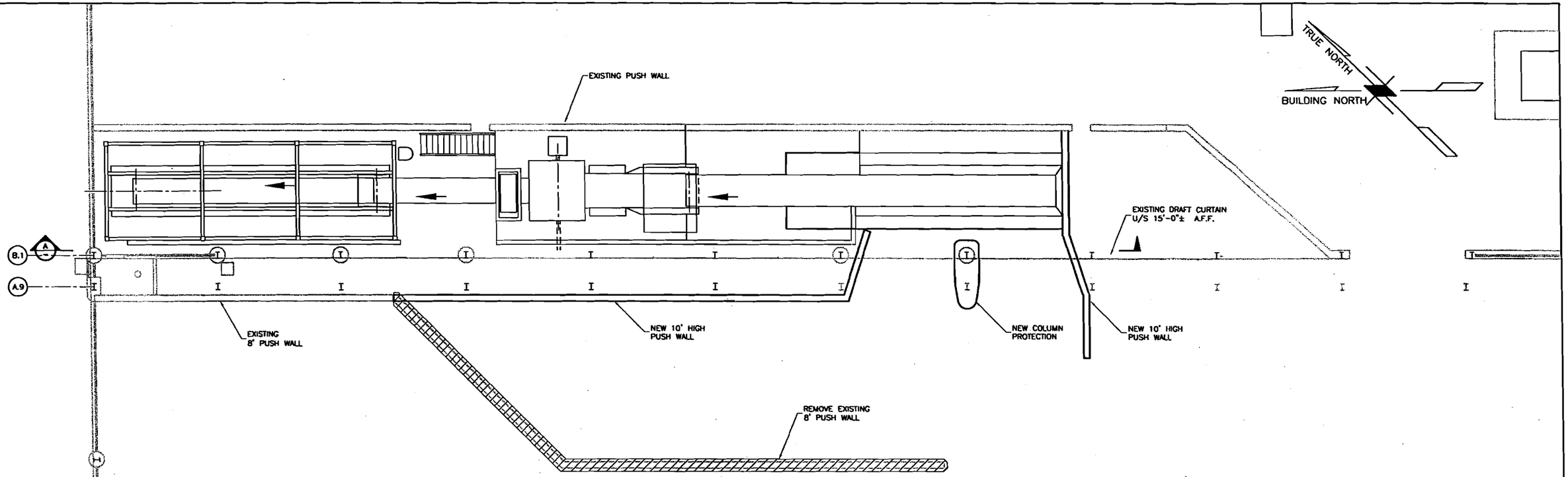
METRO CENTRAL STATION

MASTER PLAN
INCREASE WOOD ROOM SPACE

DRAWING NUMBER:	MCS-03
CAD FILE NUMBER:	MCS-03
SHEET: OF	REV. A



PLAN
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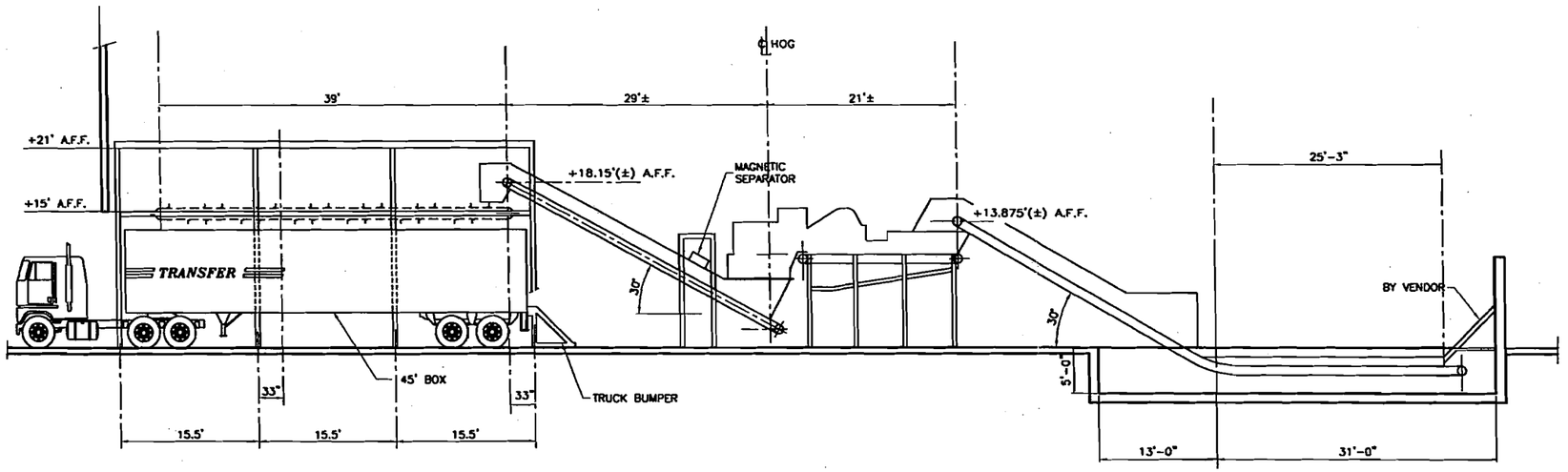

SECTION A
1/8"=1'-0"

8 0 8 16
SCALE IN FEET

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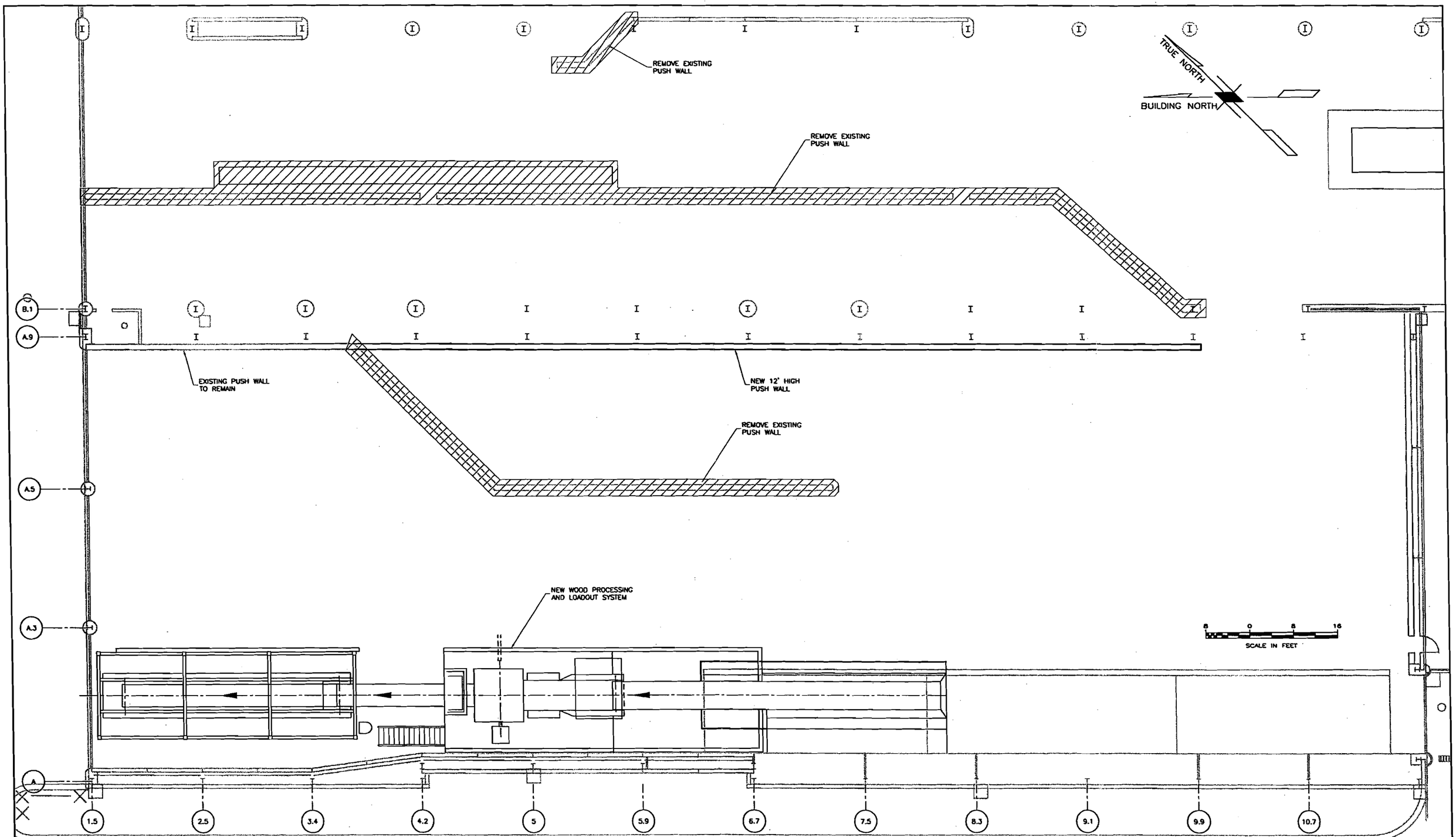
				SCALE: 1/8=1'-0"	DRAWN BY: MLJ	APPROVED BY:						CAD FILE NUMBER: MCS-04
					CHECKED BY: RWC	DATE: 8/23/01						SHEET: OF / REV. A
A	8/27/01	CAS	FOR CLIENT REVIEW									
No.	DATE	BY	REVISION									



No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No.: 52-00140015.00
SCALE: 1/8=1'-0"
DESIGNED:
DRAWN BY: MLJ
CHECKED BY: RWC
PROJ. ENGINEER: RWC
APPROVED BY:
DATE: 8/23/01

WARNING
0 1/2 1
IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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METRO

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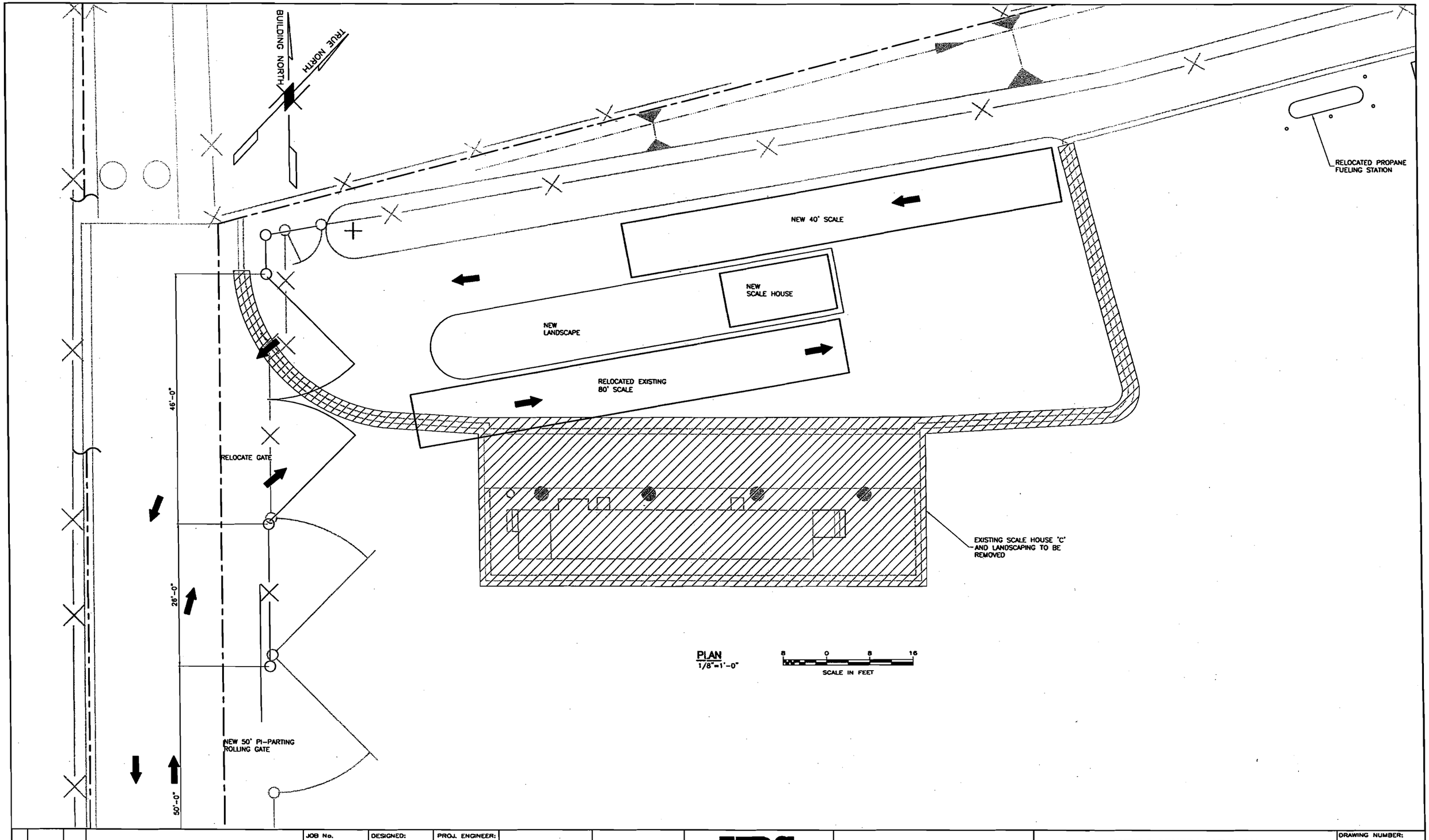
METRO CENTRAL STATION

MASTER PLAN
WOOD ROOM TRUCK LOADING ALTERNATE 3

DRAWING NUMBER: MCS-05
CAD FILE NUMBER: MCS-05
SHEET: OF
REV. A



PLAN
1/8"=1'-0"

8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00	DESIGNED:	PROJ. ENGINEER: RWC	WARNING 0 1/2 1 IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.
SCALE: 1/8=1'-0"	DRAWN BY: MLJ	APPROVED BY:	
	CHECKED BY: RWC	DATE: 7/27/01	

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METRO

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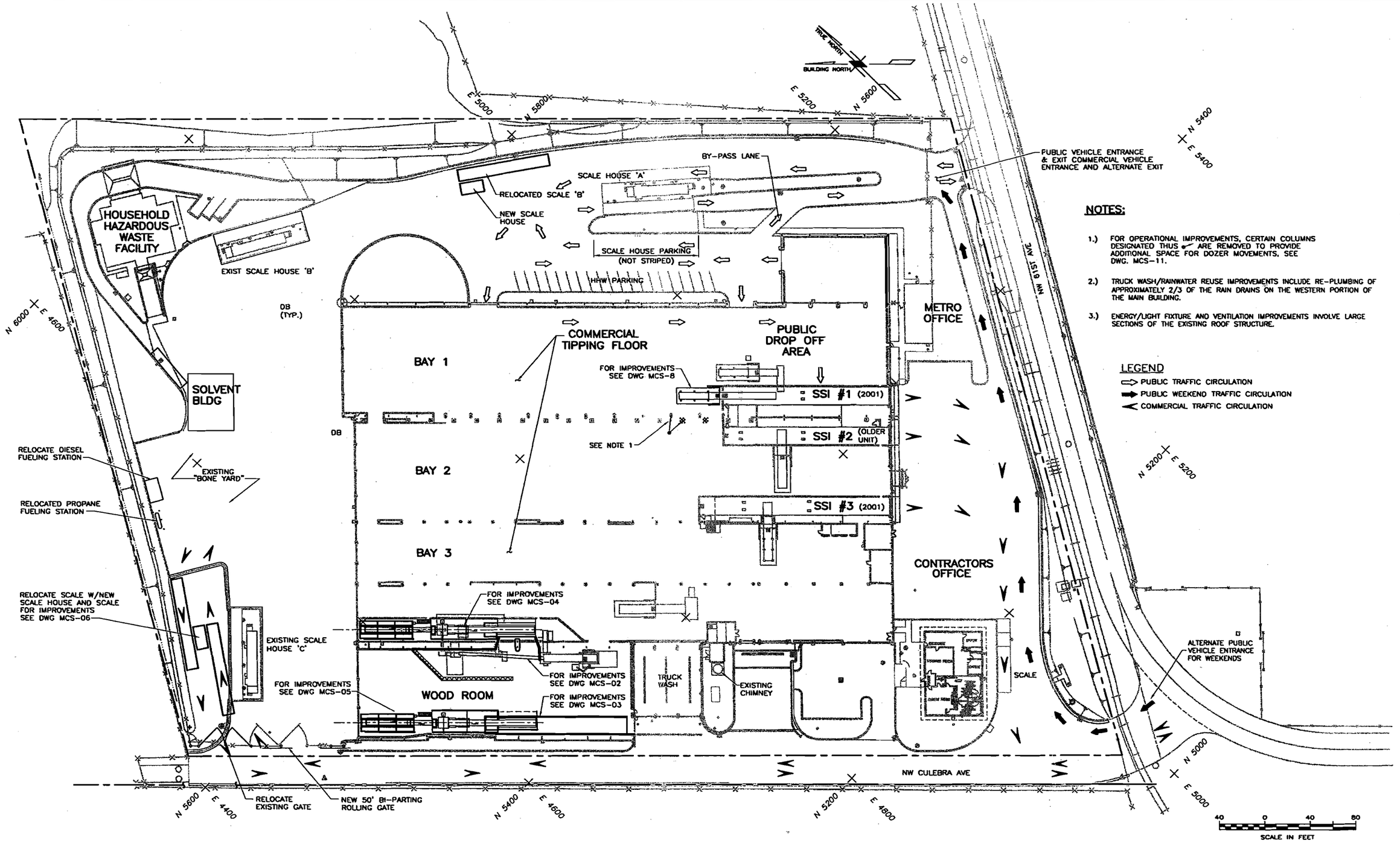
METRO CENTRAL STATION

MASTER PLAN
SCALEHOUSE 'C' RELOCATION

DRAWING NUMBER:	MCS-06
CAD FILE NUMBER:	MCS-06
SHEET: OF	REV. A



NOTES:

1.) FOR OPERATIONAL IMPROVEMENTS, CERTAIN COLUMNS DESIGNATED THUS ✓ ARE REMOVED TO PROVIDE ADDITIONAL SPACE FOR DOZER MOVEMENTS, SEE DWG. MCS-11.

2.) TRUCK WASH/RAINWATER REUSE IMPROVEMENTS INCLUDE RE-PLUMBING OF APPROXIMATELY 2/3 OF THE RAIN DRAINS ON THE WESTERN PORTION OF THE MAIN BUILDING.

3.) ENERGY/LIGHT FIXTURE AND VENTILATION IMPROVEMENTS INVOLVE LARGE SECTIONS OF THE EXISTING ROOF STRUCTURE.

LEGEND

- ⇨ PUBLIC TRAFFIC CIRCULATION
- ➡ PUBLIC WEEKEND TRAFFIC CIRCULATION
- ◄ COMMERCIAL TRAFFIC CIRCULATION

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00 | DESIGNED: | PROJ. ENGINEER: RWC
SCALE: 1=40'-0" | DRAWN BY: MLJ | APPROVED BY:
CHECKED BY: RWC | DATE: 07/17/01

WARNING
0 1/2 1
IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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METRO

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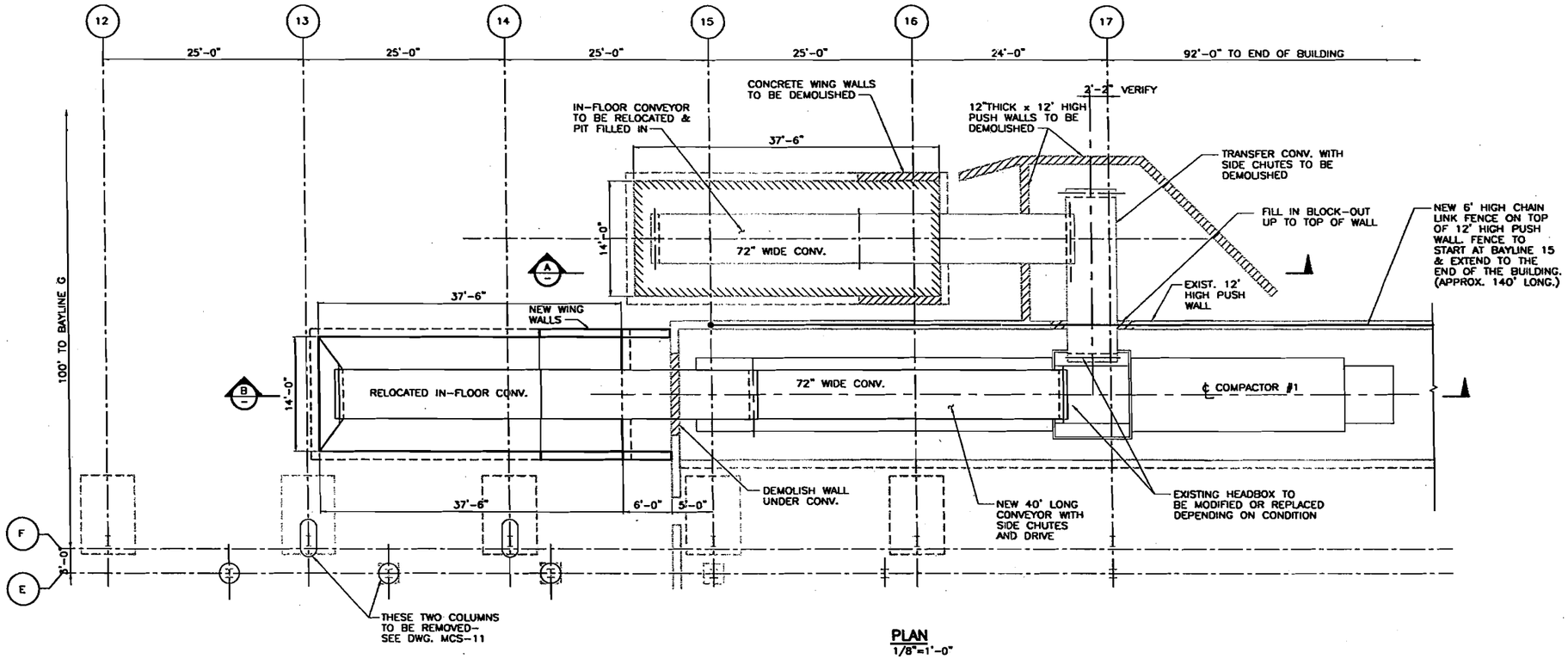
METRO CENTRAL STATION

