City of Scappoose, Oregon
Public Works Department

Storm Drain System Master Plan

FINAL DRAFT

November 1998

KCM
7080 SW Fir Loop
Portland, OR 97223

in association with:
Shaun Pigott Associates

STORM DRAIN SYSTEM
MASTER PLAN

FINAL DRAFT

NOVEMBER 1998

Prepared for:
City of Scappoose, Oregon
Public Works Department
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Scappoose, Oregon 97056

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KCM Project No. 2640064

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN
TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Scappoose Storm Drain System Master Plan

EXECUTIVE SUMMARY

INTRODUCTION

Recent periods of heavy rainfall, in combination with continued urban development in Scappoose, has demonstrated the City's need for a storm drain system master plan. The City recognized that development of a storm drain system master plan would identify existing drainage problems and solutions, would identify future requirements of the City and private development, and would allow identification of means and methods for funding storm drainage improvements. In February 1997, the City of Scappoose contracted with KCM, Inc. to develop a storm drain system master plan for the area within the City's urban growth boundary. The purpose of this plan is to determine long-term existing drainage structure adequacy for conveying existing storm flows and required structure size to minimize future flooding potential.

DESCRIPTION OF THE STORM DRAINAGE SYSTEM

The Scappoose study area is currently served by three primary systems for drainage: South Scappoose Creek, Jackson Creek, and dry wells.

South Scappoose Creek provides a major conveyance system for drainage service west of Highway 30. Jackson Creek provides the major conveyance system for the southern and eastern portions of the study area. Dry wells (stormwater discharge to the ground) provide the majority of drainage service in the northeast portion of the study area where soils are generally suitable.

PROBLEM AREAS / CAPACITY OF THE STORM DRAINAGE SYSTEM

Notable problem areas as reported by the public and City Staff included:

- extended periods of standing water in the Sunset Loop area during 1996 flood event,
- high water for extended periods (1-2 days) along Jackson Creek during 1996,
- lack of reliability of dry well systems in the north portion of the City,
- inadequate drainage along 5th, 6th and 7th Streets north of E.J. Smith Road,
- occasional flow over roadways along South Scappoose Creek outside of the main channel (E.J. Smith Road, J.P. West Road, E.M. Watts Road)
- general concerns were also stated regarding stormwater impacts of new development,
- Scappoose Drainage District also expressed concerns about the impacts of stormwater quantity and quality on their conveyance systems and facilities.

RECOMMENDED IMPROVEMENTS

Table ES.1 (Capital Improvement Plan) shows the improvements recommended over the 20-year planning period.

The total cost of the CIP projects for the twenty-year period is $7,288,000 *(rounded to the nearest $10,000)*. This includes the following projects.

Recommended Improvements - East Side of Highway 30

- *West Lane Storm Drainage System* – New storm pipelines to serve existing developed northeast area that has unreliable or failing dry wells.
- *Sawyer Street Storm Drainage System* – New storm pipelines to serve existing developed northeast area that has unreliable or failing dry wells.
- *Columbia Avenue Storm Drainage System* – New storm pipeline to provide storm drainage service to new and existing development north and south of Columbia Avenue east of 6th Street.
- *Elm Street Storm Drainage System* - New storm pipeline to provide storm drainage service to new and existing development north and south of Elm Street east of 4th Street.
- *Vine Street Storm Drainage System* - New storm pipeline to provide storm drainage service to new and existing development north and south of Vine Street east of 4th Street.
- *Crown Storm Line* – New storm pipeline to provide storm drainage service to area proposed for industrial development north of existing Crown Zellerbach Road.
- *Airport Industrial Area* - New storm pipeline to provide storm drainage service for proposed development around the airport.
- *Jackson Creek* – Temporary/mobile pumping units to divert excess flows from Jackson Creek to the Multnomah Channel during extreme flood events.

Recommended Improvements - West side of Highway 30

- *5th, 6th, 7th (Smith Road)* - New storm piping system to provide storm drainage service to existing development along 5th, 6th and 7th Streets north of Smith Road.
- *5th, 6th, 7th (Wheeler Road)* - New storm piping system to provide storm drainage service to existing development along 5th, 6th and 7th Streets south of Wheeler.
- *JP West Storm Pipeline* - New storm pipeline to provide storm drainage service and prevent stormwater ponding in existing developed area south of JP West Road west of 1st Street.

- ***Callahan-Dutch Canyon area*** - New combined open channel/pipe conveyance system to provide storm drainage service for proposed development in the Callahan-Dutch Canyon area.

- ***Scappoose Creek*** – Roadway and culvert improvements to prevent shallow flooding of JP West and EM Watts. Interchange improvements at Scappoose-Vernonia Highway to reduce flood levels in South Scappoose Creek.

FUNDING OF IMPROVEMENTS

Funding options were reviewed as part of the storm drain master planning process. Specific options included implementation of a stormwater utility rate and a stormwater system development charge.

- Equivalent Service Unit (ESU) – Based on measurements of mapped impervious areas (rooftops, driveways, etc.) for single family residential dwellings in Scappoose, one equivalent service unit is approximately 2,750 square feet.

  Current ESUs in Scappoose = 3,909
  Remaining ESUs in Scappoose = 3,569
  Total ESUs in Scappoose UGB = 7,478

- Stormwater Utility Rate – Based on anticipated operating and maintenance costs for a stormwater utility in Scappoose, a monthly rate for each ESU is expected in the range of $3.50 to $4.00. This rate would support an annual budget in the range of $160,000 to $190,000.

- System Development Charge (SDC) – Based on future development requirements and flow contributions to the identified capital projects, a SDC of $500 per ESU has been estimated (development allocation $1,740,000 / 3569 ESUs = $487 per ESU).

Draft ordinances for both the stormwater utility and system development charge have been prepared.

Chapter 1

INTRODUCTION

Scappoose Storm Drain System Master Plan

CHAPTER 1.
INTRODUCTION

1.1 BACKGROUND

Recent periods of heavy rainfall, in combination with continued urban development in Scappoose, has demonstrated the City's need for a storm drain system master plan. The City recognized that development of a storm drain system master plan would identify existing drainage problems and solutions, would identify future requirements of the City and private development, and would allow identification of means and methods for funding storm drainage improvements.

1.2 AUTHORIZATION

In February 1997, the City of Scappoose contracted with KCM, Inc. to develop a storm drain system master plan for the area within the City's urban growth boundary.

1.3 PURPOSE AND SCOPE

The purpose of this plan is to determine long-term existing drainage structure adequacy for conveying existing storm flows and required structure size to minimize future flooding potential. The scope of the project includes the following elements:

- Review existing information, including previous designs, survey information, drainage reports, and other data to support development of the storm drain system master plan.
- Prepare aerial-based topographic mapping for the City on 1"=100' scale and 2-foot contour intervals.
- Conduct analysis of the storm drainage system hydrology and hydraulics to address existing drainage problems in the study area and impacts of new development.
- Based on the data review and system analysis, identify measures for improving drainage and reducing the flooding within the study area.
- Develop and present alternatives to the City for drainage system improvements.
- Develop and present alternative funding methods to the City for implementation of improvements.
- Document the analysis in a draft and final storm drain system master plan report.

1.4 REPORT ORGANIZATION

This report represents the *City of Scappoose - Storm Drain System Master Plan - Draft Report.* It consists of the following seven chapters:

- Introduction—Describing project background, authorization, purpose, scope, and report organization
- Study Area—Describing the study area's location, topography, climate, and land use.
- Existing Drainage System—Describing the components of the existing drainage system and reports of flooding.
- System Evaluation and Alternatives—Describing evaluation results and alternatives developed.
- Management Measures—Describing current and future requirements for non-structural control measures.
- Funding Alternatives—Describing alternative funding methods.
- Recommended Plan—Describing the overall plan for structural and non-structural control measures.

This report includes appendices that provide supporting information on public input, groundwater discharge, hydraulic evaluation, project background and draft ordinances.

Chapter 2

STUDY AREA

Scappoose Storm Drain System Master Plan

CHAPTER 2.
STUDY AREA

2.1 STUDY AREA

2.1.1 Topography

The City of Scappoose is located along the Columbia River in Columbia County, approximately 20 miles northwest of Portland, and is shown in Figure 2-1. On the west side of Highway 30, the terrain is hilly with ground slopes predominantly ranging from 0 to 15 percent. Small areas within the urban growth boundary have slopes in excess of 30 percent. The milder 0 to 15 percent slopes are generally conducive to development of land for residential and light commercial uses. Land elevations around the City vary from approximately 10 feet near Jackson Creek to as high as 500 feet on the southern and western edges of the urban growth boundary (UGB), near the headwaters of Jackson Creek and South Scappoose Creek and tributaries. The lands east of U.S. Highway 30 are predominantly below 60 feet in elevation. For analysis purposes, the study area coincides with the UGB, as shown in Figure 2-2.

2.1.2 Geology

The geology of Scappoose is characterized by a variety of formations and deposits. According to the 1986 Soil Conservation Service Soil Survey of Columbia County, the soils east of Highway 30 are predominantly of the Sauvie-Rafton series. These soils are characterized as deep, nearly level, poorly drained and very poorly drained silt loams and silty clay loams formed in recent alluvial deposits. These soils are typical of the Jackson Creek area downstream of Highway 30 as well as most of South Scappoose floodplain area. In the northeast portion of the study area, Sifton-Mulnomah soils are present. These soils are characterized as deep, nearly level, somewhat excessively drained and well drained loams that formed in old gravelly alluvial deposits. These areas are generally consistent with the locations of existing City dry wells.

The soils west of Highway 30 are varied. The upper portions of the Jackson Creek basin are predominantly comprised of Cornelius-Cascade soils. These soils are typified as deep, gently sloping, to moderately steep, moderately well drained and somewhat poorly drained silt loams, that formed in silty materials. The upper portions of the South Scappoose Creek basin and Salt Creek (tributary to South Scappoose Creek) are comprised primarily of Goble series soils. These soils are moderately deep, gently sloping to moderately steep, moderately well drained silt loams that formed in silty materials.

2.1.3 Climate

The climate for the Scappoose area is characterized by mild winters and cool summers. The average January air temperature is about 38 degrees F and the average July temperature is about 66 degrees F. Temperature extremes range from the low 20's to high 80's. Rainfall occurs predominantly during the winter months, with an average of about 43 inches per year. Approximately 75 percent of this total falls in the six winter months from November through

April. Extreme months during the 26-year period of record (1951-1976) at Warren, included November 1973 (14.82"), January 1953 (13.19"), and December 1973 (12.95"). For the month of February 1996, Scappoose Public Works Department recorded approximately 12.6 inches.

2.1.4 Vegetation

Varieties of vegetation within the study area are depending on soil conditions and the degree of urbanization. Trees in the urbanized areas range from deciduous types, such as maple, oak and ash, to coniferous fir and a few pines. Most of the residential areas have lawns and varieties of shrubs. Vacant areas quickly revert to grasses and blackberries. Low lying areas along South Scappoose Creek and Jackson Creek are normally covered by blackberries and willow, cottonwood, maple and fir trees.