MASTER PLAN
PROPOSED CIRCULATION IMPROVEMENTS

DRAWING NUMBER: MCS-07
CAD FILE NUMBER: MCS-07
SHEET: OF | REV. A



PLAN
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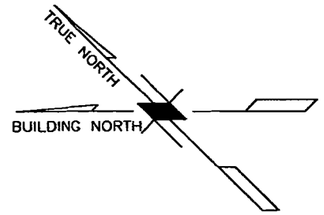

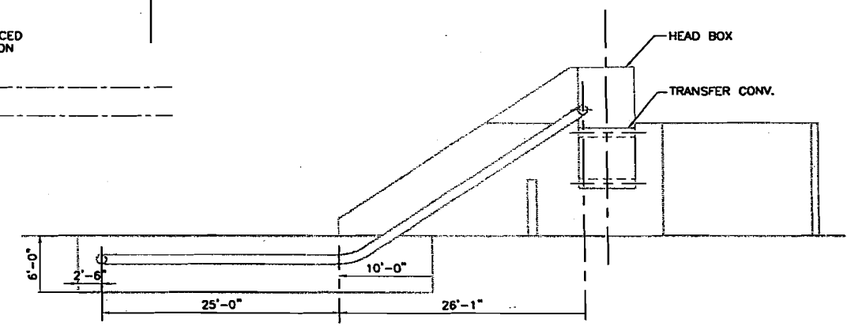

SECTION A
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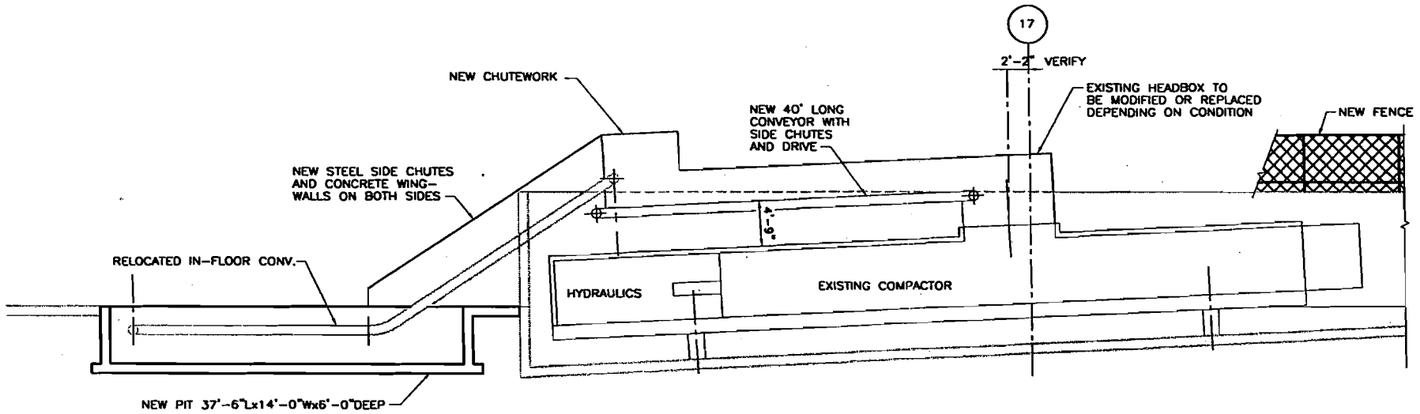
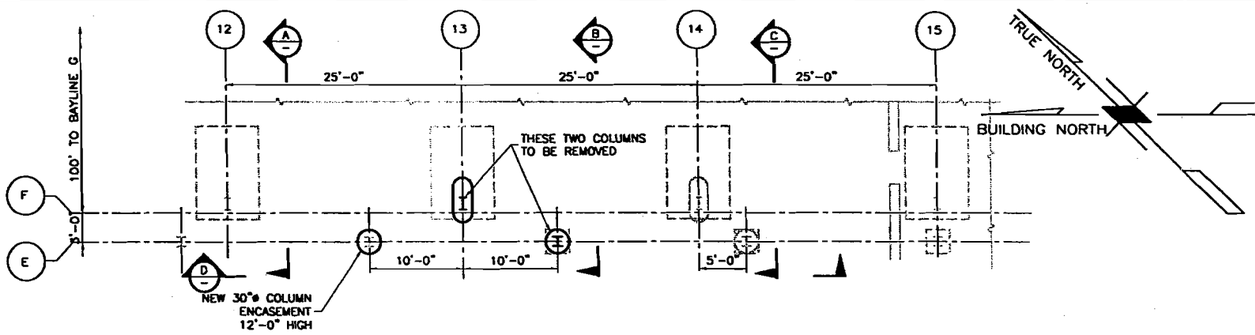
(EXISTING)



SECTION B
1/8"=1'-0"
(MODIFIED)

8 0 8 16
SCALE IN FEET

				JOB No. 52-00140015.00	DESIGNED:	PROJ. ENGINEER: RWC	WARNING 0 1/2 1 IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.	URS 111 S.W. Columbia, Suite 900 Portland, Oregon 97201 (tel) 503-222-7200 (fax) 503-222-4292	METRO PORTLAND OREGON	METRO CENTRAL STATION MASTER PLAN NEW CONVEYOR @ SSI NO.1	DRAWING NUMBER: MCS-08
				SCALE: 1/8=1'-0"	DRAWN BY: MLJ	APPROVED BY:					CAD FILE NUMBER: MCS-08
					CHECKED BY: RWC	DATE: 7/26/01					SHEET: OF / REV. A
A	8/27/01	CAS	FOR CLIENT REVIEW								
No.	DATE	BY	REVISION								



PLAN
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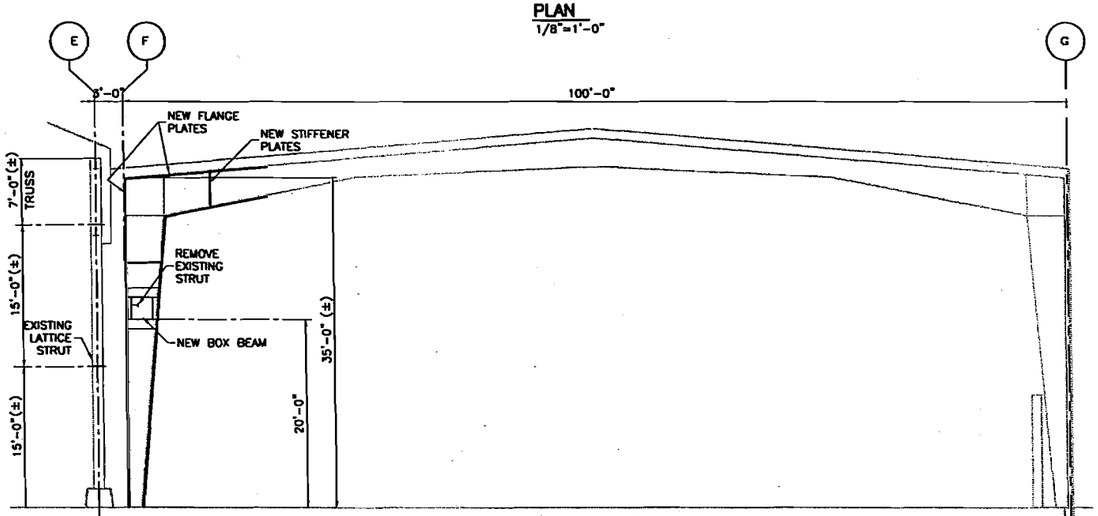

SECTION A
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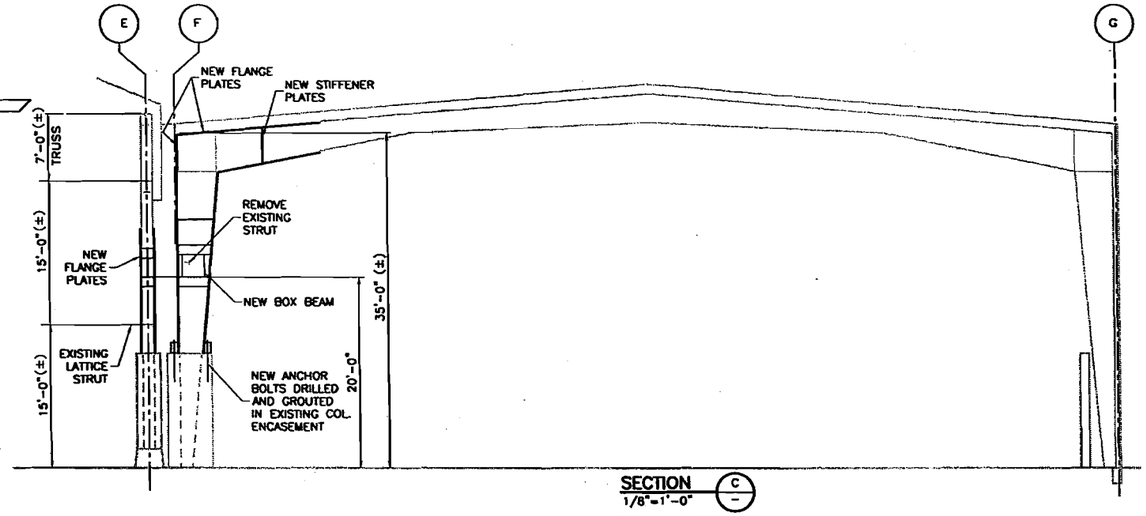

SECTION C
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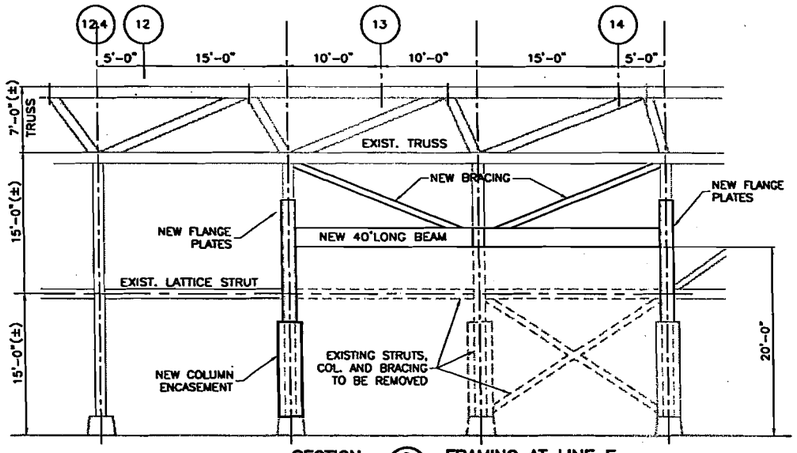
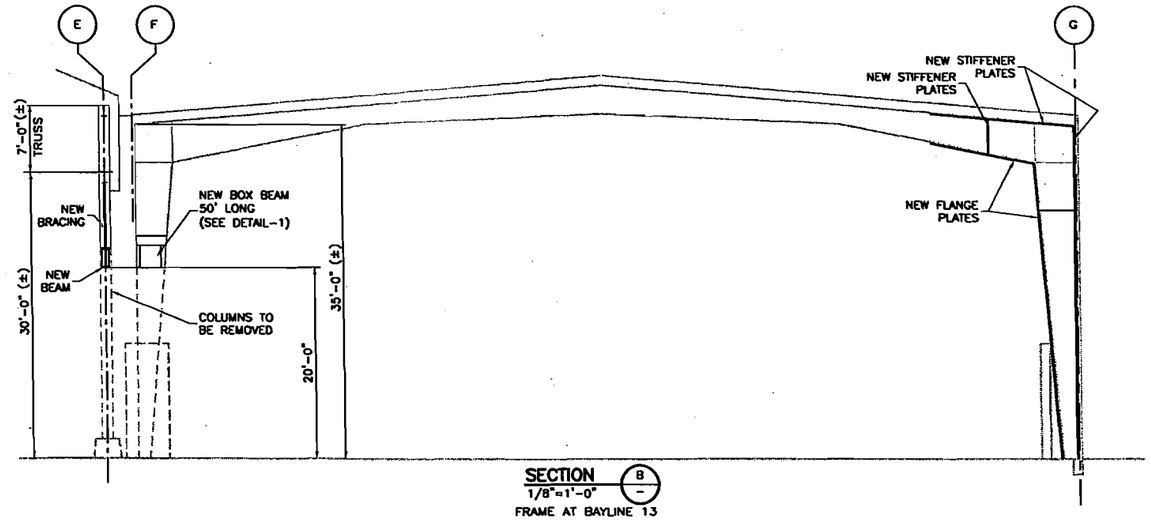
FRAME AT BAYLINE 14



SECTION D
1/8"=1'-0"
FRAMING AT LINE E
(MODIFICATIONS AT LINE F NOT SHOWN FOR CLARITY)



SECTION B
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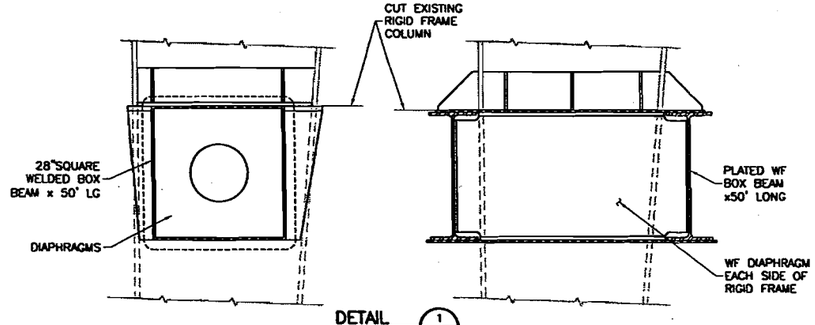
FRAME AT BAYLINE 13



DETAIL 1
ALTERNATE BOX BEAM SECTION

NOTES:

1. DRAWINGS & DATA OF RIGID FRAMES & FOOTINGS AT BAYLINES 12, 13 & 14 AND THE FRAMING ALONG LINE E DO NOT EXIST, THEREFORE A FULL INVESTIGATION WILL BE REQUIRED TO DETERMINE MEMBER & FOOTING SIZES.

8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52'00140015.00	DESIGNED:	PROJ. ENGINEER: RWC
SCALE: 1/8=1'-0"	DRAWN BY: MLJ	APPROVED BY:
	CHECKED BY: RCW	DATE: 8/2/01

WARNING
0 1/2 1
IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.

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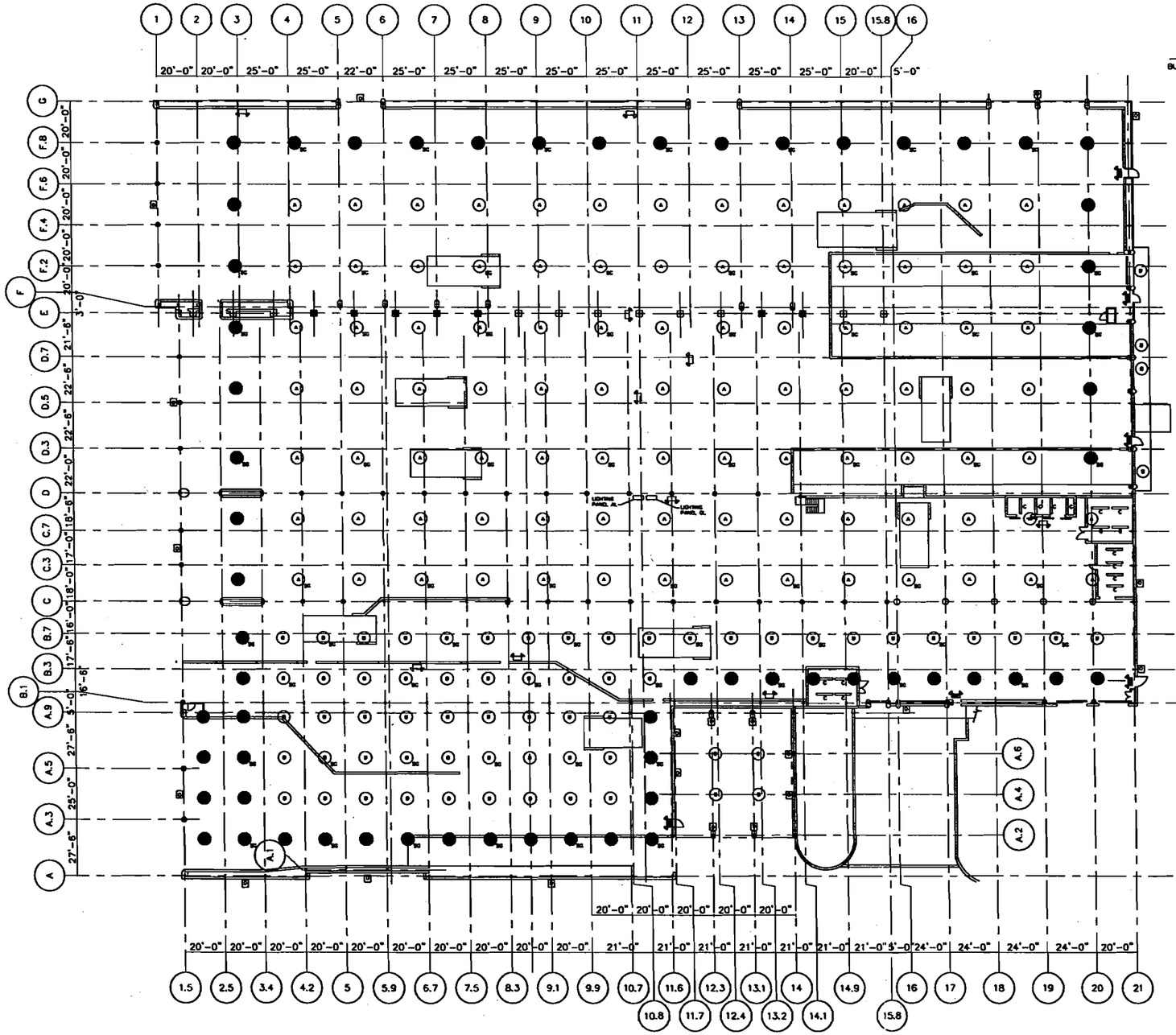
Portland, Oregon 97201
(tel) 503-222-7200
(fax) 503-222-4292

METRO
PORTLAND, OREGON

METRO CENTRAL STATION
MASTER PLAN
COLUMN REMOVAL

DRAWING NUMBER:	MCS-09
CAD FILE NUMBER:	MCS-09
SHEET: OF	REV. A

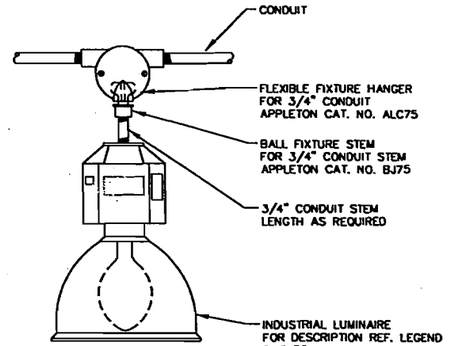


LEGEND

- (A) CROUSE-HINDS 1000 WATT FLEXOLINER II INDUSTRIAL HID LUMINAIRE, METAL HALIDE LAMP, 277 VOLTS MOUNTED AT 35'-0" ABOVE BUILDING FLOOR
- (B) CROUSE-HINDS 400 WATT FLEXOLINER II INDUSTRIAL HID LUMINAIRE, METAL HALIDE LAMP, 277 VOLTS MOUNTED AT 25'-0" ABOVE BUILDING FLOOR
- (A SG) "SG" INDICATES FIXTURE WIRED TO LIGHTING PANEL GL (FED FROM STANDBY GENERATOR) REMAINING FIXTURES WIRED TO LIGHTING PANEL AL
- (C) FLOURESCENT 8'-0" LIGHTING FIXTURE (2 PLAMP)
- (D) WALL PACK LIGHT FIXTURE
- EMERGENCY/EXIT LIGHT, BATTERY PACK UNIT
- EMERGENCY LIGHT, BATTERY PACK UNIT
- LIGHTS TO BE CIRCUITED OFF DURING THE DAY LITGHT HOURS.

NOTES

1. FOR TYPICAL MOUNTING OF TYPE A AND B LIGHTING SEE DETAIL 1 THIS DRAWING.
2. MAXIMUM OF 3-1000 WATT FIXTURES PER 20 AMP CIRCUIT. MAXIMUN OF 7-400 WATT FIXTURES PER 20 AMP CIRCUIT.



DETAIL – 1
N.T.S.