2.2 LAND USE PATTERNS AND POPULATION

Land use zoning in the City of Scappoose is comprised primarily of residential uses, with lesser amounts of land dedicated to commercial, institutional, open space and recreational uses. Land use boundaries are delineated in the City of Scappoose Comprehensive Plan adopted in April 1991. Zoning classifications and restrictions are identified in the City Zoning Ordinance. In 1991, the urban growth boundary encompassed approximately 1640 acres comprised of:

- general residential (214 acres/13%),
- suburban residential (830 acres/50%),
- mobile home residential (75 acres/ 5%),
- commercial (85 acres/ 5%),
- industrial, and (275 acres/17%),
- public/semi-public (160 acres/10%).

With expansions of the UGB since 1991, the UGB now encompasses approximately 2500 acres. Approximately 350 acres of the current UGB lies within the Scappoose Drainage District boundary. Figure 2-3 identifies the urban growth boundary and the land use boundaries within it.

The population of the City of Scappoose was 3,529 in 1990 and 4,130 in 1996. Population growth averaged 0.95 percent per year between 1980 and 1990 and 5.62 percent per year between 1970 and 1980. A 1995 analysis by the Center for Population research and Census (Portland State University) determined that the City average 2.96 residents per dwelling in 1995.

Columbia County, especially the City of Scappoose, has experienced recent growth due to its proximity to Portland and the availability of reasonably priced land. With the expansion of Highway 30 to four lanes and Portland area prices increasing, people are moving to lower priced rural settings with only a 25-minute commute to downtown Portland. It is also close to Hillsboro and Beaverton. The current population is estimated at approximately 4,700 people.

2.3 FEMA FLOOD INSURANCE STATUS

In 1968, the U.S. Congress passed the Flood Insurance Act which established a federal program enabling property owners to buy flood insurance at a reasonable cost (FEMA, 1980). In return,

communities carry out local floodplain management measures to protect lives and new construction from future flooding. The program is administered by the Federal Insurance Administration within the Federal Emergency Management Agency (FEMA).

A community qualifies for the program in two separate phases -- the Emergency and Regular Programs.

During the initial Emergency phase, limited amounts of flood insurance becomes available to local property owners. A community's efforts to reduce flood losses are general, in many cases guided only by preliminary flood data. The map FEMA provides the community at this stage is called a Flood Hazard Boundary Map. It outlines the flood-prone areas within the community. Subsidized rates are charged for all structures regardless of their flood risk.

Under the Regular Program, the full limits of flood insurance coverage become available locally. The premiums charged for new construction vary according to exposure to flood damage. A structure's exposure is based upon the elevation at its lowest floor above or below the "Base Flood Elevation". The community's floodplain management efforts become more comprehensive under the Regular Program where new buildings are elevated or flood-proofed above certain flood levels. These levels are derived from FEMA's detailed on-site engineering survey in the community. The community is issued a detailed map, called a Flood Insurance Rate Map, which shows flood elevations and risk zones used for insurance purposes.

To qualify for the flood insurance program, a community must: (1) require development permits for all proposed construction or other development in the community; and (2) review the permit to assure that sites are reasonably free from flooding. For its flood-prone areas, the community must also require: (1) proper anchoring of structures; (2) use of construction materials and methods that will minimize flood damage; (3) adequate drainage for new subdivisions; (4) the location and design of new or replacement utility systems to prevent flood loss; and (5) that all new construction and substantial improvements to existing structures in FEMA-identified flood-prone areas be elevated or flood-proofed to the level of the base flood.

The base flood is a term used to describe the level of flooding the program is geared to protect against. While sometimes referred to as the "100-year flood", it is more appropriately the flood having a 1 percent chance of being equaled or exceeded in any year.

The City of Scappoose presently participates in the regular phase of the Flood Insurance Program. (Date of entry into the Regular Program was August 16, 1988.) Products of the flood insurance study include flood profiles and maps for the portions of South Scappoose Creek within the Scappoose city limits. Flood profiles and maps for those portions of the Creek which lie outside of the city limits are included in the Flood Insurance Study prepared for Unincorporated Areas of Columbia County. In addition, flood hazard areas protected by levees, dikes or other structures are shown for much of the area within the UGB west of Highway 30 and below approximate elevation 24.0 (100-year), and below approximate elevation 30.0 (500-year). Columbia County is also a participant of the regular phase of the Flood Insurance Program (date of entry into the Regular Program was August 16, 1988).

For each creek, the studies define floodplains for the 100- and 500-year floods and a 100-year, 1-foot floodway (the portion of the stream necessary to convey flow). To continue in the Flood Insurance Program, the City must require that all construction in the floodplain be elevated so

the first floor is above the 100-year flood or be flood-proofed. Any construction in the floodway must be prohibited unless an engineering study can demonstrate the construction would not raise the 100-year flood elevation. In this Storm Drain Master System Plan for Scappoose, detailed hydrologic/hydraulic analyses were not performed to either verify or modify the current effective Flood Insurance Study.

FIG2-3B 1=15002640064 11.5.98

KCM

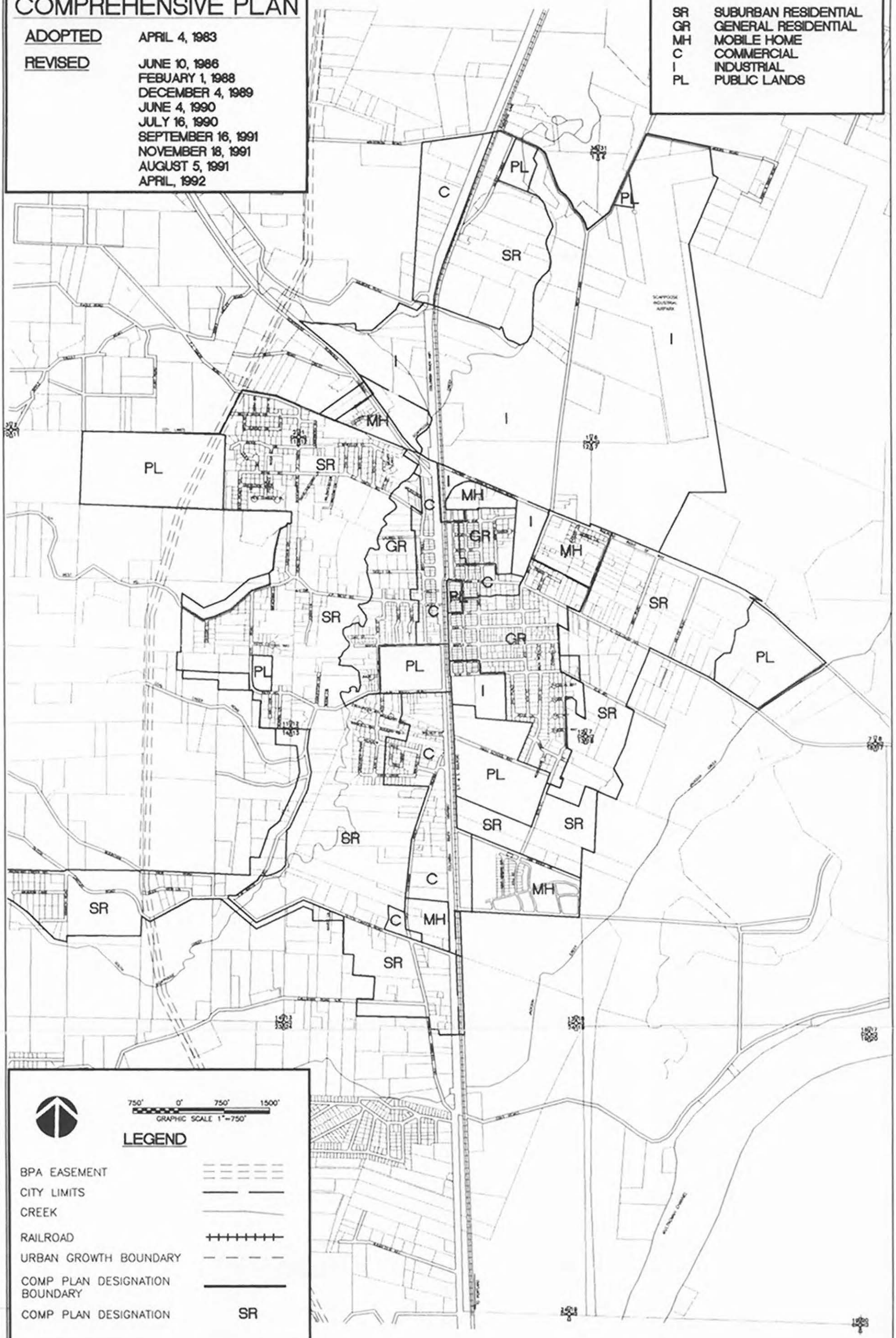
CITY OF SCAPPOOSE COMPREHENSIVE PLAN

ADOPTED APRIL 4, 1983

REVISED
JUNE 10, 1986
FEBUARY 1, 1988
DECEMBER 4, 1989
JUNE 4, 1990
JULY 16, 1990
SEPTEMBER 16, 1991
NOVEMBER 18, 1991
AUGUST 5, 1991
APRIL, 1992