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00	DESIGNED: DH	PROJ. ENGINEER: RWC	WARNING 0 1/2 1 IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.
SCALE: 1"=30'-0"	DRAWN BY: MLJ	APPROVED BY:	
	CHECKED BY: RWC	DATE: 8/7/01	

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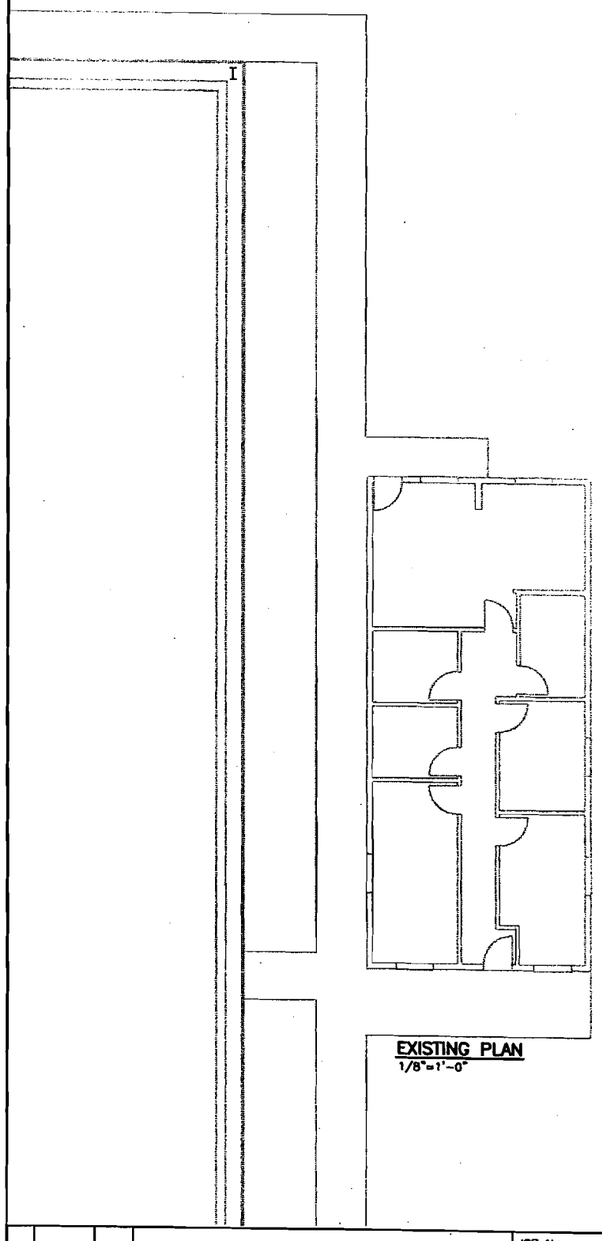
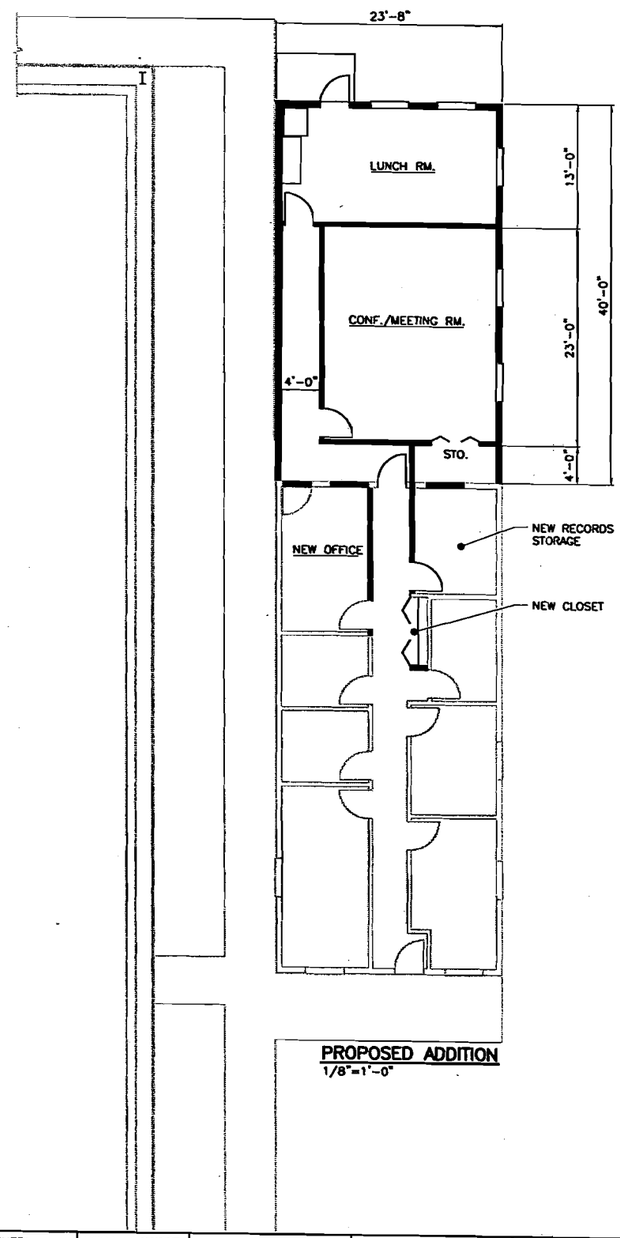
METRO SOUTH STATION
MASTER PLAN
RECIRCUITING IMPROVEMENTS

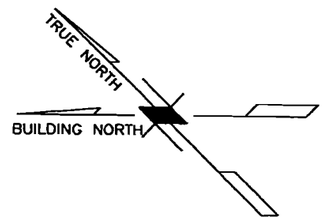
DRAWING NUMBER:	MCS-10
CAD FILE NUMBER:	MCS-10
SHEET: OF	REV. A



EXISTING PLAN
1/8"=1'-0"



PROPOSED ADDITION
1/8"=1'-0"



8 0 8 16
SCALE IN FEET

No.	DATE	BY	REVISION
A	8/27/01	CAS	FOR CLIENT REVIEW

JOB No. 52-00140015.00	DESIGNED:	PROJ. ENGINEER: RWC	WARNING 0 1/2 1 — IF BAR DOES NOT MEASURE 1" AT FULL SIZE, THEN SCALES ON DRAWING NOT TO SCALE.
SCALE: 1/8=1'-0"	DRAWN BY: MLJ/CAS	APPROVED BY:	
	CHECKED BY: RWC	DATE: 8/23/01	

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METRO
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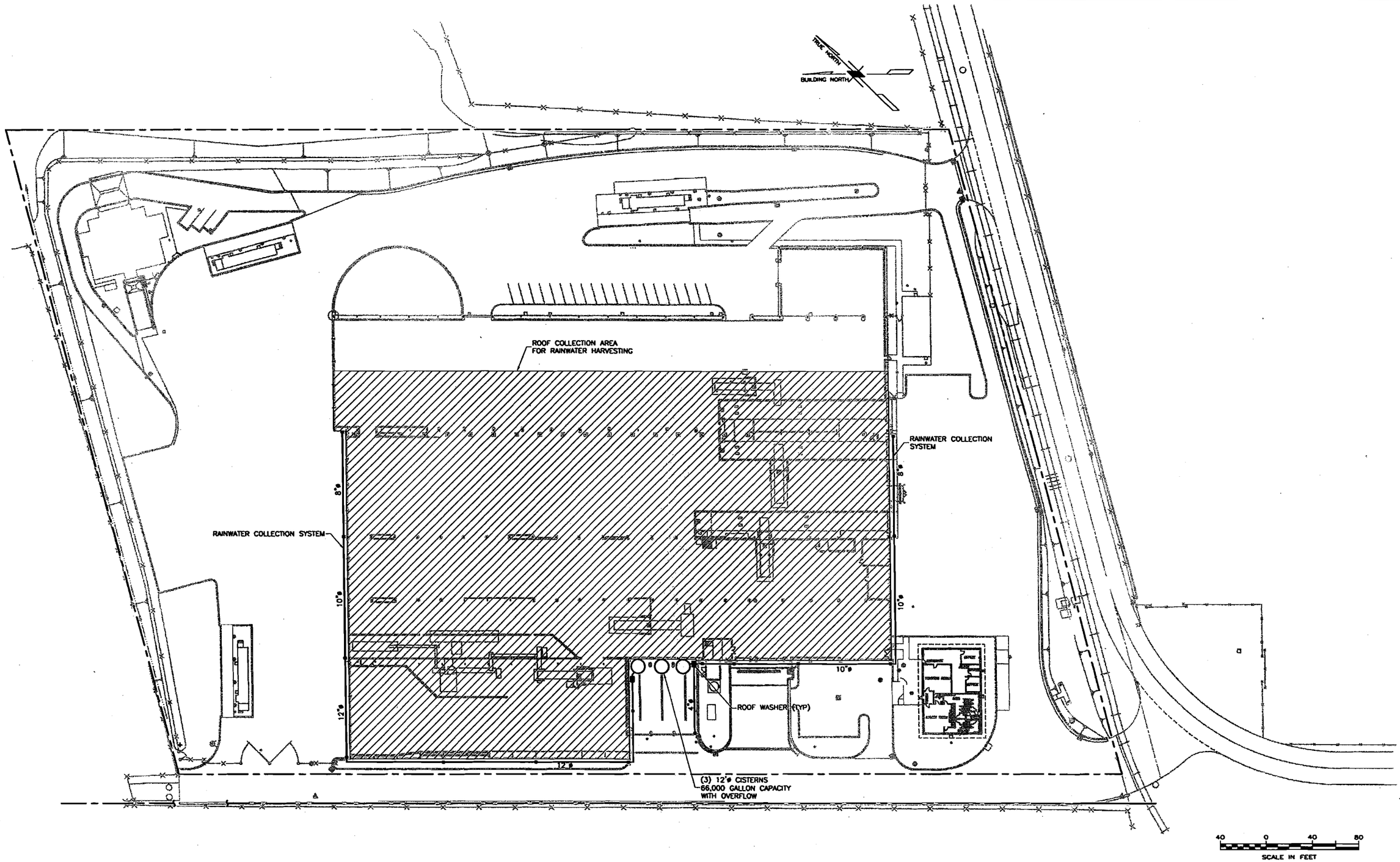
METRO CENTRAL STATION
MASTER PLAN
METRO FACILITIES ADDITON

DRAWING NUMBER:	MCS-11
CAD FILE NUMBER:	MCS-11
SHEET: OF	REV. A



No.	DATE	BY	REVISION
A	8/27/01	MLJ	FOR CLIENT REVIEW

JOB No. 52-00140015.00	DESIGNED: TA	PROJ. ENGINEER: RWC
SCALE: 1"=40'-0"	DRAWN BY: MLJ	APPROVED BY:
	CHECKED BY:	DATE:

WARNING

0 1/2 1

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METRO

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METRO CENTRAL STATION

MASTER PLAN
RAINWATER HARVESTING SYSTEM

DRAWING NUMBER:	
MCS-12	
CAD FILE NUMBER:	
MCS-12	
SHEET: OF	REV. A

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION PLANNING/TRAFFIC ENGINEERING
610 SW ALDER, SUITE 700 • PORTLAND, OR 97205 • (503) 228-5230 • FAX (503) 273-8169

October 19, 2001 Project #: 4704.0

Doug Drennen
URS Greiner
111 SW Columbia, Suite 900
Portland, OR 97201

RE: Metro Transfer Station Traffic Operations and Safety Analysis – Oregon City, Oregon

Dear Doug:

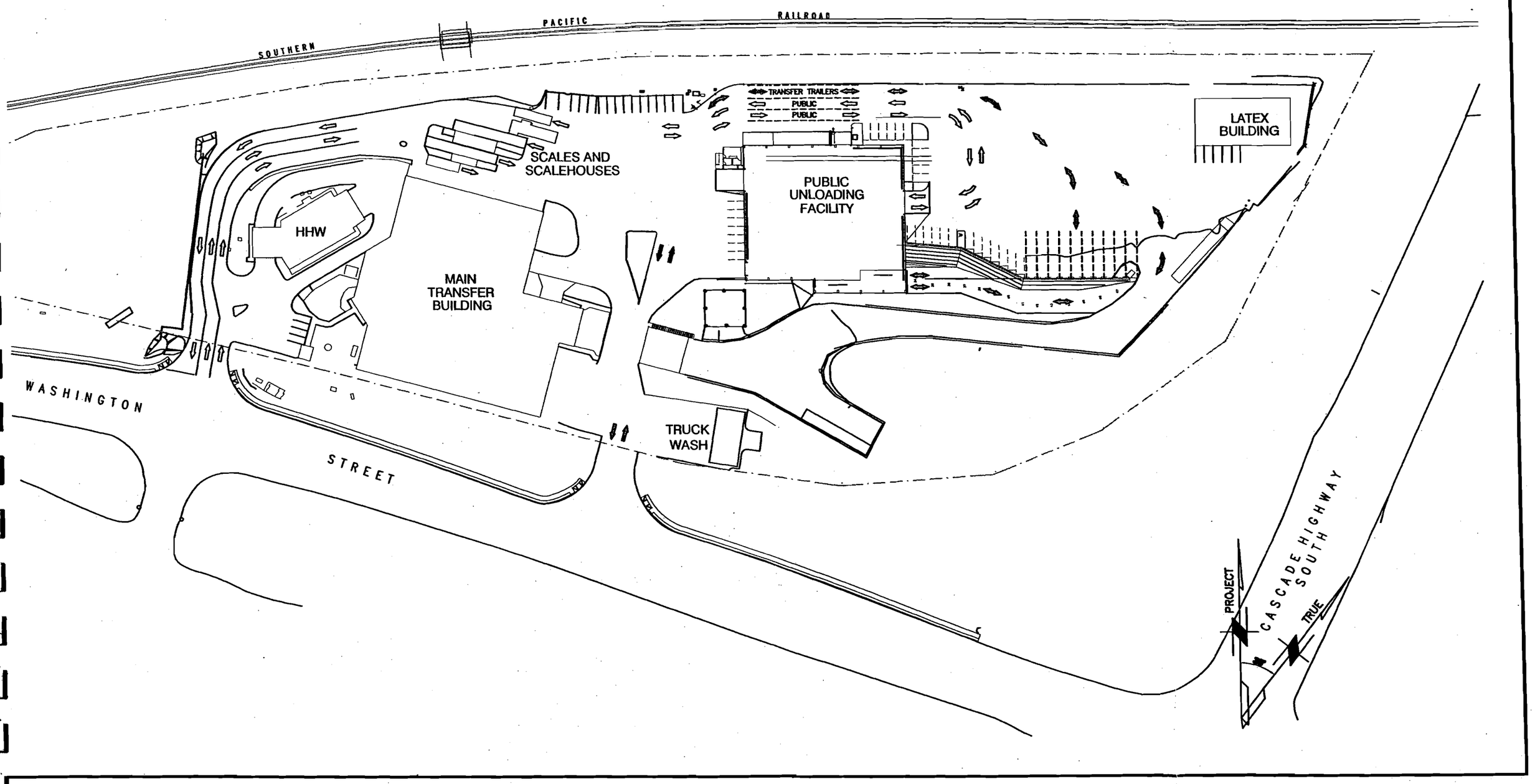
Per your request, Kittelson and Associates, Inc. has performed an analysis of the site-access driveways at the Metro South Transfer Station in Oregon City, Oregon. This report serves as an update to our May 15, 1997 and July 6, 1999 reports that evaluated site-access operations and on-site circulation. Since the previous report was prepared in July 1999, a public unloading facility has been constructed at the South Transfer site. The public unloading facility was opened on August 20, 2001. This report provides an evaluation of the site-access driveways with the addition of the public loading facility. Figure 1 provides the site plan for the Metro South Transfer Station.

Facility Operations

Access to the transfer station is provided via two full-access driveways on Washington Street. Washington Street is classified by Oregon City as a Minor Arterial and has a posted speed of 45 miles per hour in the vicinity of the site. Washington Street maintains a three-lane cross section and does not include sidewalks or bike lanes along the site frontage. The site driveways are located approximately 600 feet and 1,100 feet, respectively, from the signalized Cascade Highway (Highway 213)/Washington Street intersection.

The primary entrance to the transfer station occurs via the west access on Washington Street. The west driveway includes a right-turn deceleration lane on Washington Street that has 350 feet of storage. The entrance includes two inbound lanes and one outbound lane. Approximately 360 feet of storage is available per lane to accommodate vehicle stacking between Washington Street and the entry scales.

Four entry scales are provided at the entrance to the transfer station. The general contractor that monitors and controls traffic flow on-site has the ability to operate each scale as either inbound or outbound, or as commercial-only or public only. Under low volume conditions, the transfer station typically operates one inbound scale and one outbound scale.



SITE PLAN

METRO SOUTH TRANSFER STATION OREGON CITY, OREGON OCTOBER 2001	FIGURE *1*	

4704F001

Under high volume conditions two scales are typically operated to serve public trips (one in, one out) and two scales are operated to serve commercial trips (one in, one out). If excessive queuing is found to occur internal to the site, the scales can be configured to provide a third outbound scale. Likewise, if excessive queuing is found to occur at the entrance to the transfer station, a third inbound scale can be provided.

The recently constructed public unloading facility includes 16 unloading bays for refuse and 4 bays for yard debris. One lane is provided in each direction within the transfer station to serve public vehicles. These vehicles travel along the north edge of the unloading facility and enter the drop-off area via the east end of the building and return to the exit scales using the same path. The transfer station is open to the public seven days a week between 7 a.m. and 7 p.m. during spring/summer months, and between 7 a.m. and 6 p.m. during fall/winter months. The peak period for public drop-offs is during Saturday afternoon between 11 a.m. and 2 p.m.

Commercial vehicles enter the site via the west driveway and weigh-in at the entry scales. The transfer station is open for commercial vehicles that can be electronically weighed between 4 a.m. and 7 p.m. Monday through Saturday. The commercial vehicles are directed to the Main Transfer building located immediately south of the entry scales. All commercial vehicles that are tare weighted (pre-weighed) do not have to weigh-out and can exit the site via the east driveway. All non-tare-weighted vehicles must exit the site using one of the outbound scales.

Transfer trailers are used to haul waste off-site from the Metro South Transfer Station. The transfer trailers enter the site from the east driveway on Washington Street and circulate around the public unloading facility in a clockwise manner to the south end of the facility. After the trailers are loaded, they travel the same path around the north side of the unloading facility. The trailers exit the site by turning left via the east driveway onto Washington Street in order to gain access to I-205.

The Metro South Transfer Station also includes a building for depositing hazardous waste materials, a truck wash area, and a latex disposal building.

Traffic Operations Analysis

The May 15, 1997 Metro South Transfer Station Traffic Analysis report provided operational analyses for the site driveways during the weekday noon peak hour, the weekday p.m. peak hour, and the Saturday afternoon peak hour. Of the three time periods, the weekday p.m. peak hour was found to be the critical period for traffic operations at the Metro Transfer Station driveways. This is due to the fact that the highest level of through traffic volumes on Washington Street occurs during the weekday p.m. peak hour. During the critical weekday p.m. peak hour the west and east driveways were found to operate at level-of-service "C" and "B," respectively.

Existing Conditions

Turning movement volumes were collected in September 2001 at the site-access driveways on Washington Street in order to update the analysis performed in 1997. The counts were conducted during a Saturday afternoon period (11 a.m. to 2 p.m.), and a weekday p.m. peak hour period (4-6 p.m.). A review of load data provided by Metro shows that September traffic conditions are a reasonable representation of average traffic conditions throughout the year. The

lane configurations and traffic control devices for the Metro driveways are provided in Figure 2. Figure 3 shows the peak hour turning movement volumes for the three study periods. Note that all volumes have been rounded to the nearest five vehicles. *Attachment "A" provides the traffic count data analyzed in this report.*

A level-of-service analysis was performed for the site driveways under existing conditions. The level-of-service analysis was performed in accordance with the procedures outlined in the 1997 *Highway Capacity Manual* (Transportation Research Board). The City of Oregon City requires level-of-service "D" or better operations for signalized intersections and level-of-service "E" or better operations for unsignalized intersections. The results of the level-of-service analysis are provided in Table 1. *Attachment "B" includes all level-of-service worksheets summarized in this report.*

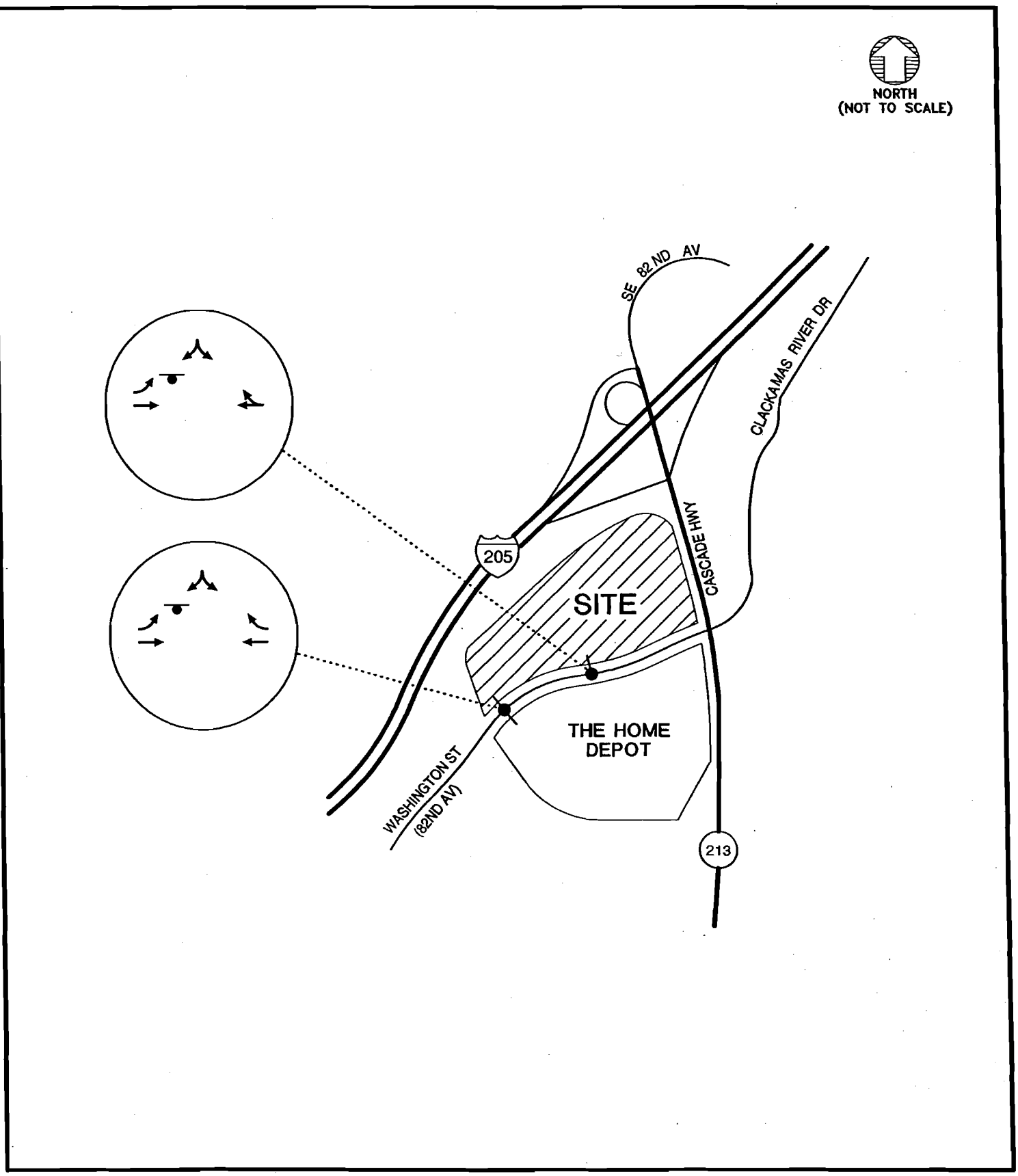
Table 1
2001 Existing Conditions Levels of Service

Driveway	Critical Movement	Volume-to-Capacity Ratio	Average Control Delay (veh/sec)	LOS
Weekday PM Peak Hour				
Metro West Driveway	Southbound Left Turn	0.19	18.5	C
Metro East Driveway	Southbound Left Turn	0.07	17.6	C
Saturday Afternoon Peak Hour				
Metro West Driveway	Southbound Left Turn	0.34	18.9	C
Metro East Driveway	Southbound Left Turn	0.04	14.1	B

As indicated in the table, both site-access driveways operate at acceptable levels of service under existing conditions.