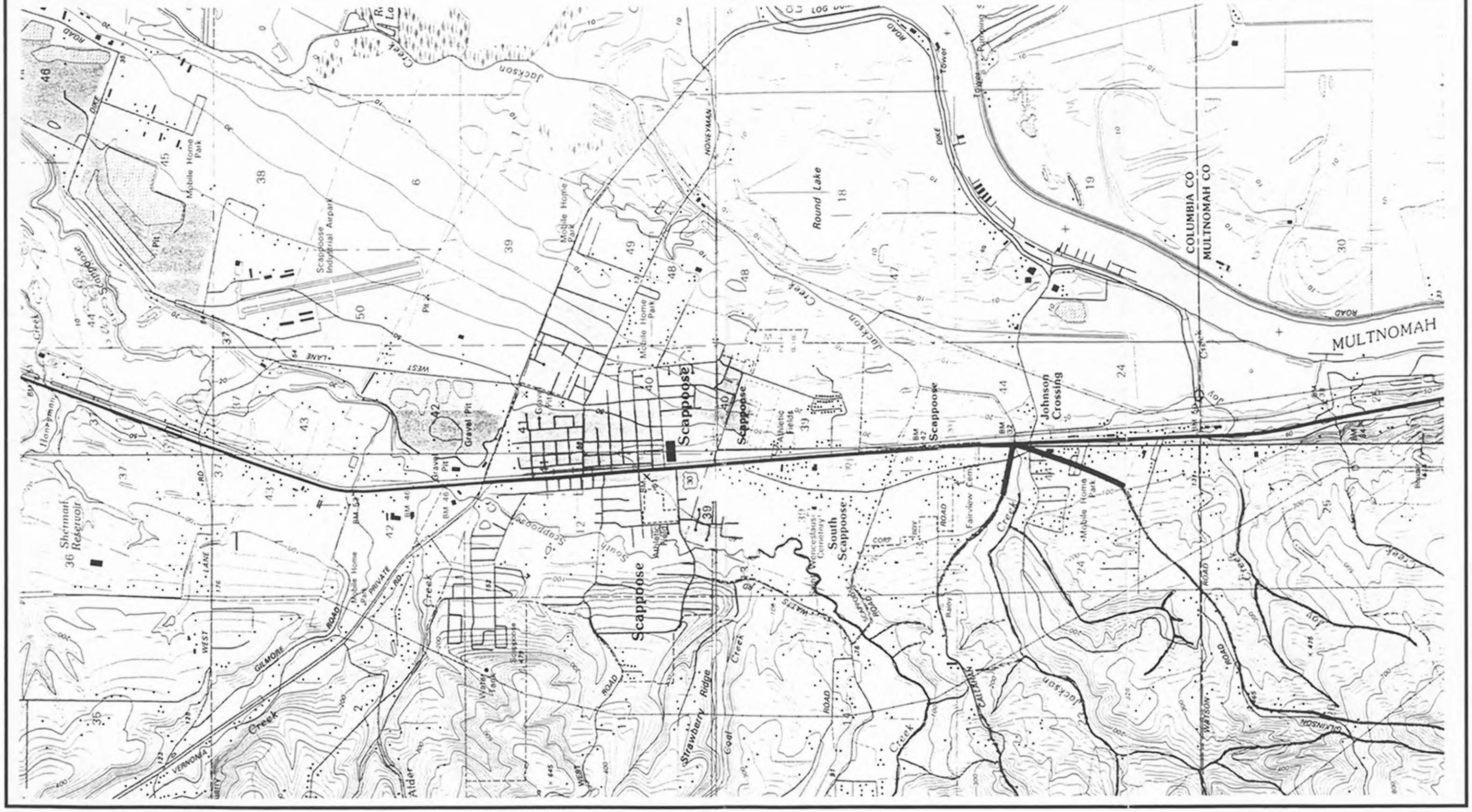
DESIGNATIONS

SR	SUBURBAN RESIDENTIAL
GR	GENERAL RESIDENTIAL
MH	MOBILE HOME
C	COMMERCIAL
I	INDUSTRIAL
PL	PUBLIC LANDS



City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 2-3
LAND USE



KCM	City of Scappoose	FIGURE 2-1
7080 S.W. Fir Loop Portland, Oregon 97223	Storm Drain System Master Plan	Vicinity Map

fig2-2 1= 20002640064 2.29.98 clrbase

KCM

LEGEND

CITY LIMITS

URBAN GROWTH BOUNDARY

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 2-2
STUDY AREA

Chapter 3

EXISTING SYSTEM

Scappoose Storm Drain System Master Plan

CHAPTER 3.
EXISTING SYSTEM

3.1 INTRODUCTION

The Scappoose study area is currently served by three primary systems for drainage:

- South Scappoose Creek
- Jackson Creek
- Dry Wells

South Scappoose Creek provides a major conveyance system for drainage service west of Highway 30. Jackson Creek provides the major conveyance system for the southern and eastern portions of the study area. Dry wells (stormwater discharge to the ground) provide the majority of drainage service in the northeast portion of the study area, where soils are generally suitable. The existing storm drainage system is presented in Figures 3-1(A-F). These systems are further described in the following sections.

3.2 EXISTING SYSTEM

South Scappoose Creek
Being the primary corridor for stormwater conveyance on the west side of Highway 30, land development has historically discharged directly to the Creek with short, storm piping configurations with very localized service. The City currently has a policy requiring stormwater detention from new developments discharging into South Scappoose Creek. This policy has helped to limit stormwater quantity impacts on the main channel.

Lands within the City comprise a very small portion of the South Scappoose Creek drainage area. For example, at the Dutch Canyon Road crossing of South Scappoose Creek, the contributing watershed area is approximately 23.5 square miles of which 0.16 square miles (0.7%) comes from within the urban growth boundary. Further downstream at the J.P. West road crossing of South Scappoose Creek, the contributing watershed area is approximately 24.7 square miles of which 0.76 square miles (3.1%) comes from within the urban growth boundary. The existing flood insurance study for South Scappoose Creek has defined 10-, 50-, 100- and 500-year flood levels, as well as the floodway corridor.

Jackson Creek
Jackson Creek is a primary conveyance system in the southern and eastern portion of the study area. The headwaters of Jackson Creek originate outside of the urban growth boundary and are undeveloped. Under normal flow conditions, Jackson Creek flows east where it crosses under Highway 30 and the railroad tracks (near Johnson Crossing). From this point, upper Jackson Creek flows are diverted due south in a ditch system to Joy Creek where flow ultimately is conveyed to the Multnomah Channel and Columbia River. During high water stages on the Columbia River, the south diversion is closed, and Jackson Creek flows east and north where all flows are ultimately pumped out by Scappoose Drainage District's main pump station.

Lower Jackson Creek cannot effectively convey all upstream storm flows for extended periods. Out of bank flooding was experienced along Jackson Creek during the February 1996 flood event. Adequate downstream capacity is available in Scappoose Drainage District's main pump station. With improvements to the pump impellers at the main pump station, the pump station is capable of conveying approximately 320 cubic feet per second (144,000 gallons per minute (gpm), 3 pumps at 38,000 gpm and 1 pump at 30,000 gpm).

Lands within the City comprise a very small portion of the Jackson Creek drainage area. For example, at the Highway 30 crossing of Jackson Creek, the contributing watershed area is approximately 3.0 square miles of which 0.10 square miles (3.3%) is within the current City urban growth boundary. Further downstream at the Columbia Avenue crossing of Jackson Creek, the contributing watershed area is approximately 4.9 square miles of which 0.62 square miles (12.7%) comes from within the urban growth boundary.

Dry wells

Areas in the northeast portion of the City currently discharge stormwater to the ground by way of dry wells. Dry wells can be an effective means of stormwater discharge, under certain conditions. Oregon Administrative Rules (OAR 340-44-050, see Appendix A) suggest that dry wells should only be considered when:

- surface discharging storm sewers are impractical
- they serve only residential areas
- there are some means of closing or plugging in the event of a spill
- there are no domestic water supply wells within 500 feet

In addition, dry wells require more intense maintenance to operate reliably when needed, which can render them less effective.

Other systems

Other portions of the study area have no defined drainage system currently in place. This area generally is north of High School Way and east of 4th Street. Stormwater currently ponds on the ground and is gradually absorbed over time, however this is not a reliable long-term approach.

3.3 EXISTING PROBLEM AREAS

Early during the study process, a public meeting was held to discuss stormwater issues and specific drainage problem areas. Forms were provided to the public and the results are presented in Appendix B. Notable problem areas as reported by the public and City Staff included:

- extended periods of standing water in Sunset Loop area during 1996 flood event,
- high water for extended periods (1-2 days) along Jackson Creek during 1996,
- lack of reliability of dry well systems in the north portion of the City,
- inadequate drainage along 5th, 6th and 7th Streets north of E.J. Smith Road,

- occasional flow over roadways along South Scappoose Creek outside of main channel (E.J. Smith Road, J.P. West Road, E.M. Watts Road)
- general concerns were also stated concerning stormwater impacts of new development,
- Scappoose Drainage District also expressed concerns about the impacts of stormwater quantity and quality on their conveyance systems and facilities

N

300 0 300 600
GRAPHIC SCALE 1"=600'

SOUTH SCAPPOOSE CREEK

DUTCH CANYON RD

MOUNTAIN VIEW DR

WEST RD

FIVE PEAK TERRACE

0.7%C

10"

fig1 1=600 2640064 11 2 98 CLRBASE

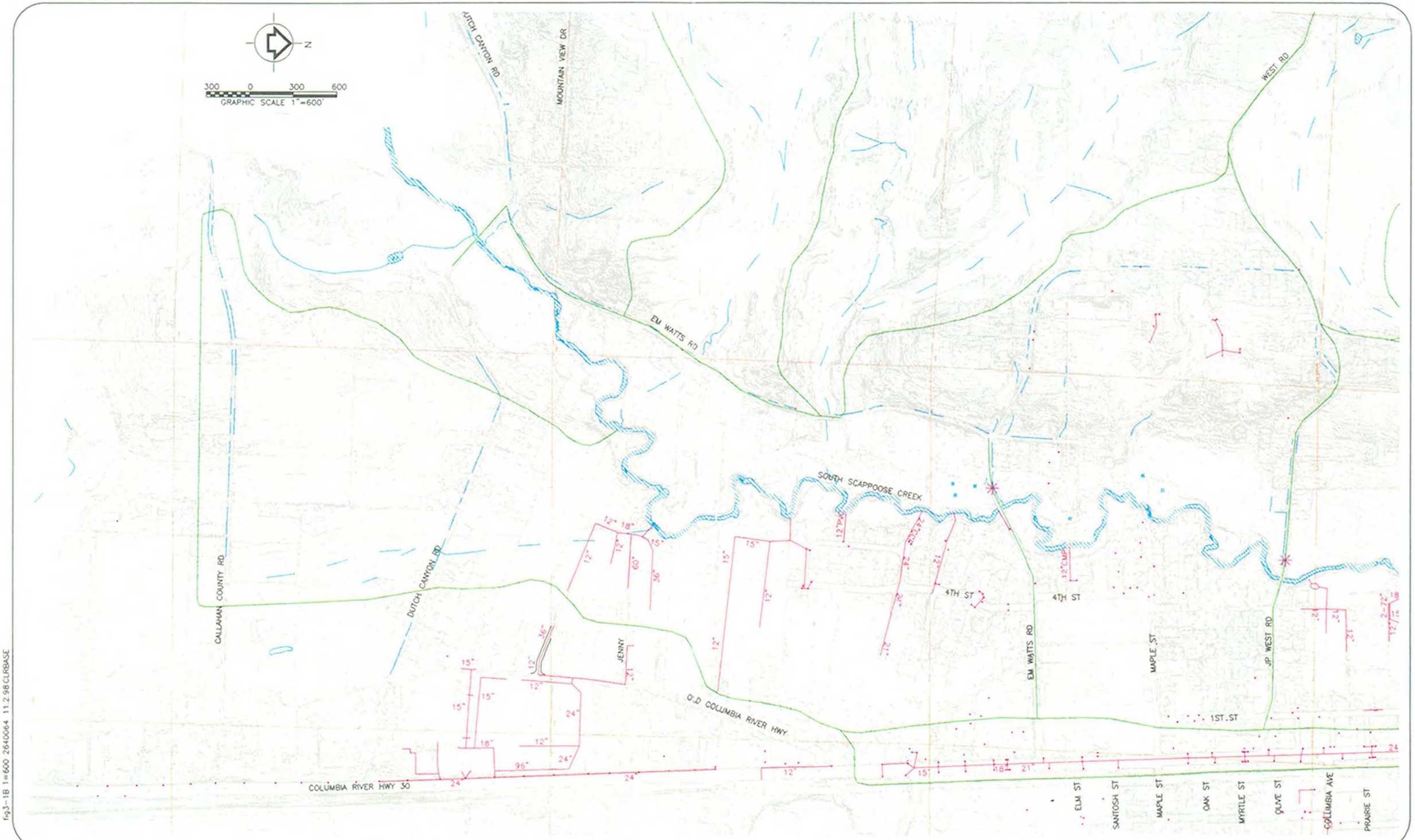
KCM

LEGEND

STREAMS, OPEN CHANNELS
PIPE SYSTEMS
DRAINAGE BOUNDARIES
DRY WELL
PROBLEMS LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 3-1A
EXISTING SYSTEM