Future Conditions

The Home Depot is currently constructing a 133,000 square-foot home improvement center on the southwest corner of the Highway 213/Washington Street intersection, immediately south of the Metro South Transfer Station. Primary access to The Home Depot site will occur via a driveway located opposite the Metro South Transfer Station West Driveway. As part of project construction, a traffic signal will be installed at this intersection. A secondary access to The Home Depot site will be provided on Washington Street approximately 100 feet east of the existing Metro East Driveway. A raised median is planned for construction on Washington Street beginning at The Home Depot right-in/right-out access driveway and extending east to Cascade Highway. Full access will be maintained at the Metro East Driveway. In addition, The Home Depot will install a traffic signal at the Metro West Driveway-Home Depot access on Washington Street. Figure 4 shows the planned lane configurations for Washington Street.



LEGEND

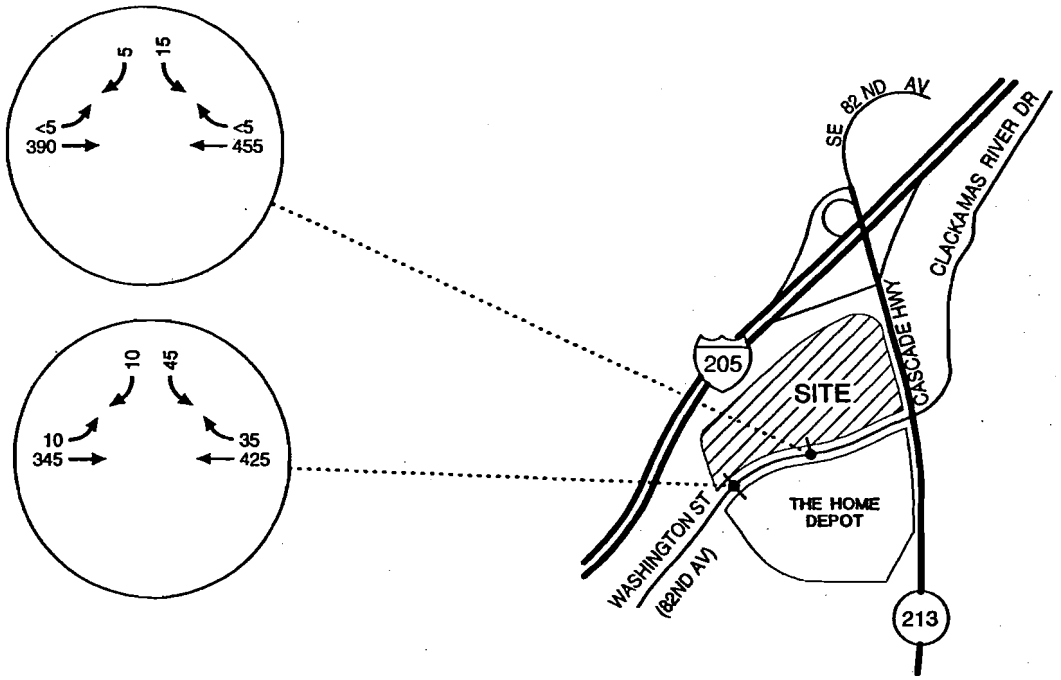
– STOP SIGN

– TRAFFIC SIGNAL

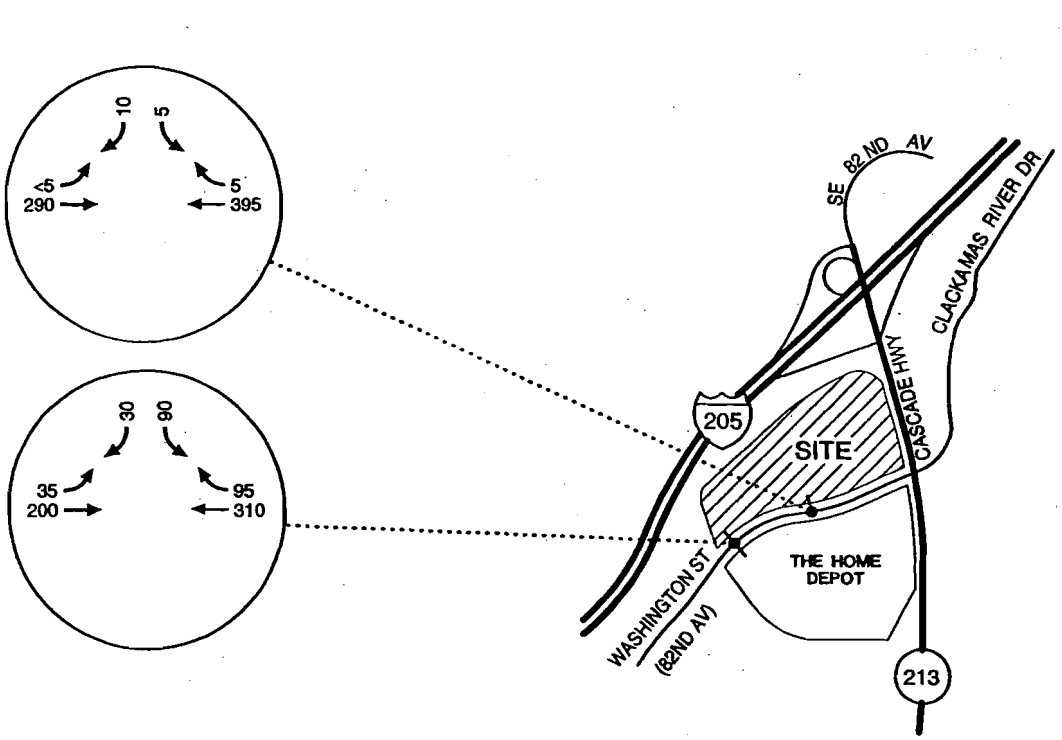
EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES

METRO SOUTH TRANSFER STATION OREGON CITY, OREGON	FIGURE 2
OCTOBER 2001	

4704F002



WEDNESDAY
PM PEAK HOUR



SATURDAY AFTERNOON
PEAK HOUR

2001 EXISTING TRAFFIC VOLUMES

METRO SOUTH TRANSFER STATION OREGON CITY, OREGON OCTOBER 2001	FIGURE 3

4704F003

Based on the *Home Depot Transportation Impact Study* (Kittelson and Associates, Inc., July 1999), Home Depot is forecast to generate approximately 5,115 daily trips ends during a typical weekday, of which 350 will occur during the weekday p.m. peak hour. The Home Depot is forecast to generate 680 trips during the Saturday peak hour.

A year 2002 traffic operations analysis was performed at the Metro driveways. The analysis assumes a five percent growth in background traffic volumes on Washington Street and the addition traffic volumes generated by Home Depot. The background growth rate of five percent per year was determined based on a review of historical traffic volumes in the area and forecast volumes from the Metro Regional Transportation Model. Traffic projections provided by Metro for the South Transfer Station indicate that peak hour vehicle trips are expected to grow at an annual rate of three percent per year (see Attachment "C"). Note that due to rounding and the low volume of turning movements at the Metro driveways, traffic volumes into and out of the transfer station remain the same under year 2002 future conditions as year 2001 existing conditions.

The year 2002 analysis assumes the planned illustrated in Figure 4. Figure 5 provides the year 2002 traffic volumes for the Saturday afternoon and weekday p.m. peak hours. Table 1 provides a summary of the level of service analysis for the driveways.

Table 2
2002 Future Conditions Levels of Service

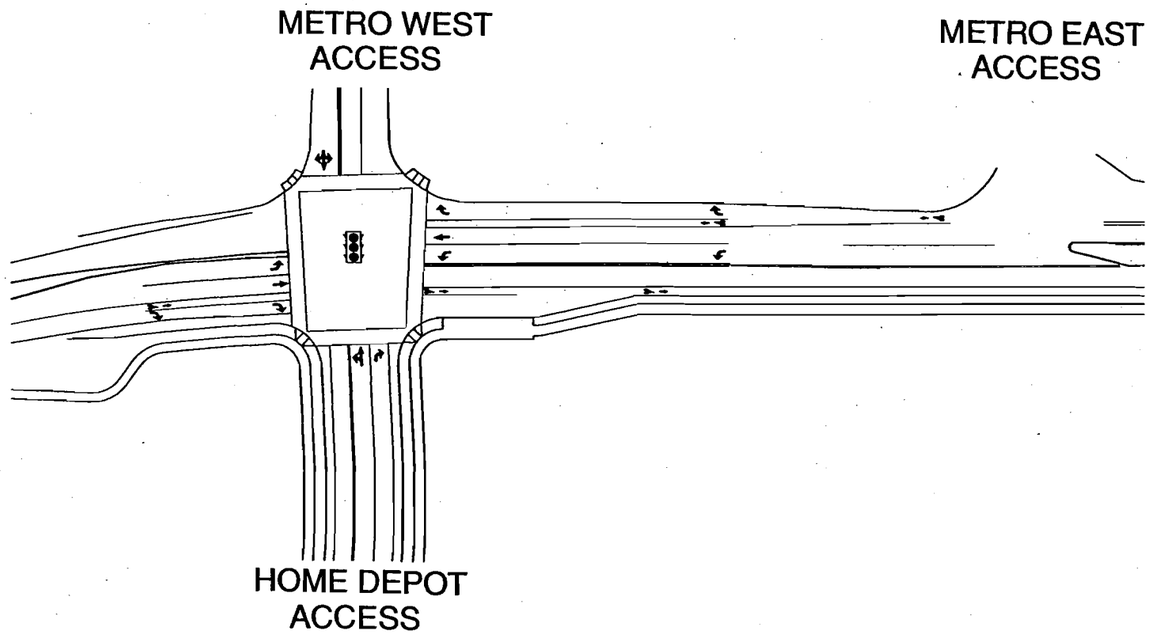
Driveway	Critical Movement	Volume-to-Capacity Ratio	Average Control Delay (veh/sec)	LOS
Weekday PM Peak Hour				
Metro West Driveway (signalized)	N/A	0.48	17.1	B
Metro East Driveway (unsignalized)	Southbound Left Turn	0.13	27.6	D
Saturday Afternoon Peak Hour				
Metro West Driveway (signalized)	N/A	0.58	23.3	C
Metro East Driveway (unsignalized)	Southbound Left Turn	0.07	21.4	C

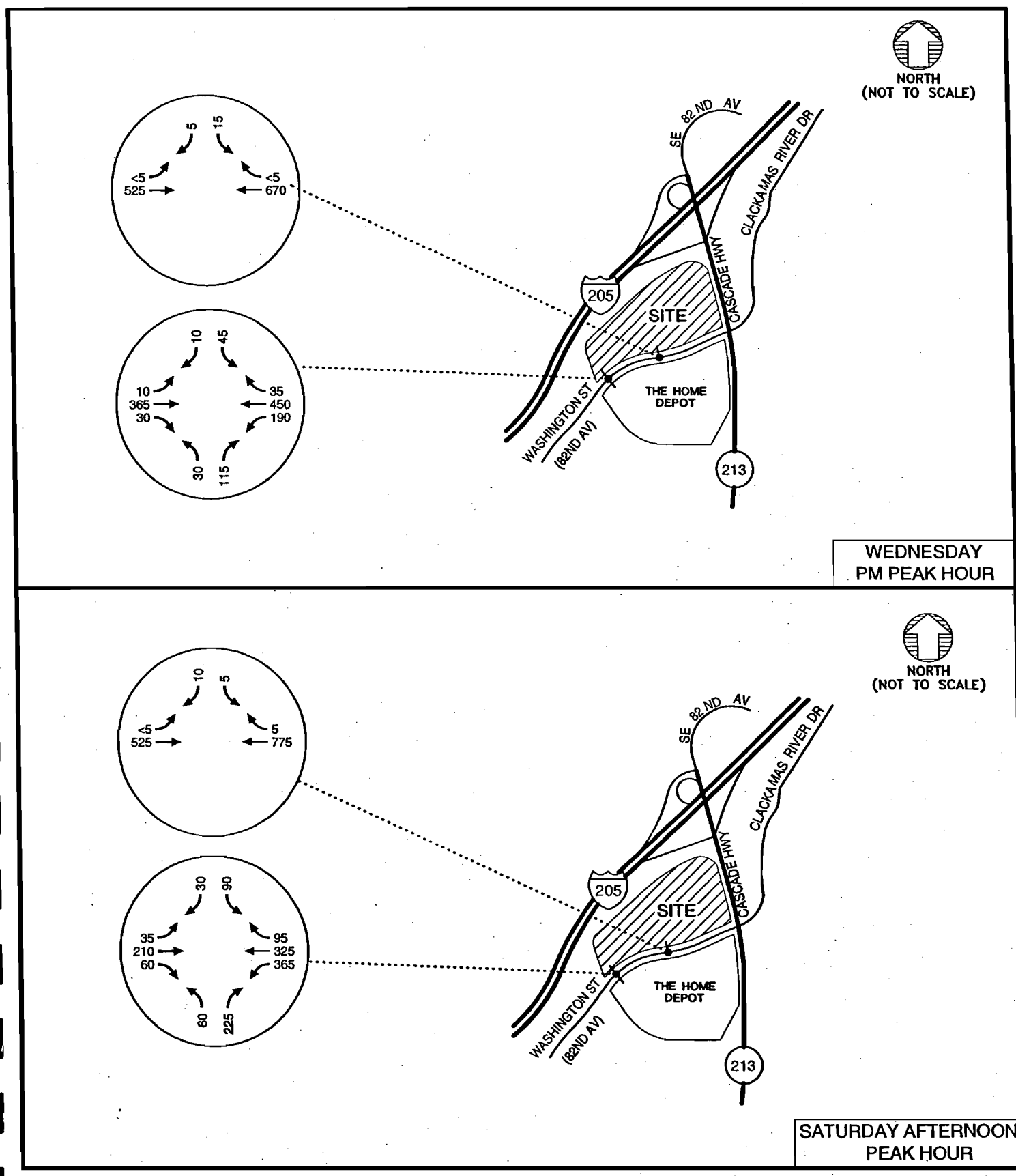
N/A = Not Applicable for signalized intersections

As shown in Table 2, the Metro driveways are forecast to operate at acceptable levels of service under year 2002 conditions with full build-out of Home Depot.

Washington Street/Cascade Highway Planned Improvements

The Oregon Department of Transportation is in the process of preparing final design plans for widening Cascade Highway (Highway 213) at the intersection of Washington Street to include three southbound through lanes and an exclusive right-turn lane. The third through lane will continue south to Redland Road. The improvement is scheduled for completion by the end of 2002. The addition of the third through lane is forecast to reduce the level of service at the Washington Street/Cascade Highway intersection from "F" to "D" during the weekday p.m. peak hour, based on the results of the *Home Depot Transportation Impact Analysis.*


METRO WEST
ACCESS
METRO EAST
ACCESS
HOME DEPOT
ACCESS



2002 FUTURE TRAFFIC VOLUMES

METRO SOUTH TRANSFER STATION OREGON CITY, OREGON OCTOBER 2001	FIGURE 5	K

4704F005

Washington Street Queuing Analysis

A 95th percentile vehicle queuing analysis was performed at the signalized Washington Street/Cascade Highway and the future signalized Metro West Access-Home Depot Access/Washington Street intersection. The analysis was performed for year 2002 (with Home Depot) conditions during the weekday p.m. peak hour and Saturday afternoon peak hour. The purpose of the analysis was to identify whether vehicle queues from the traffic signals will spill back beyond the Metro East driveway, and whether the turn pockets at the future signalized Metro West driveway intersection have adequate storage available.

In the queuing analysis, a Poisson distribution was applied at a 95-percent confidence level to determine queue length probabilities. In essence, random arrivals were assumed and the queue lengths shown will not be exceeded during 95 percent of the signal cycles occurring in the peak hour. In the analysis, one vehicle was assumed to occupy 25 feet. Note that traffic volumes for the Cascade Highway/Washington Street intersection were obtained from the *Home Depot Transportation Impact Analysis.* Table 3 presents the results of the analysis.

Table 3
95th Percentile Vehicle Queuing Analysis – 2002 Conditions

Intersection	Lane Group	Required Storage (feet)		Available Storage per Lane (feet)	Adequate?
		Weekday PM Peak Hour	Saturday Afternoon Peak Hour		
Cascade Highway/ Washington Street	EB Left Turn	200	225	250	Yes
	EB Through/Right Turn	250	300	600	Yes
Metro West Access- The Home Depot Access/ Washington Street	EB Left Turn	25	75	100	Yes
	WB Left Turn	175	250	300	Yes
	WB Through	150	175	350	Yes
	WB Right Turn	25	75	350	Yes
	SB Left/Through/Right	75	125	350	Yes
Metro East Access/ Washington Street	Eastbound Left Turn	25	25	100	Yes
	Southbound	25	25	100	Yes

As shown in Table 3, vehicle queues from the traffic signals on Washington Street are not forecast to block the Metro East Driveway following build-out of Home Depot. Adequate storage is available on Washington Street to accommodate the back-to-back left-turn queues at the unsignalized Metro East driveway and the signalized Home Depot access. In addition, adequate storage is available to accommodate vehicle queuing for vehicles exiting the transfer station at both driveways. *Attachment "D" includes all queuing analysis worksheets.*

Crash History

Crash data was obtained from ODOT for Washington Street between Abernathy Road and Cascade Highway for the five-year period from January 1, 1996 to December 31, 2000. Results from the crash data show that of the 45 crashes reported along Washington Street, 39 occurred at the intersection of Cascade Highway/Washington Street, 4 crashes involved through vehicles along Washington Street, and 2 crashes occurred at the Metro driveways.

The first of the two Metro driveway crashes occurred at the east driveway in June 1999. The crash occurred while a vehicle traveling in the westbound direction on Washington Street was waiting for a vehicle to turn left out of the Metro East driveway. A second vehicle followed on Washington Street and was forced to slow when it was rear-ended by a third vehicle. The collision resulted in an injury to the driver and passenger of the lead vehicle.

The second reported crash occurred in February 2000 at the west driveway when a vehicle making a left-hand turn out of the transfer station was struck by a through vehicle on Washington Street traveling in the eastbound direction. The vehicle turning left out of the transfer station did not yield proper right-of-way. The crash took place during a rainy day when pavement conditions were wet. The crash resulted in an injury to the through vehicle traveling along Washington Street.

No additional crashes were reported at the Metro driveways between January 1, 1996 and December 31, 2000. *Attachment "E" includes the crash data obtained from ODOT.*

East Driveway Safety and Operations

Concern has been raised regarding the safety and operations of the left-turn egress movement at the east driveway on Washington Street, particularly for the transfer trailers. Under the current configuration, all transfer trailers enter and exit the site via the east driveway. Other users of the east driveway include contractors, staff, tare-weighted commercial vehicles, and vehicles hauling recoverables (i.e., cardboard, metals, aluminum, etc.). Results from the existing turning movement counts indicate the left-turn movement experiences a volume of 15 vehicles during the weekday p.m. peak hour, two of which were semi-tractor trailers (transfer trailers). Data provided by Metro for the month of June 2001 were reviewed to identify the peak hourly volume of transfer trailer trips during the peak volume day within the month. The data showed that during the peak one-hour period of transfer trailer traffic, five transfer trailers were observed. Based on discussions with Metro staff, the number of transfer trailer trips is expected to remain at similar levels in the future (2 to 5 trips per hour), as are the volumes associated with the other users of the driveway. Our analysis has shown that sufficient capacity is available to accommodate left-turn egress movements under future year conditions, which assumes full build-out of Home Depot. In addition, field observations have verified that sufficient gaps are available on Washington Street to allow transfer trailers to safely and efficiently turn left out of the east driveway.

Given the low-volume nature of ingress and egress movements at the east driveway, the availability of gaps in the traffic stream along Washington Street, and the fact that only one reported crash has occurred at the driveway over the past five years, it is recommended that the east driveway continue to operate as an unsignalized intersection with full-access movements. The driveway should be monitored over time to ensure that acceptable operations and safety are maintained.

On-Site Circulation

The on-site circulation at the Metro South Transfer Station was evaluated based on an examination of the site plan (shown in Figure 1) and field observations during peak traffic conditions. A staff person is present at the entry scales to direct motorists to the proper scale. After weighing in at the entry scale, a second staff person directs motorists to the unloading facility and controls traffic to eliminate conflicts between "self-haulers," commercial vehicles, and transfer trailers. The staff personnel monitor traffic conditions and help to reduce vehicle queuing by utilizing unloading bays at the main transfer building when necessary, opening additional entry scales, and by ensuring that motorists are accessing the unloading facility and unloading their waste in an efficient manner.

The addition of the recently constructed public unloading facility has improved internal circulation by separating public vehicles from commercial vehicles and increasing the capacity for unloading waste. The addition of the facility has improved the turnover rate of "self-haulers" by providing more unloading bays. This has improved the overall capacity of the transfer station and has helped to reduce vehicle queuing at the entrance under peak conditions. Based on discussions with Metro staff, vehicle queues have not been observed to extend to Washington Street since the opening of the public unloading facility.

In addition, the on-site circulation and internal traffic flow was evaluated for transfer trailer vehicles. By allowing the transfer trailers to exit the site via the east driveway, on-site conflicts between the trailers and public vehicles are reduced, thus improving the overall safety and operations of the transfer station. As discussed in the previous section, approximately two to five transfer trailers exit the facility during a typical hour. Field observations confirm that adequate capacity is available on Washington Street to allow left-turn movements at the east driveway and that transfer trailers experience minor delays waiting to turn left.

Overall, the site plan provides safe and efficient circulation for public vehicles, commercial vehicles, and transfer trailers. No improvements to the existing site plan are recommended.

Conclusions and Recommendations

The following conclusions and recommendations can be made regarding the findings from our analysis:

- The Metro East and West driveways on Washington Street currently operate at level-of-service "C" or better during the weekday p.m. and Saturday peak hours.

- The improvements made at the transfer station over the past few years, which include re-striping the entrance at the west driveway to provide two inbound lanes, adding a scale and scale house, and, most recently, constructing a new public unloading facility, have greatly reduced the amount of vehicle queuing at the transfer station entrance. In addition, the facility operators have helped reduce vehicle queuing by monitoring traffic conditions and adjusting the configuration of the entry/exit lanes at the scales to best serve traffic demand. Metro staff have indicated that since the opening of the public unloading facility and with the presence of the facility operators, vehicle queues have not been observed to extend to Washington Street.

- As part of construction of the Home Depot, a traffic signal will be installed at the Metro West access-Home Depot access on Washington Street. Under year 2002 conditions, which include traffic from the Home Depot, the Metro driveways are forecast to continue to operate at acceptable levels of service.

- The Washington Street/Cascade Highway intersection is currently being improved to include a third through lane in the southbound direction. With the improvement in place, the intersection is forecast to operate at level-of-service "D" under year 2002 conditions.

- Vehicle queues from the traffic signals on Washington Street at the Cascade Highway intersection and the Metro West Driveway-Home Depot Access are not expected to block the Metro East Driveway under year 2002 conditions.

- A review of crash data provided by ODOT indicates that one reported crash occurred at the Metro West Driveway and one reported crash occurred at the Metro East Driveway for the five-year period between January 1996 and December 2000.

- The current site plan provides a safe and efficient circulation pattern for public vehicles, commercial vehicles, and transfer trailers. By allowing transfer trailers to exit the site via the east driveway, conflicts with public and commercial vehicles on-site are reduced. In addition, adequate capacity is available on Washington Street to accommodate the left-turn egress movement from the east driveway.

- The peak period of weekday traffic demand at the Metro South Transfer Station coincides with off-peak traffic demand on the surrounding transportation system. The peak period of traffic demand at the transfer station for commercial vehicles is from 10 a.m. to 2 p.m. Monday through Friday. Traffic volumes along Washington Street peak between 4:15 p.m. and 5:15 p.m. during the weekday.

- The facility operators schedule the times that transfer trailers exit the site. In order to limit the amount of truck traffic that is sent out of the site during the evening commute period, transfer trips are generally not scheduled beyond 4 p.m.

- Based on field observations, a review of historical crash data, and an evaluation of traffic operations at the Metro East Driveway, it is recommended that the east driveway continue to operate with full-access turning movements. Given the low volume of turning movements, the east driveway is expected to maintain safe operations following build-out of the Home Depot site. The east driveway should be monitored over time to ensure that adequate safety and operational levels are maintained.

We trust this memorandum adequately addresses the safety and operations of the driveways at the Metro South Transfer Station in Oregon City, Oregon. Please do not hesitate to call with any questions.

Sincerely,
KITTELSON & ASSOCIATES, INC.

Brandon Nevers
Engineering Associate

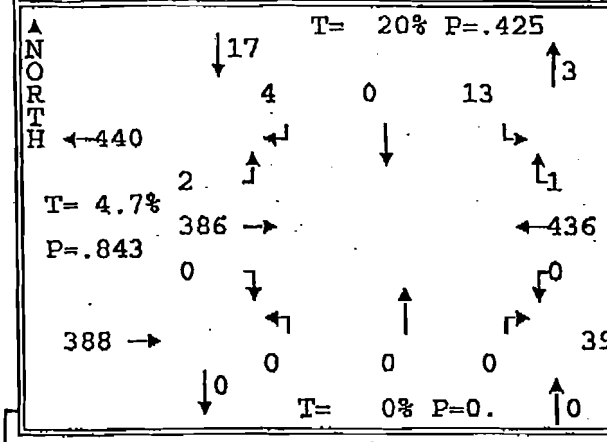
Gary Katsion, P.E.
Principal Engineer

Attachments: "A" – Traffic Count Data
"B" – Level of Service Worksheets
"C" – Transfer Station Traffic Forecasts
"D" – Queuing Analysis Worksheets
"E" – Crash Data

Attachment "A"

Traffic Count Data

INTERSECTION TURN MOVEMENT COUNT SUMMARY REPORT
METRO WASTE TRANSFER NORTH DRIVEWAY AT WASHINGTON STREET



DATE OF COUNT: 09/05/01
DAY OF WEEK: Wed
TIME STARTED: 16:15
TIME ENDED: 18:00

TEV=TOTAL ENTRY VOLUME
T=%TRUCKS BY APPROACH
P=PHF BY APPROACH

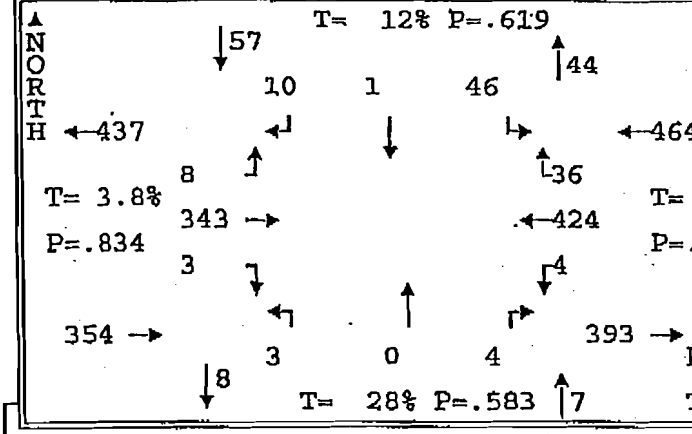
DLCS

Peak Hour
16:15-17:15
TEV=842

Traffic Smithy
(503) 641-6333

TIME PERIOD FROM - TO	EAST BOUND ↓	EAST BOUND →	EAST BOUND ↑	SOUTH BOUND ↵	SOUTH BOUND ↓	SOUTH BOUND ↳	NORTH BOUND ↰	NORTH BOUND ↑	NORTH BOUND ↱	WEST BOUND ↓	WEST BOUND ←	WEST BOUND ↑	ALL
16:15-16:20	0	34	0	1	0	2	0	0	0	0	38	1	76
16:20-16:25	0	35	1	1	0	5	0	0	0	0	33	0	75
16:25-16:30	0	23	1	0	0	1	0	0	0	0	39	0	64
16:30-16:35	0	23	0	0	0	0	0	0	0	0	44	0	67
16:35-16:40	0	42	0	0	0	1	0	0	0	0	43	0	86
16:40-16:45	0	36	0	0	0	1	0	0	0	0	42	0	79
16:45-16:50	0	37	0	0	0	0	0	0	0	0	37	0	74
16:50-16:55	0	35	0	0	0	1	0	0	0	0	29	0	65
16:55-17:00	0	27	0	0	0	0	0	0	0	0	30	0	57
17:00-17:05	0	26	0	1	0	1	0	0	0	0	33	0	61
17:05-17:10	0	38	0	1	0	1	0	0	0	0	40	0	80
17:10-17:15	0	30	0	0	0	0	0	0	0	0	28	0	58
17:15-17:20	0	32	0	0	0	2	0	0	0	0	24	0	58
17:20-17:25	0	29	0	1	0	0	0	0	0	0	36	3	69
17:25-17:30	0	31	0	0	0	0	0	0	0	0	37	0	68
17:30-17:35	0	29	0	0	0	2	0	0	0	0	13	0	44
17:35-17:40	0	30	0	0	0	1	0	0	0	0	27	0	58
17:40-17:45	0	26	0	0	0	0	0	0	0	0	23	0	49
17:45-17:50	0	29	0	0	0	1	0	0	0	0	28	1	59
17:50-17:55	0	24	1	0	0	0	0	0	0	0	22	0	47
17:55-18:00	0	20	0	0	0	1	0	0	0	0	32	1	54
Total Survey	0	636	3	5	0	20	0	0	0	0	678	6	1348
PHF	0	.84	.25	.5	0	.41	0	0	0	0	.84	.25	.880
% Trucks	0	4.7	0	0	0	25	0	0	0	0	8.7	66.7	7.3
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
Peds	0	0	0	0	2	0	0	0	0	0	0	0	
Hourly Totals													
16:15-17:15	0	386	2	4	0	13	0	0	0	0	436	1	842
16:30-17:30	0	386	0	3	0	7	0	0	0	0	423	3	822
16:45-17:45	0	370	0	3	0	8	0	0	0	0	357	3	741
17:00-18:00	0	344	1	3	0	9	0	0	0	0	343	5	705

INTERSECTION TURN MOVEMENT COUNT SUMMARY REPORT
METRO WASTE TRANSFER SOUTH DRIVEWAY AT WASHINGTON STREET



DATE OF COUNT: 09/05/01
DAY OF WEEK: Wed
TIME STARTED: 16:00
TIME ENDED: 18:00

TEV=TOTAL ENTRY VOLUME
T=%TRUCKS BY APPROACH
P=PHF BY APPROACH

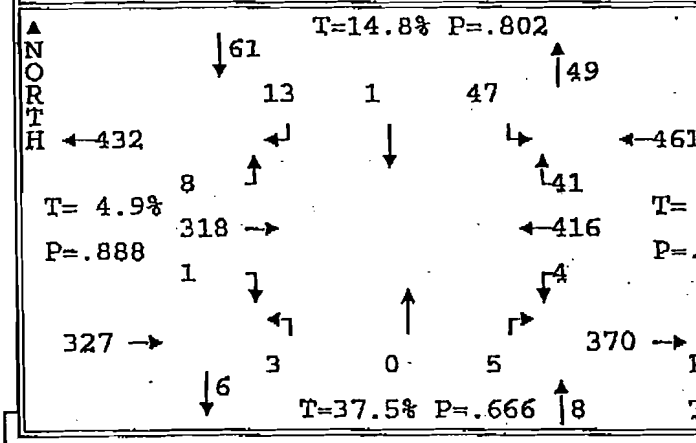
DJSY

Peak Hour
16:10-17:10
TEV=882

Traffic Smithy
(503) 641-6333

TIME PERIOD FROM - TO	EAST BOUND ↓	EAST BOUND →	EAST BOUND ↑	SOUTH BOUND ↲	SOUTH BOUND ↓	SOUTH BOUND ↳	NORTH BOUND ↰	NORTH BOUND ↑	WEST BOUND ↱	WEST BOUND ↓	WEST BOUND ←	WEST BOUND ↑	ALL
16:00-16:05	0	20	1	3	0	2	1	0	0	0	31	4	62
16:05-16:10	0	19	0	2	0	2	0	0	2	1	31	4	61
16:10-16:15	0	27	1	0	0	6	0	0	0	0	43	7	84
16:15-16:20	0	29	0	1	1	4	1	0	0	0	36	2	74
16:20-16:25	0	35	0	0	0	3	0	0	0	0	30	3	71
16:25-16:30	0	13	3	2	0	8	0	0	0	0	36	3	65
16:30-16:35	0	18	0	0	0	5	0	0	1	2	37	6	69
16:35-16:40	0	35	0	2	0	6	0	0	1	1	36	7	88
16:40-16:45	0	39	0	0	0	3	0	0	1	0	43	1	87
16:45-16:50	1	30	1	1	0	2	0	0	0	0	37	1	73
16:50-16:55	0	28	2	1	0	4	0	0	0	0	25	2	62
16:55-17:00	0	25	0	1	0	2	1	0	0	0	31	1	61
17:00-17:05	2	23	1	1	0	1	0	0	1	1	32	1	63
17:05-17:10	0	41	0	1	0	2	1	0	0	0	38	2	85
17:10-17:15	0	23	1	2	0	2	0	0	0	0	27	0	55
17:15-17:20	1	31	0	0	0	4	0	0	0	0	27	1	64
17:20-17:25	0	34	0	0	0	1	1	0	0	0	31	3	70
17:25-17:30	0	21	0	0	0	3	0	0	0	0	33	2	59
17:30-17:35	1	31	0	1	0	2	0	0	1	0	14	0	50
17:35-17:40	0	26	0	1	0	3	1	0	0	0	26	0	57
17:40-17:45	1	21	1	1	0	3	3	0	3	0	26	1	60
17:45-17:50	1	23	0	0	0	1	0	0	2	0	26	2	55
17:50-17:55	0	21	1	0	0	1	1	0	3	0	23	0	50
17:55-18:00	0	18	1	0	0	1	0	0	0	0	33	0	53
Total Survey	7	631	13	20	1	71	10	0	15	5	752	53	1578
PHF	.38	.82	.67	.63	.25	.61	.38	0	.33	.33	.91	.56	.889
% Trucks	71.4	2.9	15.4	10	100	11.3	50	0	13.3	20	6	7.5	5.9
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Hourly Totals													
16:00-17:00	1	318	8	13	1	47	3	0	5	4	416	41	857
16:15-17:15	3	339	8	12	1	42	3	0	4	4	408	29	853
16:30-17:30	4	348	5	9	0	35	3	0	4	4	397	27	836
16:45-17:45	6	334	6	10	0	29	7	0	5	1	347	14	759
17:00-18:00	6	313	5	7	0	24	7	0	10	1	336	12	721

INTERSECTION TURN MOVEMENT COUNT PEAK HOUR REPORT
METRO WASTE TRANSFER SOUTH DRIVEWAY AT WASHINGTON STREET



DATE OF COUNT: 09/05/01
DAY OF WEEK: Wed
TIME STARTED: 16:00
TIME ENDED: 18:00

TEV=TOTAL ENTRY VOLUME
T=%TRUCKS BY APPROACH
P=PHF BY APPROACH

DJSY

Peak Hour
16:00-17:00
TEV=857

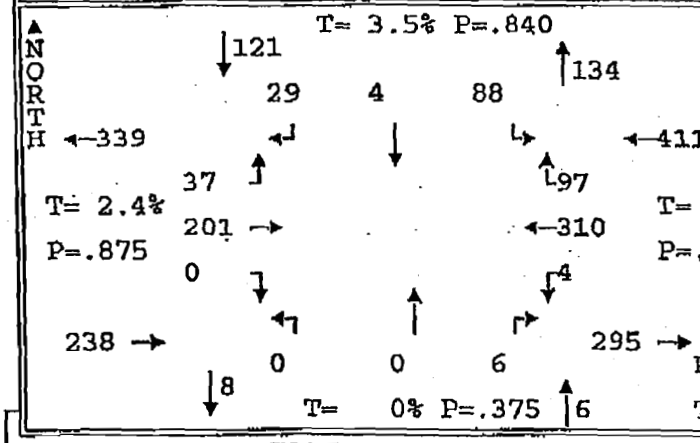
Traffic Smithy
(503)641-6333

TIME PERIOD FROM - TO	EAST BOUND ↓	EAST BOUND →	EAST BOUND ↑	SOUTH BOUND ↲	SOUTH BOUND ↓	SOUTH BOUND ↳	NORTH BOUND ↰	NORTH BOUND ↑	NORTH BOUND ↱	WEST BOUND ↓	WEST BOUND ←	WEST BOUND ↑	ALL
ALL VEHICLES													
16:00-16:15	0	66	2	5	0	10	1	0	2	1	105	15	207
16:15-16:30	0	77	3	3	1	15	1	0	0	0	102	8	210
16:30-16:45	0	92	0	2	0	14	0	0	3	3	116	14	244
16:45-17:00	1	83	3	3	0	8	1	0	0	0	93	4	196
LIGHT TRUCKS (SINGLE UNIT 2 AXLES)													
16:00-16:15	0	3	0	1	0	2	0	0	0	0	4	0	10
16:15-16:30	0	2	0	0	1	0	0	0	0	0	4	2	9
16:30-16:45	0	1	0	0	0	2	0	0	0	0	12	1	16
16:45-17:00	0	2	2	1	0	0	0	0	0	0	4	0	9
MEDIUM TRUCKS (SINGLE UNIT > 2 AXLES)													
16:00-16:15	0	1	0	0	0	1	0	0	0	0	0	1	3
16:15-16:30	0	1	0	0	0	0	0	0	0	0	1	0	2
16:30-16:45	0	0	0	0	0	1	0	0	0	1	1	0	3
16:45-17:00	1	1	0	0	0	0	1	0	0	0	0	0	3
HEAVY TRUCKS (SEMI-TRACTOR TRAILER)													
16:00-16:15	0	1	0	0	0	0	0	0	1	0	1	0	3
16:15-16:30	0	0	0	0	0	0	0	0	0	0	1	0	1
16:30-16:45	0	1	0	0	0	0	0	0	1	0	0	0	2
16:45-17:00	0	0	0	0	0	0	0	0	0	0	2	0	2
BICYCLES													
16:00-16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15-16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30-16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45-17:00	0	0	0	0	0	0	0	0	0	0	1	0	1

PEDESTRIANS	CROSSWALK USEAGE SOUTH	WEST	EAST	NORTH	ALL
16:00-16:15	0	0	0	0	0
16:15-16:30	0	0	0	0	0
16:30-16:45	0	0	0	0	0
16:45-17:00	0	0	0	0	0

Peak Hour by Movement													
PHF	.25	.86	.67	.65	.25	.78	.75	0	.42	.33	.9	.68	.878
% Trucks(all)	100	4.1	25	15.4	100	12.8	33.3	0	40	25	7.2	9.8	7.4
% Trucks(M+H)	100	1.6	0	0	0	4.3	33.3	0	40	25	1.4	2.4	2.2
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
Hourly Totals													
16:00-17:00	1	318	8	13	1	47	3	0	5	4	416	41	857
16:15-17:15	3	339	8	12	1	42	3	0	4	4	408	29	853
16:30-17:30	4	348	5	9	0	35	3	0	4	4	397	27	836
16:45-17:45	6	334	6	10	0	29	7	0	5	1	347	14	759
17:00-18:00	6	313	5	7	0	24	7	0	10	1	336	12	721

INTERSECTION TURN MOVEMENT COUNT SUMMARY REPORT
METRO SOLID WASTE-WEST DRIVEWAY



9/15/01

DATE OF COUNT: 09/14/01
DAY OF WEEK: SAT
TIME STARTED: 11:00 9/15/01
TIME ENDED: 14:00

TEV=TOTAL ENTRY VOLUME
T=%TRUCKS BY APPROACH
P=PHF BY APPROACH

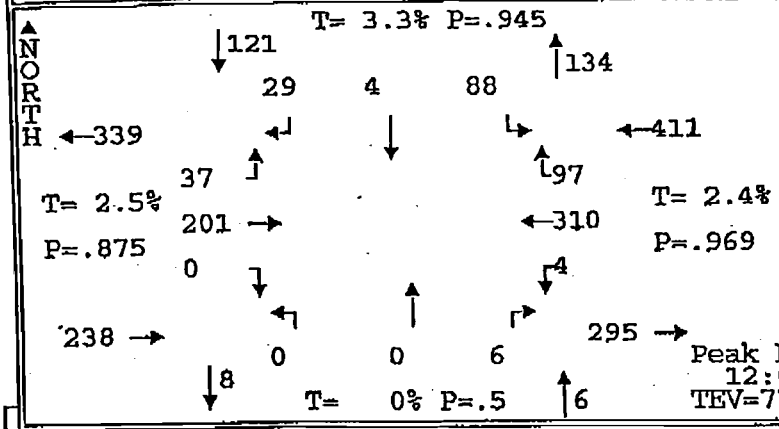
v3dk

Peak Hour
12:00-13:00
TEV=776

Traffic Smithy
(503) 641-6333

TIME PERIOD FROM - TO	EAST BOUND ↓	EAST BOUND →	EAST BOUND ↑	SOUTH BOUND ↵	SOUTH BOUND ↓	SOUTH BOUND ↳	NORTH BOUND ↰	NORTH BOUND ↑	WEST BOUND ↱	WEST BOUND ↓	WEST BOUND ←	WEST BOUND ↑	ALL
11:00-11:05	1	12	2	1	0	4	0	1	0	0	17	7	45
11:05-11:10	0	19	2	2	0	6	0	0	0	0	19	8	56
11:10-11:15	0	13	2	2	0	3	0	0	0	0	18	6	44
11:15-11:20	1	17	2	2	0	4	0	0	0	0	23	6	55
11:20-11:25	0	11	1	2	0	9	0	0	0	0	20	9	52
11:25-11:30	0	12	0	4	0	5	0	0	0	0	11	7	39
11:30-11:35	0	18	0	1	0	8	0	0	1	0	17	9	54
11:35-11:40	0	14	1	1	0	5	0	0	1	0	31	7	60
11:40-11:45	0	13	2	1	0	7	0	0	0	0	31	12	66
11:45-11:50	0	18	0	0	0	6	0	0	0	0	13	6	43
11:50-11:55	0	19	2	0	0	4	0	0	0	0	25	10	60
11:55-12:00	0	14	3	1	0	7	0	0	0	0	19	7	51
12:00-12:05	0	19	2	1	1	9	0	0	1	1	26	8	68
12:05-12:10	0	15	7	1	0	8	0	0	1	0	34	6	71
12:10-12:15	0	22	3	4	1	7	0	0	1	0	26	5	69
12:15-12:20	0	14	3	5	1	9	0	0	3	2	21	13	71
12:20-12:25	0	19	1	2	0	5	0	0	0	0	17	10	54
12:25-12:30	0	22	3	3	0	2	0	0	0	0	30	10	70
12:30-12:35	0	13	2	0	0	10	0	0	1	1	20	6	53
12:35-12:40	0	15	4	2	1	6	0	0	0	0	26	11	65
12:40-12:45	0	13	4	4	0	7	0	0	0	0	26	6	60
12:45-12:50	0	14	1	4	0	4	0	0	0	0	35	11	69
12:50-12:55	0	19	2	3	0	14	0	0	0	0	27	5	70
12:55-13:00	0	16	5	0	0	7	0	0	0	0	22	6	56
13:00-13:05	0	10	4	6	0	10	0	0	0	0	29	7	66
13:05-13:10	0	17	1	1	0	6	0	0	0	0	19	14	58
13:10-13:15	0	15	0	2	0	7	0	0	0	0	18	5	47
13:15-13:20	0	10	1	2	1	8	0	0	1	0	18	10	51
13:20-13:25	0	10	1	1	0	10	0	0	0	0	23	4	49
13:25-13:30	0	17	1	2	1	6	0	0	0	0	22	7	56
13:30-13:35	0	12	1	2	0	7	0	0	0	0	22	7	51
13:35-13:40	0	20	1	4	0	6	0	0	0	0	20	7	58
13:40-13:45	1	20	1	1	0	6	0	0	0	0	40	5	74
13:45-13:50	0	9	2	1	0	3	0	0	0	0	36	4	55
13:50-13:55	0	16	0	1	0	3	0	0	0	0	21	2	43
13:55-14:00	0	18	0	2	0	9	0	0	0	0	21	7	57
Total Survey	3	555	67	71	6	237	0	1	9	4	843	270	2066
PHF	0	.9	.71	.66	.5	.88	0	0	.38	.5	.88	.73	.919
% Trucks	0	2.5	1.5	1.4	0	4.2	0	0	0	0	1.7	4.1	2.5
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
Peds	0	0	0	0	0	0	0	0	0	0	0	0	
Hourly Totals													
11:00-12:00	2	180	17	17	0	68	0	1	2	0	244	94	625
11:15-12:15	1	192	23	18	2	79	0	0	4	1	276	92	688
11:30-12:30	0	207	27	20	3	77	0	0	7	3	290	103	737
11:45-12:45	0	203	34	23	4	80	0	0	6	4	283	98	735
12:00-13:00	0	201	37	29	4	88	0	0	6	4	310	97	776
12:15-13:15	0	187	30	32	2	87	0	0	4	3	290	104	739
12:30-13:30	0	169	26	27	3	95	0	0	2	1	285	92	700
12:45-13:45	1	180	19	28	2	91	0	0	1	0	295	88	705
13:00-14:00	1	174	13	25	2	81	0	0	1	0	289	79	665