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KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- DRY WELL
- PROBLEMS LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 3-1B
EXISTING SYSTEM

fig3-1C 1=600 2640064 11 2 98 CURBASE

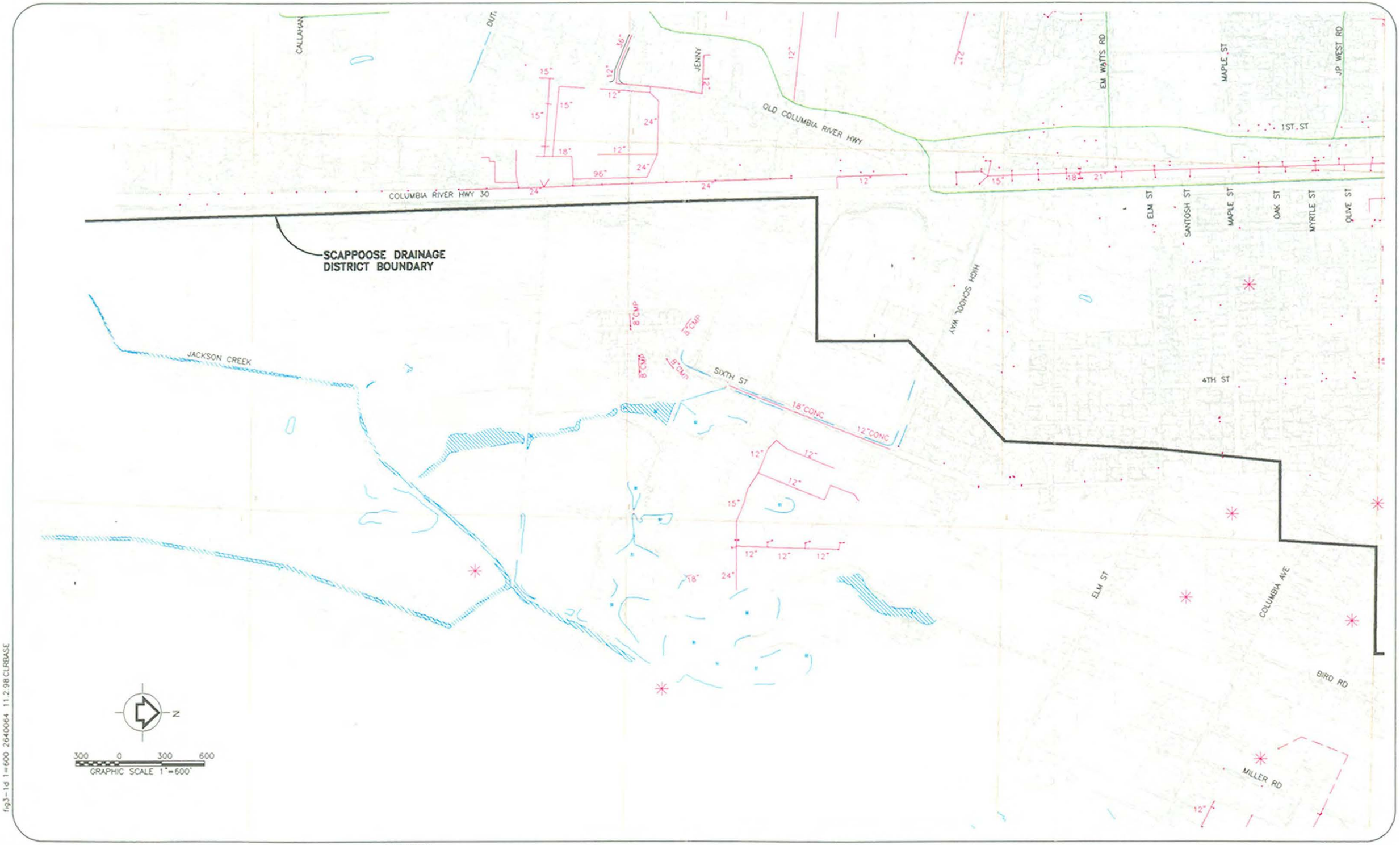
KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- DRY WELL
- PROBLEMS LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 3-1C
EXISTING SYSTEM



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LEGEND

STREAMS, OPEN CHANNELS
PIPE SYSTEMS
DRAINAGE BOUNDARIES
DRY WELL
PROBLEMS LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 3-1D
EXISTING SYSTEM

1ST. ST

24"

24"

15"

MYRTLE ST

OLIVE ST

COLUMBIA AVE

PRAIRIE ST

WATTS ST

LAUREL ST

WILLIAMS ST

12"

15"

15"

COLUMBIA RIVER HWY 30

NORTH SCAPPOOSE CREEK

SCAPPOOSE CREEK

WEST LANE

CROWN LOGGING

NORTH RD

BIRD RD

18"

24"