INTERSECTION TURN MOVEMENT COUNT PEAK HOUR REPORT
METRO SOLID WASTE-WEST DRIVEWAY



DATE OF COUNT: 09/14/01
DAY OF WEEK: SAT
TIME STARTED: 11:00
TIME ENDED: 14:00

TEV=TOTAL ENTRY VOLUME
T=%TRUCKS BY APPROACH
P=PHF BY APPROACH

v3dk

Peak Hour
12:00-13:00
TEV=776

Traffic Smithy
(503)641-6333

TIME PERIOD FROM - TO	EAST BOUND ↓	EAST BOUND →	EAST BOUND ↑	SOUTH BOUND ↵	SOUTH BOUND ↓	SOUTH BOUND ↳	NORTH BOUND ↰	NORTH BOUND ↑	NORTH BOUND ↱	WEST BOUND ↓	WEST BOUND ←	WEST BOUND ↑	ALL
ALL VEHICLES													
12:00-12:15	0	56	12	6	2	24	0	0	2	1	86	19	208
12:15-12:30	0	55	7	10	1	16	0	0	3	2	68	33	195
12:30-12:45	0	41	10	6	1	23	0	0	1	1	72	23	178
12:45-13:00	0	49	8	7	0	25	0	0	0	0	84	22	195
LIGHT TRUCKS (SINGLE UNIT 2 AXLES)													
12:00-12:15	0	2	0	0	0	1	0	0	0	0	2	0	5
12:15-12:30	0	2	0	0	0	0	0	0	0	0	2	0	4
12:30-12:45	0	1	0	0	0	0	0	0	0	0	1	1	3
12:45-13:00	0	0	0	0	0	1	0	0	0	0	0	1	2
MEDIUM TRUCKS (SINGLE UNIT > 2 AXLES)													
12:00-12:15	0	0	0	0	0	0	0	0	0	0	1	0	1
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	1	1
12:30-12:45	0	0	0	0	0	1	0	0	0	0	1	0	2
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0
HEAVY TRUCKS (SEMI-TRACTOR TRAILER)													
12:00-12:15	0	1	0	0	0	0	0	0	0	0	0	0	1
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	1	0	0	0	0	0	0	1
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0
BICYCLES													
12:00-12:15	0	0	0	0	0	0	0	0	0	0	1	0	1
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0	0	0

PEDESTRIANS	CROSSWALK USEAGE SOUTH	WEST	EAST	NORTH	ALL
12:00-12:15	0	0	0	0	0
12:15-12:30	0	0	0	0	0
12:30-12:45	0	0	0	0	0
12:45-13:00	0	0	0	0	0

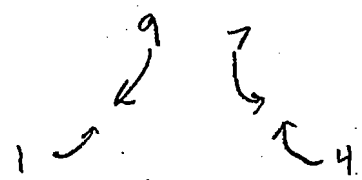
Peak Hour by Movement													
PHF	0	.9	.77	.73	.5	.88	0	0	.5	.5	.9	.73	.932
% Trucks(all)	0	3	0	0	0	4.5	0	0	0	0	2.3	3.1	2.6
% Trucks(M+H)	0	.5	0	0	0	2.3	0	0	0	0	.6	1	.8
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	
Hourly Totals													
11:00-12:00	2	180	17	17	0	68	0	1	2	0	244	94	625
11:15-12:15	1	192	23	18	2	79	0	0	4	1	276	92	688
11:30-12:30	0	207	27	20	3	77	0	0	7	3	290	103	737
11:45-12:45	0	203	34	23	4	80	0	0	6	4	283	98	735
12:00-13:00	0	201	37	29	4	88	0	0	6	4	310	97	776
12:15-13:15	0	187	30	32	2	87	0	0	4	3	290	104	739
12:30-13:30	0	169	26	27	3	95	0	0	2	1	285	92	700
12:45-13:45	1	180	19	28	2	91	0	0	1	0	295	88	705
13:00-14:00	1	174	13	25	2	81	0	0	1	0	289	79	665

METRO SOLID WASTE CENTER - EAST DRIVEWAY
SEPTEMBER 12, 2001

17

TIME:	EASTBOUND		WESTBOUND	
	IN	OUT	IN	OUT
1100-1115	2	5	1	1
1115-1130	2	3	1	0
1130-1145	0	3	0	0
1145-1200	2	2	1	1
1200-1215	1	1	0	3
1215-1230	0	3	0	3
1230-1245	1	2	0	1
1245-1300	2	1	1	2
1300-1315	2	0	2	2
1315-1330	0	0	3	1
1330-1345	3	0	1	1
1345-1400	1	0	1	0
1100-1400	16	20	11	15

TOTAL IN: 27
TOTAL OUT: 35



Prepared by: GJ —Traffic Smithy 2001

Attachment "B"

Level of Service Worksheets

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2001 Existing Conditions

Level Of Service Computation Report
1997 HCM Unsignalized Method (Base Volume Alternative)

****

Intersection #1 Metro West Access/Washington Street [Existing PM Peak Hour]

****

Average Delay (sec/veh): 18.5 Worst Case Level Of Service: C

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 0	0 0		0 0 1!	0 0		1 0	1 0 0		0 0	1 0 1	
Volume Module:												
Base Vol:	0	0	0	45	0	10	10	345	0	0	425	35
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	45	0	10	10	345	0	0	425	35
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	0	0	0	51	0	11	11	388	0	0	478	39
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	0	0	51	0	11	11	388	0	0	478	39
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	6.5	xxxx	6.3	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	3.6	xxxx	3.4	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	888	xxxx	478	517	xxxx	xxxxx	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	302	xxxx	568	1039	xxxx	xxxxx	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	299	xxxx	568	1039	xxxx	xxxxx	xxxx	xxxx	xxxxx
Level Of Service Module:												
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	328	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	18.5	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	*	C	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			18.5			xxxxxx			xxxxxx		
ApproachLOS:	*			C			*			*		

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2001 Existing Conditions

Level Of Service Computation Report
1997 HCM Unsignalized Method (Base Volume Alternative)

****

Intersection #2 Metro East Driveway/Washington Street [Existing PM Peak Hour]

****

Average Delay (sec/veh): 17.6 Worst Case Level Of Service: C

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 0	0 0	0	0 0	1! 0	0	1 0	1 0	0	0 0	0 1	0
Volume Module:												
Base Vol:	0	0	0	15	0	5	2	390	0	0	455	1
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	15	0	5	2	390	0	0	455	1
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
PHF Volume:	0	0	0	17	0	6	2	443	0	0	517	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	0	0	17	0	6	2	443	0	0	517	1
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	6.5	xxxx	6.3	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	3.6	xxxx	3.4	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	965	xxxx	518	518	xxxx	xxxxx	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	271	xxxx	539	1033	xxxx	xxxxx	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	271	xxxx	539	1033	xxxx	xxxxx	xxxx	xxxx	xxxxx
Level Of Service Module:												
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	309	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	17.6	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	*	C	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			17.6			xxxxxx			xxxxxx		
ApproachLOS:	*			C			*			*		

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2001 Existing Conditions

Level Of Service Computation Report
1997 HCM Unsignalized Method (Base Volume Alternative)

****

Intersection #3 Metro West Access/Washington Street [Existing Sat. Peak Hour]

****

Average Delay (sec/veh): 18.9 Worst Case Level Of Service: C

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 0	0 0		0 0 1	0 0		1 0 1	0 0		0 0 1	0 1	
Volume Module:												
Base Vol:	0	0	0	90	0	30	35	200	0	0	310	95
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	90	0	30	35	200	0	0	310	95
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	0	0	0	98	0	33	38	217	0	0	337	103
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	0	0	98	0	33	38	217	0	0	337	103
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	6.4	xxxx	6.2	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	3.5	xxxx	3.3	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	332	xxxx	337	440	xxxx	xxxxx	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	347	xxxx	701	1120	xxxx	xxxxx	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	338	xxxx	701	1120	xxxx	xxxxx	xxxx	xxxx	xxxxx
Level Of Service Module:												
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.3	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	389	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	18.9	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	*	C	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			18.9			xxxxxx			xxxxxx		
ApproachLOS:	*			C			*			*		

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2001 Existing Conditions

Level Of Service Computation Report
1997 HCM Unsignalized Method (Base Volume Alternative)

****

Intersection #4 Metro East Driveway/Washington Street [Existing Sat. Peak Hour]

****

Average Delay (sec/veh): 14.1 Worst Case Level Of Service: B

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 0 0 0			0 0 1! 0 0			1 0 1 0 0			0 0 0 1 0		
Volume Module:												
Base Vol:	0	0	0	5	0	10	2	290	0	0	395	5
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	5	0	10	2	290	0	0	395	5
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	0	0	0	5	0	11	2	315	0	0	429	5
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	0	0	5	0	11	2	315	0	0	429	5
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	6.5	xxxx	6.3	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	3.6	xxxx	3.4	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	572	xxxx	432	435	xxxx	xxxxx	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	252	xxxx	603	1109	xxxx	xxxxx	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	251	xxxx	603	1109	xxxx	xxxxx	xxxx	xxxx	xxxxx
Level Of Service Module:												
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.3	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	411	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	14.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	*	B	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			14.1			xxxxxx			xxxxxx		
ApproachLOS:	*			B			*			*		

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2002 Future Condition

Level Of Service Computation Report
1997 HCM Operations Method (Base Volume Alternative)

Intersection #1 Metro West Access/Washington Street [PM Peak Hour]

Cycle (sec):	90	Critical Vol./Cap. (X):	0.477
Loss Time (sec):	9 (Y+R = 4 sec)	Average Delay (sec/veh):	17.1
Optimal Cycle:	33	Level Of Service:	B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	0 1	0	0 0	1! 0	0	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	30	0	115	45	0	10	10	365	30	190	450	35
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	30	0	115	45	0	10	10	365	30	190	450	35
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	34	0	129	51	0	11	11	410	34	213	506	39
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	34	0	129	51	0	11	11	410	34	213	506	39
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	34	0	129	51	0	11	11	410	34	213	506	39
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.78	1.00	0.85	0.54	1.00	0.54	0.91	0.96	0.82	0.90	0.94	0.80
Lanes:	1.00	0.00	1.00	0.82	0.00	0.18	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1486	0	1615	847	0	183	1736	1828	1554	1702	1792	1523
Capacity Analysis Module:												
Vol/Sat:	0.02	0.00	0.08	0.06	0.00	0.06	0.01	0.22	0.02	0.13	0.28	0.03
Crit Moves:			****					****		****		
Green/Cycle:	0.17	0.00	0.17	0.17	0.00	0.17	0.02	0.47	0.47	0.26	0.72	0.72
Volume/Cap:	0.14	0.00	0.48	0.36	0.00	0.36	0.39	0.48	0.05	0.48	0.39	0.04
Delay/Veh:	32.2	0.0	35.2	34.5	0.0	34.5	52.8	16.7	12.9	28.8	5.2	3.7
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	32.2	0.0	35.2	34.5	0.0	34.5	52.8	16.7	12.9	28.8	5.2	3.7
DesignQueue:	1	0	5	2	0	0	1	12	1	8	8	1

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2002 Future Condition

Level Of Service Computation Report
1997 HCM Unsignalized Method (Base Volume Alternative)

****

Intersection #2 Metro East Driveway/Washington Street [PM Peak Hour]

****

Average Delay (sec/veh): 27.6 Worst Case Level Of Service: D

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 0	0 0	0	0 0	1! 0	0	1 0	1 0	0	0 0	0 1	0
Volume Module:												
Base Vol:	0	0	0	15	0	5	2	525	0	0	670	1
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	15	0	5	2	525	0	0	670	1
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
PHF Volume:	0	0	0	17	0	6	2	597	0	0	761	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	0	0	17	0	6	2	597	0	0	761	1
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	6.5	xxxx	6.3	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	3.6	xxxx	3.4	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	1363	xxxx	762	763	xxxx	xxxxx	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	155	xxxx	389	837	xxxx	xxxxx	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	155	xxxx	389	837	xxxx	xxxxx	xxxx	xxxx	xxxxx
Level Of Service Module:												
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	9.3	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	182	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	27.6	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	*	D	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			27.6			xxxxxx			xxxxxx		
ApproachLOS:	*			D			*			*		

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2002 Future Condition

Level Of Service Computation Report
1997 HCM Operations Method (Base Volume Alternative)

Intersection #3 Metro West Access/Washington Street [Sat. Peak Hour]

Cycle (sec):	90	Critical Vol./Cap. (X):	0.580
Loss Time (sec):	9 (Y+R = 4 sec)	Average Delay (sec/veh):	23.3
Optimal Cycle:	39	Level Of Service:	C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	0 1	0	0 0	1! 0	0	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	60	0	225	90	0	30	35	210	60	365	325	95
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	60	0	225	90	0	30	35	210	60	365	325	95
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	65	0	245	98	0	33	38	228	65	397	353	103
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	65	0	245	98	0	33	38	228	65	397	353	103
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	65	0	245	98	0	33	38	228	65	397	353	103
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.71	1.00	0.81	0.42	1.00	0.42	0.91	0.96	0.82	0.90	0.94	0.80
Lanes:	1.00	0.00	1.00	0.75	0.00	0.25	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	1340	0	1537	599	0	202	1736	1828	1554	1702	1792	1523
Capacity Analysis Module:												
Vol/Sat:	0.05	0.00	0.16	0.16	0.00	0.16	0.02	0.12	0.04	0.23	0.20	0.07
Crit Moves:				****				****		****		
Green/Cycle:	0.28	0.00	0.28	0.28	0.00	0.28	0.06	0.22	0.22	0.40	0.56	0.56
Volume/Cap:	0.17	0.00	0.56	0.58	0.00	0.58	0.35	0.58	0.19	0.58	0.35	0.12
Delay/Veh:	24.6	0.0	29.3	31.5	0.0	31.5	42.5	33.8	29.2	22.2	11.3	9.6
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	24.6	0.0	29.3	31.5	0.0	31.5	42.5	33.8	29.2	22.2	11.3	9.6
DesignQueue:	2	0	9	4	0	1	2	9	3	13	8	2

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2002 Future Condition

Level Of Service Computation Report
1997 HCM Unsignalized Method (Base Volume Alternative)

Intersection #4 Metro East Driveway/Washington Street [Sat. Peak Hour]

Average Delay (sec/veh): 21.4 Worst Case Level Of Service: C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 0	0 0		0 0	1! 0	0	1 0	1 0	0	0 0	0 1	0
Volume Module:												
Base Vol:	0	0	0	5	0	10	2	525	0	0	775	5
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	0	0	5	0	10	2	525	0	0	775	5
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
PHF Volume:	0	0	0	5	0	11	2	571	0	0	842	5
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	0	0	5	0	11	2	571	0	0	842	5
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	6.5	xxxx	6.3	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	3.6	xxxx	3.4	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	1420	xxxx	845	848	xxxx	xxxxx	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	143	xxxx	348	777	xxxx	xxxxx	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	143	xxxx	348	777	xxxx	xxxxx	xxxx	xxxx	xxxxx
Level Of Service Module:												
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	9.6	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	235	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	21.4	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	*	C	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			21.4			xxxxxx			xxxxxx		
ApproachLOS:	*			C			*			*		

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2002 Future Condition

Level Of Service Computation Report
1997 HCM Operations Method (Base Volume Alternative)

****

Intersection #9 Highway 213/Washington [PM Peak Hour]

****

Cycle (sec):	120	Critical Vol./Cap. (X):	0.977
Loss Time (sec):	16 (Y+R = 4 sec)	Average Delay (sec/veh):	45.0
Optimal Cycle:	180	Level Of Service:	D

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	2 0	1	1 0	3 0	1	2 0	0 1	0	1 0	1 0	1
Volume Module:												
Base Vol:	90	1475	75	265	2710	500	345	80	120	75	80	255
Growth Adj:	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Initial Bse:	94	1549	79	278	2846	525	362	84	126	79	84	268
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	99	1630	83	293	2995	553	381	88	133	83	88	282
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	99	1630	83	293	2995	553	381	88	133	83	88	282
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	99	1630	83	293	2995	553	381	88	133	83	88	282
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.90	0.90	0.81	0.90	0.87	0.81	0.88	0.87	0.87	0.90	0.95	0.81
Lanes:	1.00	2.00	1.00	1.00	3.00	1.00	2.00	0.40	0.60	1.00	1.00	1.00
Final Sat.:	1718	3437	1537	1718	4938	1537	3334	655	991	1718	1809	1537
Capacity Analysis Module:												
Vol/Sat:	0.06	0.47	0.05	0.17	0.61	0.36	0.11	0.13	0.13	0.05	0.05	0.18
Crit Moves:	****				****				****		****	
Green/Cycle:	0.06	0.50	0.50	0.18	0.62	0.62	0.14	0.14	0.14	0.05	0.05	0.23
Volume/Cap:	0.98	0.95	0.11	0.95	0.98	0.58	0.83	0.98	0.98	0.97	0.98	0.80
Delay/Veh:	138.2	40.4	15.9	86.4	33.4	14.4	62.7	105	104.8	144.0	144	55.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	138.2	40.4	15.9	86.4	33.4	14.4	62.7	105	104.8	144.0	144	55.8
DesignQueue:	6	61	3	17	88	15	23	5	8	5	6	15

****

Kittelson and Associates, Inc.
Project#: 4704 - Metro South Transfer Station
2002 Future Condition

Level Of Service Computation Report
1997 HCM Operations Method (Base Volume Alternative)

Intersection #10 Highway 213/Washington [Sat. Peak Hour]

Cycle (sec):	120	Critical Vol./Cap. (X):	0.862
Loss Time (sec):	16 (Y+R = 4 sec)	Average Delay (sec/veh):	39.3
Optimal Cycle:	112	Level Of Service:	D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0	2 0	1	1 0	3 0	1	2 0	0 1	0	1 0	1 0	1
Volume Module:												
Base Vol:	170	1250	60	180	1540	475	430	60	205	55	75	150
Growth Adj:	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Initial Bse:	179	1313	63	189	1617	499	452	63	215	58	79	158
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
PHF Volume:	188	1382	66	199	1702	525	475	66	227	61	83	166
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	188	1382	66	199	1702	525	475	66	227	61	83	166
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	188	1382	66	199	1702	525	475	66	227	61	83	166
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.90	0.90	0.81	0.90	0.87	0.81	0.88	0.84	0.84	0.90	0.95	0.81
Lanes:	1.00	2.00	1.00	1.00	3.00	1.00	2.00	0.23	0.77	1.00	1.00	1.00
Final Sat.:	1718	3437	1537	1718	4938	1537	3334	360	1239	1718	1809	1537
Capacity Analysis Module:												
Vol/Sat:	0.11	0.40	0.04	0.12	0.34	0.34	0.14	0.18	0.18	0.04	0.05	0.11
Crit Moves:		****		****				****			****	
Green/Cycle:	0.14	0.47	0.47	0.13	0.46	0.46	0.21	0.21	0.21	0.05	0.05	0.19
Volume/Cap:	0.76	0.86	0.09	0.86	0.76	0.75	0.67	0.86	0.86	0.67	0.86	0.58
Delay/Veh:	61.7	33.6	17.9	77.4	28.6	31.4	45.9	65.1	65.1	73.0	107	47.2
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	61.7	33.6	17.9	77.4	28.6	31.4	45.9	65.1	65.1	73.0	107	47.2
DesignQueue:	11	54	2	12	67	21	26	4	12	4	5	9

Attachment "C"

Transfer Station Traffic Forecasts

FACILITY NEEDS ASSESSMENT

A. Waste/Traffic Volumes

1. Projections

Table 2.1 presents the waste and traffic volumes collected by Metro from the scalehouse operations from 1993 through 1997. The table also presents projected waste and traffic volumes for 1998 up to the year 2010.

Table 2-1
Metro South Station

	Tons of Waste				Vehicles				
Year	Com'l	Public	Total	Peak Day	Com'l	Public	Total	Peak Day	Peak Hour
1993	332,984	38,865	371,849	1,670	73,959	101,937	175,896	696	98
1994	346,985	40,385	387,370	1,784	78,082	107,965	186,047	711	121
1995	337,806	39,423	377,229	1,760	75,906	109,120	185,026	788	105
1996	341,015	44,507	385,522	2,061	76,278	119,177	196,651	797	109
1997	329,306	47,603	376,902	1,755	71,488	125,169	196,651	805	115
1998	293,439	47,610	341,049	1,572	65,646	128,677	194,323	786	112
1999	295,394	49,368	344,762	1,589	66,084	133,427	199,511	807	115
2000	310,985	51,125	362,110	1,669	69,571	138,177	207,748	841	120
2001	317, 158	52,883	370,041	1,705	70,953	142,927	213,880	865	124
2002	323,854	54,640	378,495	1,744	72,451	147,677	220,128	891	127
2003	331,050	56,398	387,447	1,786	74,060	152,427	226,487	917	131
2004	338,451	58,155	396,607	1,828	75,716	157,177	232,893	942	135
2005	346,069	59,913	405,982	1,871	77,420	161,927	239,347	969	138
2006	353,898	61,670	415,569	1,915	79,172	166,677	245,849	995	142
2007	361,951	63,428	425,379	1,960	80,973	171,427	252,400	1,021	146
2008	370,229	65,185	435,415	2,007	82,825	176,177	259,002	1,048	150
2009	378,742	66,943	445,685	2,054	84,730	180,927	256,657	1,075	154
2010	387,488	68,700	456,188	2,102	86,686	185,677	272,363	1,102	157

Note: The 1993 through 1997 numbers are actual data.

Attachment "D"

Queuing Analysis Worksheets

SIGNALIZED QUEUE ANALYSIS

Project Name: Metro South Transit Station
Project Number: 4704
Analyst: BBR
Date: 9/20/01
Filename: H:\proj\le\4704\Excel\Cascade Queue.XLS]SIGQUEUE

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

Intersection: Cascade Hwy/Washington Street
Conditions (yr, alt., etc.): 2002 Conditions

GENERAL INPUT PARAMETERS:

Cycle Length:	120	sec
Confidence Level (C.L.):	95%	
Storage length/vehicle:	25	feet

	APPROACH/MOVEMENT							
	#1	#2	#3	#4	#5	#6	#7	#8
	PM Peak Hour Conditions				Sat. Peak Hour			
	EB LT	EB T/R	NB	SB	EB LT	EB T/R		
INPUT PARAMETERS:								
Volume (pre-PHF) (vph):	260	210			450	280		
G/C for movement:	0.42	0.42			0.42	0.42		
Number of lanes:	2	1			2	1		
CALCULATIONS:								
Length of red interval (sec):	103.2	103.2			94.8	94.8		
Average total queue (veh):	10.3	6.0			11.9	7.4		
Maximum total queue (veh):	16	10			18	12		
Total queue length (feet):	400	250			450	300		
Required storage/lane (feet):	200	250			225	300		
PERMITTED LEFT TURNS:								
Opposing volume (pre-PHF):								
Opposing sat. flow rate:								
CALCULATIONS:								
Opposing flow ratio (Yo):								
Unblocked G/C:								
Effective red interval (sec):								
Average total queue (veh):								
Maximum total queue (veh):								
Total queue length (feet):								
Required storage/lane (feet):								

METHODOLOGY AND FORMULAS USED:

Length of red interval = (1 - G/C) * Cycle length

Average queue/lane = Volume * Red interval / 3600

Maximum queue: Random arrival/Constant service
Random arrivals behave according to a Poisson distribution.
There is a probability equal to the confidence level desired (e.g. 95%)
that the queue formed during each red interval will be less than
or equal to the maximum queue.

(Prob. of arrivals = N) = (Red interval)^N * exp(-N) / N! (the Poisson distribution)
(Prob. of arrivals >= N) = 1 - Sum of probabilities for vehicles 0, 1, ..., N-1
Max N: Highest N such that the sum of probabilities > (1 - confidence level)

Queue length = Maximum queue * Storage length per vehicle

Required storage per lane = Queue length / Number of lanes, rounded
up to the next highest whole vehicle

Opposing flow ratio Yo = opposing volume vo / opposing sat. flow rate sop

Unblocked G/C (gu/C) = (g/C - Yo)/(1-Yo)

SIGNALIZED QUEUE ANALYSIS

Project Name: Metro South Park & Ride Study
Project Number: 4704
Analyst: ELK
Date: 9/20/01
Filename: H:\proj\le\4704\Excel\[Metro Queue1.XLS]SIGQUEUE

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

Intersection: Metro West Driveway/Washington Street
Conditions (yr, alt., etc.): 2002 Conditions - Weekday PM Peak Hour

GENERAL INPUT PARAMETERS:

Cycle Length:	90 sec
Confidence Level (C.L.):	95%
Storage length/vehicle:	25 feet

	APPROACH/MOVEMENT							
	#1	#2	#3	#4	#5	#6	#7	#8
	SB	WBT	WBTR	WBR	EBT			
INPUT PARAMETERS:								
Volume (pre-PHF) (vph):	65	130	150	35	10			
G/C for movement:	0.17	0.26	0.22	0.22	0.07			
Number of lanes:	1	1	1	1	1			
CALCULATIONS:								
Length of red interval (sec):	74.7	66.6	25.2	25.2	88.2			
Average total queue (veh):	1.1	3.5	3.2	0.2	0.2			
Maximum total queue (veh):	3	7	6	1	1			
Total queue length (feet):	75	175	150	25	25			
Required storage/lane (feet):	75	175	150	25	25			
PERMITTED LEFT TURNS:								
Opposing volume (pre-PHF):	570							
Opposing sat. flow rate:	1610							
CALCULATIONS:								
Opposing flow ratio (Yo):	0.07							
Unblocked G/C:	0.11							
Effective red interval (sec):	80.4							
Average total queue (veh):	1.2							
Maximum total queue (veh):	3							
Total queue length (feet):	75							
Required storage/lane (feet):	75							

METHODOLOGY AND FORMULAS USED:

Length of red interval = (1 - G/C) * Cycle length

Average queue/lane = Volume * Red interval / 3600

Maximum queue: Random arrival/Constant service
Random arrivals behave according to a Poisson distribution.
There is a probability equal to the confidence level desired (e.g. 95%)
that the queue formed during each red interval will be less than
or equal to the maximum queue.

(Prob. of arrivals = N) = (Red interval)^N * exp(-N) / N! (the Poisson distribution)
(Prob. of arrivals >= N) = 1 - Sum of probabilities for vehicles 0, 1, ..., N-1
Max N: Highest N such that the sum of probabilities > (1 - confidence level)

Queue length = Maximum queue * Storage length per vehicle

Required storage per lane = Queue length / Number of lanes, rounded
up to the next highest whole vehicle

Opposing flow ratio Yo = opposing volume vo / opposing sat. flow rate sop

Unblocked G/C (gu/C) = (g/C - Yo)/(1-Yo)

SIGNALIZED QUEUE ANALYSIS

Project Name: Metro South Transfer Station
Project Number: 4704
Analyst: SLK
Date: 9/20/01
Filename: H:\proj\le\4704\Excel\[Metro Queue2.XLS]SIGQUEUE

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

Intersection: Metro Way Driveway/Wash. State Street
Conditions (yr, alt., etc.): 2002 Conditions - Saturday Peak Hour

GENERAL INPUT PARAMETERS:

Cycle Length:	90	sec
Confidence Level (C.L.):	95%	
Storage length/vehicle:	25	feet

	APPROACH/MOVEMENT							
	#1	#2	#3	#4	#5	#6	#7	#8
	SB	WBLT	WBTR	WBRT	EBLTR			
INPUT PARAMETERS:								
Volume (pre-PHF) (vph):	20	65	325	95	35			
G/C for movement:	0.28	0.40	0.56	0.56	0.06			
Number of lanes:	1	1	1	1	1			
CALCULATIONS:								
Length of red interval (sec):	64.8	54.0	39.6	39.6	84.6			
Average total queue (veh):	2.2	5.5	3.6	1.0	0.8			
Maximum total queue (veh):	5	10	7	3	3			
Total queue length (feet):	125	250	175	75	75			
Required storage/lane (feet):	125	250	175	75	75			
PERMITTED LEFT TURNS:								
Opposing volume (pre-PHF):	225							
Opposing sat. flow rate:	1616							
CALCULATIONS:								
Opposing flow ratio (Yo):	0.14							
Unblocked G/C:	0.16							
Effective red interval (sec):	75.9							
Average total queue (veh):	2.5							
Maximum total queue (veh):	5							
Total queue length (feet):	125							
Required storage/lane (feet):	125							

METHODOLOGY AND FORMULAS USED:

Length of red interval = (1 - G/C) * Cycle length

Average queue/lane = Volume * Red interval / 3600

Maximum queue: Random arrival/Constant service
Random arrivals behave according to a Poisson distribution.
There is a probability equal to the confidence level desired (e.g. 95%)
that the queue formed during each red interval will be less than
or equal to the maximum queue.

(Prob. of arrivals = N) = (Red interval)^N * exp(-N) / N! (the Poisson distribution)
(Prob. of arrivals >= N) = 1 - Sum of probabilities for vehicles 0, 1, ..., N-1
Max N: Highest N such that the sum of probabilities > (1 - confidence level)

Queue length = Maximum queue * Storage length per vehicle

Required storage per lane = Queue length / Number of lanes, rounded
up to the next highest whole vehicle

Opposing flow ratio Yo = opposing volume vo / opposing sat. flow rate sop

Unblocked G/C (gu/C) = (g/C - Yo)(1-Yo)

Project Name:	Metro South Transfer Station
Project #:	4704
Analysis Scenario:	2002 Future Traffic Conditions
Analysis Period:	0.25 (peak 15 minute analysis)
Analyst:	BLN
Date:	September 20, 2001

V = flow rate for movement
C = capacity of movement
Q = 95th percentile queue (veh)
S = storage need (ft)

# of Int:	2
Veh. Length (ft):	25

* Queue length calculated using Equation (17-37) presented in *Highway Capacity Manual 2000*.

Metro East Driveway
Weekday PM Peak Hour

	SB	EBLT										
V	23	2										
C	1821	837										
Q	0.4	0.0										
S	25	25										

Attachment "E"

Crash Data

STATE OF OREGON

MEMORANDUM

Department of Transportation
Transportation Development Branch
Mill Creek Office Park
555 13th Street NE, Suite 2
Salem, Oregon 97301-4178
(503) 986-4238 FAX (503) 986-4249

File Code:

Date: August 31, 2001

TO: Kittelson & Associates, Inc.
Attention: Casey Bergh/Brandon Nevers

FROM: Andrea Mascoe
Crash Analysis and Reporting Unit

SUBJECT: WASHINGTON ST – HWY 213 TO .75 MILE WEST

Enclosed is the PRC for Washington Street from Hwy 213 to Abernathy Road. This data includes crashes in the intersection of Hwy 213 at Washington Street/Clackamas River Drive. The search period was from January 1, 1996 through December 31, 2000.

Please call me at 503-986-4238 if you have any questions or need additional information.

Sincerely,

Andrea Mascoe

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING
CRASH SUMMARIES BY YEAR - REPORT EPSUMS1A

CLACKAMAS COUNTY OREGON CITY HIGHWAY 160, CASCADE HWY. SOUTH
WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

YEAR	COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROP. DAMAGE ONLY	CRASHES TOTAL	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	OFF-ROAD
1996	REAR-END		1	5	6		2		4	2	5	1	6	
1996	TURNING MOVEMENTS		3	1	4		4	1	3	1	3	1	4	
1996	YEAR TOTALS		4	6	10		6	1	7	3	8	2	10	
1997	REAR-END		2	3	5		5	1	3	2	4	1	5	
1997	SIDESWIPE-OVERTAKING			1	1					1		1	1	
1997	YEAR TOTALS		2	4	6		5	1	3	3	4	2	6	
1998	REAR-END			3	3				1	2	3		3	
1998	SIDESWIPE-OVERTAKING			1	1				1		1			
1998	TURNING MOVEMENTS			1	1					1		1	1	
1998	BACKING			1	1				1		1		1	
1998	YEAR TOTALS			6	6				3	3	5	1	5	
1999	ANGLE			1	1				1		1		1	
1999	REAR-END		1	3	4		2		4		4		3	
1999	TURNING MOVEMENTS		1	1	2		2	1	2		1	1	2	
1999	YEAR TOTALS		2	5	7		4	1	7		6	1	6	
2000	REAR-END		4	5	9		4		6	3	5	4	8	1
2000	TURNING MOVEMENTS		4		4		4	1	3	1	4		2	
2000	FIXED/OTHER OBJECT			1	1						1			1
2000	BACKING		1	1	2		2	1	1	1	2		2	
2000	YEAR TOTALS		9	7	16		10	2	10	5	12	4	12	2
FINAL TOTALS			17	28	45		25	5	30	14	35	10	39	2

08/31/2001 C O N T I N U O U S S Y S T E M A C C I D E N T L I S T I N G PAGE 1

WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

160, CASCADE HWY. SOUTH HWY

SERIAL NO./ INVEST	DATE/ DAY- TIME	COUNTY/ CITY	SYSTEM/ PFX-MILEP	FIRST/ INTRSCT	CONN -RAMP	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PARTI- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
00150	01/06/00	CLACKAMAS	PR-ART	0410		INTER	CROSS	RAIN	E REAR	01 MVOP	PRI	OR1-Y	STRGHT	REAR-END	
NONE	THU 07A	OREGON CITY	0 .14	0420		N 6	1	WET DAWN	INJ	INJC	PASS	45 F	SE NW	NONE	OTH-IMP
										02 MVOP	PRI	OR1-Y	STOP	NONE	EVENT13
										PDO	PASS	52 F	SE NW	STOPPED	
										03 MVOP	PRI	OR1-Y	STOP	NONE	
										PDO	PASS	25 F	SE NW	STOPPED	
04489	07/31/99	CLACKAMAS	PR-ART	0410		INTER	CROSS	CLR	D REAR	01 MVOP	PRI	OR1-Y	STRGHT	NO SLOW	
NONE	SAT 09A	OREGON CITY	0 .14	0420		NE 2	1	DRY DAY	PDO	PDO	PASS	35 M	NE SW	NONE	FOL-CLOS
										02 MVOP	PRI	OR1-Y	TURN-R	NONE	
										PDO	PASS	37 M	NE NW	NONE	
04778	08/07/00	CLACKAMAS	PR-ART	0420		INTER	CROSS	CLR	I BACK	01 MVOP	PRI	OR1-Y	BACK	IMP BACK	
CITY	MON 12N	OREGON CITY	0 .14	2605		NE 6	1	DRY DAY	PDO	PDO	TRUCK	29 F	SW NE	NONE	OTH-IMP
										02 MVOP	PRI	OR1-Y	STOP	NONE	
										PDO	PASS	42 F	NE SW	STOPPED	
00196	01/05/96	CLACKAMAS		0410		INTER	CROSS	RAIN	E REAR	01 MVOP	PRI	OR1-Y	STRGHT	REAR-END	
NONE	FRI 06A	OREGON CITY	0 .14	0420		SE 6	1	WET DUNL	PDO	PDO	PASS	40 M	SE NW	NONE	OTH-IMP
										02 MVOP	PRI	UNK-U	STOP	NONE	
										PDO	PASS	00 F	SE NW	STOPPED	
03726	06/20/96	CLACKAMAS		0410		INTER	CROSS	CLR	E REAR	01 MVOP	PRI	OR1-Y	STRGHT	IMP LANE	
NOTREC	THU 01P	OREGON CITY	0 .14	0420		SE 6	1	DRY DAY	PDO	PDO	PASS	42 M	SE NW	AVOIDING	OTH-IMP
										02 MVOP	PRI	OR1-Y	STOP	NONE	
										PDO	PASS	60 M	SE NW	WAITFORL	
04562	08/05/96	CLACKAMAS		0410		INTER	CROSS	CLR	E REAR	01 MVOP	PRI	OR1-Y	STRGHT	REAR-END	
NOTREC	MON 07P	OREGON CITY	0 .14	0420		SE 6	1	DRY DAY	PDO	PDO	PASS	26 M	SE NW	NONE	FOL-CLOS
										02 MVOP	PRI	OR1-Y	STOP	NONE	
										PDO	PASS	54 M	SE NW	STOPPED	
05288	09/04/96	CLACKAMAS		0420		INTER	CROSS	CLR	E REAR	01 MVOP	PRI	OR1-Y	STRGHT	REAR-END	
NOTREC	WED 04P	OREGON CITY	0 .14	2605		SE 6	1	DRY DAY	PDO	PDO	PASS	17 F	SE NW	NONE	OTH-IMP
										02 MVOP	PRI	OR1-Y	STOP	NONE	
										PDO	PASS	37 F	SE NW	STOPPED	
00178	01/08/98	CLACKAMAS	PR-ART	0410		INTER	CROSS	CLR	E REAR	01 MVOP	PRI	OR1-Y	STRGHT	REAR-END	
NONE	THU 02P	OREGON CITY	0 .14	0420		SE 6	1	DRY DAY	PDO	PDO	PASS	49 F	SE NW	NONE	OTH-IMP
										02 MVOP	PRI	OR1-Y	STOP	NONE	
										PDO	PASS	22 F	SE NW	STOPPED	

213/Wash St.

WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

160, CASCADE HWY, SOUTH HWY

SERIAL NO./ INVEST	DATE/ DAY- TIME	COUNTY/ CITY	SYSTEM/ PFX-MILEP	FIRST/ INTRSCT	CONN -RAMP	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PARTI- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
07094 NONE	11/15/98 SUN 03P	CLACKAMAS OREGON CITY	PR-ART 0 .14	0420 2605		INTER SE 6	CROSS 1	CLR WET DAY	E REAR PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 47 F UNK-U 00 M	STRGHT SE NW STOP SE NW	IMP STRT NONE NONE STOPPED	FOL-CLOS
07730 NOTREC	12/11/99 SAT 12N	CLACKAMAS OREGON CITY	PR-ART 0 .14	0410 0420		INTER SE 6	CROSS 1	CLR DRY DAY	C REAR PDO	01 MVOP PDO 02 MVOP PDO 03 MVOP PDO 04 MVOP PDO	PRI PASS PRI PASS PRI PASS PRI PASS	OR1-Y 45 M OR1-Y 38 F OR1-Y 67 F OR1-Y 44 F	STRGHT SE NW STRGHT SE NW STOP SE NW STOP SE NW	NO SLOW NONE NONE SLOW DN NONE STOPPED NONE STOPPED	FOL-CLOS EVENT13 EVENT13
00850 STATE	02/08/00 TUE 12N	CLACKAMAS OREGON CITY	PR-ART 0 .14	0420 2605		INTER SE 6	CROSS 1	RAIN WET DAY	I BACK INJ	01 MVOP INJC 02 MVOP INJC	PRI FARM PRI PASS	OR1-Y 22 M OR1-Y 48 F	BACK NW SE STOP SE NW	IMP BACK NONE NONE STOPPED	OTH-IMP
01437 NONE	03/07/00 TUE 09P	CLACKAMAS OREGON CITY	PR-ART 0 .14	0420 2605		INTER SE 6	CROSS 1	RAIN WET DUNL	E REAR PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 28 M UNK-U 00 F	STRGHT SE NW STOP SE NW	REAR-END NONE NONE STOPPED	OTH-IMP
05588 CITY	09/12/00 TUE 05A	CLACKAMAS OREGON CITY	PR-ART 0 .14	0410 420		INTER SE 6	CROSS 1	CLR DRY DLIT	E REAR INJ	01 MVOP PDO 02 MVOP INJB 03 MVOP PDO	PRI PASS PRI PASS PRI PASS	OR1-Y 38 F OR1-Y 55 M OR1-Y 56 M	STRGHT SE NW STOP SE NW STOP SE NW	IMP STRT DISTRCTD NONE STOPPED NONE STOPPED	OTH-IMP EVENT13
05939 STATE	09/30/00 SAT 03P	CLACKAMAS OREGON CITY	PR-ART 0 .14	0420 2605		INTER SE 6	CROSS 1	RAIN DRY DAY	E REAR INJ	01 MVOP PDO 02 MVOP PDO 03 INJB	PRI PASS PRI PASS	OR1-Y 16 F OR1-Y 44 F 83 M PSNGR	STRGHT SE NW STOP SE NW	TO CLOSE NONE NONE STOPPED	FOL-CLOS
00587 NONE	02/02/98 MON 05P	CLACKAMAS OREGON CITY	PR-ART 0 .14	0420 2605		INTER S 6	CROSS 1	RAIN WET DAY	E REAR PDO	01 MVOP PDO	PRI PASS	OR1-N 21 F	STRGHT S N	REAR-END NONE	OTH-IMP

WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

160, CASCADE HWY. SOUTH HWY

SERIAL NO./ INVEST	DATE/ DAY- TIME	COUNTY/ CITY	SYSTEM/ PFX-MILEP	FIRST/ INTRSCT	CONN -RAMP	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PARTI- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
										02	MVOP PDO	PRI PASS	OR1-Y 29 M	STOP S N	NONE STOPPED	
03699 NONE	06/17/96 MON 04P	CLACKAMAS OREGON CITY 0		0420 .14 2605		INTER SW 6	CROSS 1	CLR WET	A TURN DAY INJ	01	MVOP PDO	PRI PASS	OR1-Y 43 M	TURN-R NW SW	WIDE TRN SKIDDED	TOO-FAST
										02	MVOP INJC	PRI PASS	OR1-Y 27 F	STOP SW NE	NONE WAITFORL	
08139 NOTREC	12/21/98 MON 04P	CLACKAMAS MN-ART OREGON CITY 0		0410 .14 0420		INTER SW 6	CROSS 1	CLR ICY	A TURN DAWN PDO	01	MVOP PDO	PRI PASS	OR1-Y 31 M	TURN-R NW SW	WIDE TRN LOSTCONT	OTHER EVENT13
										02	MVOP PDO	PRI PASS	OR1-Y 56 M	STOP NE SW	NONE STOPPED	
										03	MVOP PDO	PRI PASS	UNK-U 00 U	STOP NE SW	NONE STOPPED	
06277 CITY	10/14/00 SAT 10A	CLACKAMAS PR-ART OREGON CITY 0		0420 .14 2605		INTER SW 6	CROSS 1	CLDY DRY	E REAR DAY INJ	01	MVOP PDO	PRI PASS	OR1-Y 30 M	STRGHT SW NE	REAR-END NONE	FOL-CLOS
										02	UNO4		04 F	PSNGR		
										03	UNO4		02 M	PSNGR		
										04	MVOP INJC	PRI PASS	OR2-Y 16 F	STOP SW NE	NONE STOPPED	
03431 NOTREC	06/07/96 FRI 11P	CLACKAMAS OREGON CITY 0		0410 .14 0420		INTER NW 5	CROSS 1	CLR DRY	B TURN DUNL INJ	01	MVOP PDO	PRI PASS	OR1-Y 39 F	TURN-R NE NW	TRNTOWNG NONE	IMP-TURN
										02	MVOP PDO	PRI PASS	OR1-Y 19 F	STRGHT SE NW	NONE NONE	
										03	INJC		20 F	PSNGR		
01902 CITY	03/31/96 SUN 10A	CLACKAMAS OREGON CITY 0		0420 .14 2605		INTER NW 6	CROSS 1	RAIN WET	E REAR DAY INJ	01	MVOP PDO	PRI PASS	OR1-Y 30 M	STRGHT NW SE	REAR-END DISTRCTD	DTH-IMP
										02	MVOP INJB	PRI PASS	OR1-Y 70 F	STOP NW SE	NONE STOPPED	
										03	INJB		70 M	PSNGR		
										04	UNO4		02 M	PSNGR		
										05	UNO4		02 F	PSNGR		

WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

160, CASCADE HWY. SOUTH HWY

SERIAL NO./ INVEST	DATE/ DAY- TIME	COUNTY/ CITY	SYSTEM/ PFX-MILEP	FIRST/ INTRSCT	CONN -RAMP	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PARTI- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
04513 NONE	08/01/96 THU 04P	CLACKAMAS OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	CLR DRY	E REAR DAY PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 19 F OR1-Y 44 M	STRGHT NW SE STOP NW SE	REAR-END NONE NONE STOPPED	FOL-CLOS
00827 NONE	02/11/97 TUE 09A	CLACKAMAS PR-ART OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	CLR DRY	E REAR DAY PDO	01 MVOP PDO 02 UNO4 03 MVOP PDO	PRI PASS PRI PASS	OR1-Y 30 M 01 F PSNGR OR1-Y 39 M	STRGHT NW SE STOP NW SE	IMP STRT NONE NONE STOPPED	OTH-IMP
01294 NONE	03/07/97 FRI 08A	CLACKAMAS PR-ART OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	RAIN WET	E REAR DAY PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 55 F OR1-Y 23 M	STRGHT NW SE STOP NW SE	REAR-END NONE NONE STOPPED	OTH-IMP
01563 CITY	03/17/97 MON 02P	CLACKAMAS PR-ART OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	CLDY DRY	E REAR DAY INJ	01 MVOP PDO 02 MVOP INJC 03 MVOP INJC 04 INJC	PRI PASS PRI PASS PRI PASS	OR1-Y 40 M OR1-Y 31 F OR1-Y 39 F 38 M PSNGR	STRGHT NW SE STOP NW SE STOP NW SE	TO CLOSE NONE NONE STOPPED NONE STOPPED	FOL-CLOS EVENT13
05991 NONE	09/29/97 MON 02P	CLACKAMAS PR-ART OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	CLR DRY	E REAR DAY INJ	01 MVOP PDO 02 MVOP INJC 03 INJC	PRI PASST PRI PASS	OR1-Y 43 M OR1-Y 81 F 77 F PSNGR	STRGHT NW SE STOP NW SE	DIS SGNL NONE NONE STOPPED	DIS--RAG
07412 NONE	12/07/97 SUN 05P	CLACKAMAS PR-ART OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	RAIN WET	E SS-O DLIT PDO	01 MVOP PDO 02 MVOP PDO	PRI PASST PRI PASS	OR1-Y 36 M OR1-Y 18 M	STRGHT N S STOP N S	IMP LANE SKIDDED NONE STOPPED	IMP-OVER
06735 STATE	11/02/99 TUE 02P	CLACKAMAS PR-ART OREGON CITY	0 .14	0420 2605		INTER NW 6	CROSS 1	CLDY DRY	E REAR DAY PDO	01 MVOP PDO	PRI PASS	OR1-Y 19 M	STRGHT NW SE	REAR-END NONE	OTH-IMP

WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

160, CASCADE HWY. SOUTH HWY

SERIAL NO./ INVEST	DATE/ DAY- TIME	COUNTY/ CITY	SYSTEM/ PFX-MILEP	FIRST/ INTRSCT	CONN -RAMP	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PART)- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
										02 MVOP PDO	PRI PASS	OR1-Y 28 M	STOP NW SE	NONE STOPPED	
01003 NOTREC	02/18/00 FRI 07A	CLACKAMAS PR-ART OREGON CITY 0	.14	0420 2605		INTER NW 6	CROSS NONE	CLR DRY DAY	E REAR PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 39 F OR1-Y 47 M	STRGHT NW SE STOP NW SE	IMP STRT NONE NONE STOPPED	OTH-IMP
01936 NOTREC	04/02/00 SUN 01P	CLACKAMAS PR-ART OREGON CITY 0	.14	0420 2605		INTER NW 6	CROSS 1	CLR DRY DAY	A TURN INJ	01 MVOP INJC 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 37 M OR1-Y 55 M	TURN-L SW NW STOP NW SE	UNSFEVEH LOSTCONT NONE WAITFORL	MACH-DEF
02499 NONE	04/28/00 FRI 01P	CLACKAMAS PR-ART OREGON CITY 0	.14	0410 0420		INTER NW 6	CROSS 1	RAIN WET DAY	E REAR PDO	01 MVOP PDO 02 MVOP PDO	PRI PASST PRI PASS	OR1-Y 29 M OR1-Y 47 M	STRGHT NW SE STOP NW SE	REAR-END NONE NONE STOPPED	FOL-CLOS
02635 CITY	05/01/00 MON 01P	CLACKAMAS PR-ART OREGON CITY 0	.14	0420 2605		INTER NW 6	CROSS NONE	CLR DRY DAY	E REAR PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 46 M OR1-Y 57 F	STRGHT NW SE STOP NW SE	DIS EMER NONE NONE STOPPED	NO-YIELD
02535 CITY	04/26/96 FRI 04P	CLACKAMAS OREGON CITY 0	.14	0410 0420		INTER CN 1	CROSS 1	CLDY DRY DAY	F TURN INJ	01 MVOP PDO 02 MVOP INJC 03 INJC	PRI TRCKTT PRI PASS	OR1-Y 37 M OR1-Y 41 F 14 F	TURN-R NE NW TURN-R NE NW PSNGR	WIDE TRN NONE ERROR 19 PASSING	IMP-TURN OTH-IMP
03450 CITY	06/09/96 SUN 07P	CLACKAMAS OREGON CITY 0	.14	0410 0420		INTER CN 2	CROSS 1	CLR DRY DAY	H TURN PDO	01 MVOP PDO 02 MVOP PDO	PRI PASS PRI PASS	OR1-Y 50 M OR1-Y 64 F	STRGHT SE NW TURN-L NW NE	DIS SGNL NONE NONE NONE	DIS--RAG
06268 STATE	10/15/99 FRI 11P	CLACKAMAS PR-ART OREGON CITY 0	.14	0410 0420		INTER CN 2	CROSS 1	CLR DRY DLIT	H TURN INJ	01 MVOP INJC 02 INJC 03 MVOP PDO	PRI PASS PRI PASS	OR1-Y 60 M 55 F OR1-Y 16 M	STRGHT SE NW PSNGR TURN-L NW NE	NONE NONE DIS SGNL NONE	DIS--RAG

WASHINGTON ST FROM (HWY-213 - ABERNETHY RD) 01/01/96 TO 12/31/00

160, CASCADE HWY. SOUTH HWY

SERIAL NO./ INVEST	DATE/ DAY- TIME	COUNTY/ CITY	SYSTEM/ PFX-MILEP	FIRST/ INTRSCT	CONN -RAMP	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PARTI- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
01823	04/06/99	CLACKAMAS	PR-ART	0420		INTER	CROSS	CLR	J TURN	01 MVOP	PRI	OR1-Y	TURN-R	NO ROFWY	
NONE	TUE 11A	OREGON CITY	0 .14	2605		CN 3	1	DRY DAY	PDO	PDO	TRGKTT	22 M	NW SW	NONE	NO-YIELD
										02 MVOP	PRI	OR1-Y	TURN-L	NONE	
										PDO	PASS	35 M	SE SW	NONE	
03731	06/21/99	CLACKAMAS	PR-ART	0420		INTER	CROSS	CLDY	B ANGL	01 MVOP	PRI	OR1-Y	STRGHT	NONE	
CITY	MON 10A	OREGON CITY	0 .14	2605		CN 4	NONE	DRY DAY	PDO	PDO	PASS	68 M	SW NE	NONE	
										02 MVOP	PRI	OR2-Y	STRGHT	DIS SGNL	
										PDO	PASS	53 M	NW SE	NONE	DIS--RAG
07097	11/14/00	CLACKAMAS	PR-ART	0420		INTER	CROSS	CLR	B TURN	01 MVOP	PRI	OR1-Y	STRGHT	DIS SGNL	
NONE	TUE 03P	OREGON CITY	0 .14	2605		CN 4	1	DRY DAY	INJ	PDO	PASS	83 F	NW SE	NONE	DIS--RAG
										02 MVOP	PRI	OR1-Y	TURN-L	NONE	
										INJC	PASS	63 M	SW NW	NONE	

WASHINGTON ST FROM (HWY 213 - ABERNETHY RD) 01/01/96 TO 12/31/00

CLACKAMAS COUNTY CITY OF OREGON CITY

P.10

SERIAL NO./ INVEST	DATE/ DAY- TIME	CITY STREET FIRST/ SECOND	SYSTEM/ DISTANCE FROM INTERSECT (FEET)	ROAD- CHAR/ DIREC -LOC	INTER OR (MEDIAN) TYPE/TURN LEGS OR (LANES)	WEATH/ SURF- LIGHT	TYPE ACC- COLL/ CLASS	PARTI- CIPNT/ SEVRTY	VEH OWNER/ TYPE	RES- LIC/ AGE- SEX	MOVE/ FR-TO	ERROR/ ACTION	EVENT/ CAUSE
01581 NONE	03/18/97 TUE 06P	CASCADE HWY SOUTH WASHINGTON ST	MN-ART	INTER SW 6	CROSS 1	RAIN WET	D REAR DUSK PDO	01 MVOP PDO	PRI TRCKTT	OR2-Y 70 M	STRGHT SW NE	NO SLOW NONE	FOL-CLOS
								02 MVOP PDO	PRI PASS	OR1-Y 60 M	TURN-L SW NW	NONE SLOW DN	
06922 NONE	11/17/98 TUE 12N	CASCADE HWY SOUTH WASHINGTON ST	MN-ART	INTER SW 6	CROSS NONE	CLR DRY	I BACK DAY PDO	01 MVOP PDO	PUB SCHBUS	OR1-Y 55 M	BACK NE SW	IMP BACK NONE	OTH-IMP
								02 MVOP PDO	PRI PASS	OR1-Y 66 F	STOP SW NE	NONE STOPPED	
→ 03631 NONE	06/14/99 MON 08A	WASHINGTON ST CASCADE HWY SOUTH	MN-ART 600	ALLEY SW 7	0-LEG 2	CLR DRY	E REAR DAY INJ	01 MVOP PDO	PRI PASS	OR1-Y 21 M	STRGHT NE SW	REAR-END NONE	OTH-IMP EVENT13
								02 MVOP PDO	PRI PASS	OR1-Y 61 M	STOP NE SW	NONE STOPPED	
								03 MVOP INJC	PRI PASS	OR1-Y 38 M	STOP NE SW	NONE WAITFORL	
								04 INJC		00 M	PSNGR		
→ 01197 CITY	02/25/00 FRI 01P	WASHINGTON ST CASCADE HWY SOUTH	MN-ART 999	ALLEY SW 7	0-LEG 4	RAIN WET	B TURN DAY INJ	01 MVOP PDO	PRI PASS	OR1-Y 76 M	TURN-L NW NE	NO ROFWY EXIT DWY	NO-YIELD
								02 MVOP INJC	PRI PASS	OR1-Y 47 M	STRGHT NE SW	NONE NONE	
04097 NONE	07/22/98 WED 09A	WASHINGTON ST CASCADE HWY SOUTH	MN-ART 100	STRGHT SW 8	(UNDIV) (2)	CLR DRY	C SS-O DAY PDO	01 MVOP PDO	PUB PASS	OR1-Y 63 M	STRGHT SW NE	NONE NONE	
								02 MVOP PDO	PRI PASST	OR1-Y 37 M	STRGHT SW NE	IMP LANE NONE	NO-YIELD
04139 NOTREC	07/10/00 MON 03A	WASHINGTON ST CASCADE HWY SOUTH	MN-ART	STRGHT SW 0	(UNDIV) (2)	CLR DRY	2 REAR DLIT PDO	01 MVOP PDO	PRI PASS	OR1-Y 23 F	STRGHT NE SW	BASCRULE DR SLEEP	TOO-FAST
								02 NONE PDO	PRI PASS	UNK-U 00 U	PARK-P NE SW	NONE PAR PARK	
05279 NONE	08/29/00 TUE 05P	WASHINGTON ST CASCADE HWY SOUTH	MN-ART 100	STRGHT SW 7	(UNDIV) (2)	UNK UNK	8 FIX DAY PDO	01 MVOP PDO	PRI PASS	OR1-Y 35 M	STRGHT SW NE	STRDL LN AVOIDING	POLE UTL OTHER
05813 CITY	09/25/00 MON 09A	WASHINGTON ST CASCADE HWY SOUTH	MN-ART 477	STRGHT SW 7	(UNDIV) (2)	CLR DRY	D TURN DAY INJ	01 MVOP PDO	PRI TRUCK	OR1-Y 45 M	STRGHT NE SW	NONE NONE	
								02 MVOP INJC	PRI PASS	OR1-Y 46 M	U-TURN NE NE	ILLEG U NONE	IMP-TURN

AUG-31-2001 11:50

*** C O D E S E M P L O Y E D I N P R E V I O U S A C C I D E N T S ***

CLASS	CODE	USED	DESCRIPTION	
DRIVER ACTION	01	2	SKIDDED	
	04	2	DISTRCTD	DRIVER ATTENTION DISTRACTED
	06	2	SLOW DN	VEHICLE SLOWED DOWN
	07	2	AVOIDING	AVOIDING MANEUVER
	08	1	PAR PARK	PARALLEL PARKING
	11	33	STOPPED	STOPPED IN TRAFFIC EXCEPT FOR LEFT TURN
	12	4	WAITFORL	STOPPED FOR LEFT TURN
	17	2	LOSTCONT	LOST CONTROL OF VEHICLE
	18	1	EXIT DWY	ENTERED ROADWAY FROM ALLEY OR DRIVEWAY
	25	1	DR SLEEP	DRIVER ASLEEP
	31	1	PASSING	PASSING SITUATION
PED-ACTION	NO CODES USED			
DRIVER ERROR	01	3	WIDE TRN	WIDE TURN
	07	1	TRNTOWNG	TURNED INTO WRONG LANE
	08	1	ILLEG U	U-TURNED ILLEGALLY
	11	3	IMP BACK	IMPROPER BACKING (NOT PARKING)
	14	4	IMP STRT	IMPROPER START FROM STOPPED POSITION
	17	1	UNSFEVEH	DRIVING UNSAFE VEHICLE
	19	1		DISREGARD OTHER DRIVERS SIGNAL
	20	5	DIS SGNL	DISREGARDED TRAFFIC SIGNAL
	24	1	DIS EMER	DISREGARDED WARNING OF EMERGENCY VEHICLE
	26	14	REAR-END	FAILED TO AVOID STOPPED OR PARKED VEHICLE
	28	2	NO ROFWY	DID NOT HAVE RIGHT-OF-WAY
	42	3	NO SLOW	DID NOT DECELERATE FOR SLOWER VEHICLE
	43	2	TO CLOSE	FOLLOWED TOO CLOSELY
	44	1	STRDL LN	STRADDLING OR DRIVING IN WRONG LANE
	45	3	IMP LANE	IMPROPER CHANGE OF TRAFFIC LANES
	47	1	BASCRULE	DRIVING TOO FAST FOR CONDITIONS
PED MOVEMENT	NO CODES USED			
EVENTS	13	7		FORCED BY IMPACT INTO ANOTHER VEHICLE
	53	1	POLE UTL	POLE, POWER OR TELEPHONE

TYPE OF ACCIDENT CODES

COLLISION WITH ANOTHER MOTOR VEHICLE IN TRAFFIC

- A ENTERING AT ANGLE - ONE VEHICLE STOPPED
- B ENTERING AT ANGLE - ALL OTHERS
- C FROM SAME DIRECTION - BOTH GOING STRAIGHT
- D FROM SAME DIRECTION - ONE TURN, ONE STRAIGHT
- E FROM SAME DIRECTION - ONE STOPPED
- F FROM SAME DIRECTION - ALL OTHERS (INCL PARKING)
- G FROM OPPOSITE DIRECTION - BOTH GOING STRAIGHT
- H FROM OPPOSITE DIRECTION - ONE LEFT TURN, ONE STRAIGHT
- I FROM OPPOSITE DIRECTION - ONE STOPPED
- J FROM OPPOSITE DIRECTION - ALL OTHERS (INCL PARKING)

COLLISION OF MOTOR VEHICLE WITH:

- 1 MOTOR VEHICLE ON OTHER ROADWAY
- 2 PARKED MOTOR VEHICLE
- 3 PEDESTRIAN
- 4 RAILROAD TRAIN
- 6 BICYCLIST
- 7 ANIMAL
- 8 FIXED OBJECT
- 9 OTHER OBJECT
- & OVERTURNED
- 0 OTHER NON-COLLISION

Metro Energy Reduction Recommendations – Lighting

General

The review of existing interior lighting for the Metro South and Metro Central Facilities included lighting levels and requirements, fixture type, fixture condition, environmental conditions, and the effects of day lighting. Recommendations are made with regards to cost returns and improving working conditions.

The attached spreadsheet describes the worse case daylight conditions for the Portland area. Please note that this study considers only "usable sunlight" for cost returns. Usable sunlight is determined by taking the average sunlight time per month and further reducing it for the effects of overcast skies especially during the winter months. This is why, for the months of November through January, usable sunlight is calculated slightly over 2 hours per day. Re-circuiting the existing lighting will take advantage of the day light openings. For this study, consideration will be for a manual operation of the lights only.

Metro South

Lighting systems at this facility were found to be in very good condition and will require no change of fixtures. Day lighting similar to the new building would enhance the existing conditions and allow a zoning of lighting in the transfer area.

Removing a 6 foot section of siding around the building (see drawing) would provide additional light in the transfer area. By re-circuiting the existing lighting system, the low-bay fixtures located on the east and west sides could be de-energized during usable daylight conditions. A total of twelve 400 Watt fixtures need to be re-circuited. For this facility, re-circuiting should be a minor and inexpensive task.

The estimated annual energy savings by re-circuiting these fixtures is $766. Total estimated construction cost for this project is $6,200 yielding a return of investment in just over 8 years.

Metro Central

The lighting systems at Metro Central were found to be in poor condition. Initial observations indicated the reflectors on most fixtures were contaminated with dirt which severely reduces the effectiveness of the lamp. Thirty-three of the lamps (15% of total lighting) require replacement. The reflective surfaces of the walls and ceiling require cleaning. The combination of burnt out lamps, dirty reflectors and dirty walls and ceilings resulted in very poor lighting conditions in certain areas. An average of 20 footcandles of illumination is recommended by IES for visual tasks within large size (general sorting) facilities. Existing conditions found lighting levels as low as 5 footcandles. This level of

lighting corresponds to recommendations for public spaces with dark surroundings such as a park at night or a bus stop.

By removing building siding similar to Metro South a total of twenty-seven 400 Watt lamps and thirty-four 1000 Watt lamps could be turned off for this facility. The effects of day light would actually improve the illumination conditions. The construction cost estimate for this project is $36,500. It is more expensive than Metro South primarily due to the amount of siding to be removed and re-wiring the above mentioned lighting fixtures. The re-wiring was included because the existing lighting contactor and wiring configuration are unknown. For this amount of work, installing new conduit and cable will be less expensive than attempting to re-configure existing lighting layouts and circuits through existing conduit.

The estimated annual energy savings by re-circuiting these fixtures is $6,172. This yields a return of investment in approximately 6 years.

Upon review of the drawings, it was noted that the majority of fixtures at this facility used 1000 Watt lamps in their fixtures. By changing out both 400 and 1000 Watt fixtures to a 400 Watt, self-cleaning, fixture, lighting in the entire facility will become more efficient as the reflectors will remain clean and overall energy usage will be less. The effective lighting for the floor area is calculated to be an average of 22 footcandles. It is estimated that there will be $22,680.00 in annual savings by switching to a more efficient light fixture. Estimated return on investment will be in 4.41 years.

	January	February	March	April +	May	
Average minutes/day of sunlight*	580	625	717	813	895	
Average percent sunlight/month**	28%	38%	48%	52%	57%	
Average minutes/day of usable sunlight	162	238	344	423	510	
Average in hours/day (worse case)	2.71	3.96	5.74	7.05	8.50	

Metro South Daylighting

Total daylight hours per month (worse case)	83.91	110.83	177.82	211.38	263.58	
Cost savings/month @ $0.0625/kWhr	$ 28.63	$ 37.82	$ 60.68	$ 72.13	$ 89.95	$

Estimated cost for Daylighting & Elect. Mods.[$]	$	6,200.00
Estimated Payback (years)		8.09

Metro Central Daylighting

Total daylight hours per month (worse case)	83.91	110.83	177.82	211.38	263.58	
Cost savings/month @ $0.0625/kWhr	$ 230.51	$ 304.48	$ 488.49	$ 580.70	$ 724.10	

Estimated cost for Daylighting & Elect. Mods.[$]	$	36,500.00
Estimated Payback (years) for Daylighting only		5.91
Estimated Annual op. cost w/ 1000W Luminaires	$	53,494.88
Estimated cost to change to 400W Luminaires	$	100,000.00
Estimated Annual op. cost w/ 400W Luminaires	$	30,814.88
Estimated Payback (years) for 400W Luminaires		4.41

* Average minutes of sunlight calculated from U.S. Naval Observatory, Sunrise/Sunset ti
** Average percent sunlight from Percent Possible Sunlight for Portland, OR (http://ggwea
\+ Daylight Savings Time
\- Daylight Savings Time

Normal Working Hours: 6:00 Am - 8:00 PM

Luminaires Metro South to turn off due to daylighting - 12 @ 455W/Luminaire
Luminaires Metro Central to turn off due to daylighting - 34 @ 455W/Luminaire & 27 @ 10(

$ Estimated cost for Daylighting includes direct labor (6 Ft. high opening @ $6.00 per lin

Metro Central Energy Savings
Woodline - Existing System

Existing System

Equip. No.	Motor	HP	Voltage	Amps*	kW	$/hr.
801	Pit Conveyor	20	480	27	12.96	$ 0.81
803	Primary Shredder (motor 1)	150	480	180	86.40	$ 5.40
803A	Primary Shredder (motor 2)	150	480	180	86.40	$ 5.40
804	Slow Speed Discharge	10	480	14	6.72	$ 0.42
805	RAS Infeed Conveyor	5	480	7.6	3.65	$ 0.23
806	Magnetic Separator	3	480	4.8	2.30	$ 0.14
807	RAS Fan	75	480	96	46.08	$ 2.88
808	Cyclone Rotary Valve	3	480	4.8	2.30	$ 0.14
809	Light Reject Conveyor	5	480	7.6	3.65	$ 0.23
810	Heavy Reject Conveyor	10	480	14	6.72	$ 0.42
811	Wash Tank Infeed	10	480	14	6.72	$ 0.42
812	Wash Tank Slicer Conveyor	5	480	7.6	3.65	$ 0.23
813	Wash Tank Bypass Conveyor	10	480	14	6.72	$ 0.42
814	Transfer Conveyor	10	480	14	6.72	$ 0.42
815	Secondary Shredder	300	480	361	173.28	$ 10.83
816	High Spd. Dischg. Conveyor	10	480	14	6.72	$ 0.42
817	Magnetic Separator	5	480	7.6	3.65	$ 0.23
818	Trans. Conveyor to Multi-Flow	10	480	14	6.72	$ 0.42
819	Multi-Flow	10	480	14	6.72	$ 0.42
820	Wash Tank Roller	10	480	14	6.72	$ 0.42
821	Load Leveler	20	480	27	12.96	$ 0.81
821A	Wash Tank Pump	3	480	4.8	2.30	$ 0.14
821B	Wash Tank Filter System					
822	Wash Tank Dischg. Transfer	5	480	7.6	3.65	$ 0.23
823	Wash Tank Discharge	10	480	14	6.72	$ 0.42
						$ 31.09

Annual Energy Cost @ $0.0625/kWhr $ 52,235