SCAPPOOSE DRAINAGE
DISTRICT BOUNDARY

N

300 0 300 600
GRAPHIC SCALE 1"=600'

fig3-1e 1=600 2640064 11.2.98 CLRBASE

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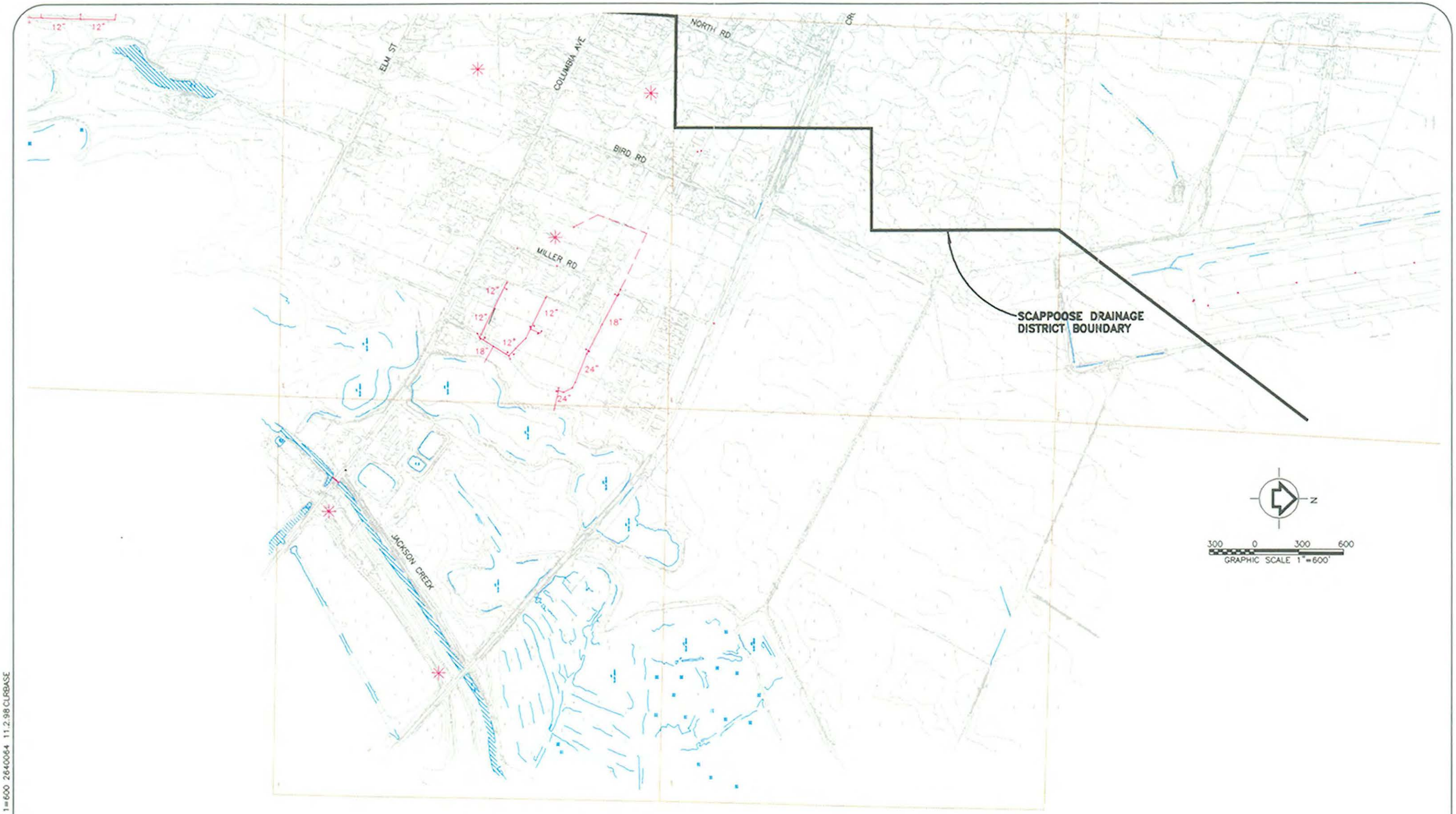
LEGEND

STREAMS, OPEN CHANNELS
PIPE SYSTEMS
DRAINAGE BOUNDARIES
DRY WELL
PROBLEMS LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 3-1E
EXISTING SYSTEM



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KCM

LEGEND

STREAMS, OPEN CHANNELS
PIPE SYSTEMS
DRAINAGE BOUNDARIES
DRY WELL
PROBLEMS LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 3-1F
EXISTING SYSTEM

Chapter 4

SYSTEM EVALUATION AND ALTERNATIVES

Scappoose Storm Drain System Master Plan

CHAPTER 4.
SYSTEM EVALUATION AND ALTERNATIVES

4.1 INTRODUCTION

This section describes the evaluation and alternatives to address problems described in Chapter 3. Alternatives are discussed for study area regions east and west of Highway 30.

4.2 WEST OF HIGHWAY 30

Initial alternatives considered for the west side of Highway 30 included:

1) On-site detention standards
2) Improvements to Scappoose-Vernonia Highway crossing over South Scappoose Creek
3) New conveyance systems for the 5th, 6th, 7th street area
4) New parallel conveyance system to South Scappoose Creek
5) Modification of road crossing structures over South Scappoose Creek (J.P. West and E.M. Watts Road)

4.2.1 On-Site Detention

The City currently has stormwater detention standards for Scappoose Creek. The volume required is necessary to reduce the peak flow rate from the 25-year storm event under developed conditions, to the peak flow rate for the 10-year storm under pre-developed conditions. This practice has helped to limit peak flows discharging to the Creek, and the City should continue this practice.

4.2.2 Improvements to Scappoose-Vernonia Highway

Inspection of the hydraulic evaluation conducted for the current effective flood insurance study revealed that flood elevation increases through the Highway 30/Scappoose-Vernonia Highway reach were between 1.5 to 2.0 feet for the 100-year event. As part of the planned interchange project between the State, County and City, modified bridge openings should be implemented to effectively convey flood flows and thereby reduce water surface elevations through this reach.

4.2.3 New Conveyance Systems for the 5th, 6th, 7th Street Area

This area occasionally experiences standing water and the drainage system is not well-defined. New piping and conveyance systems are recommended for 5th, 6th and 7th Streets, as well as portions of Smith and Wheeler.

4.2.4 New Parallel Conveyance System

A preliminary alternative to provide a parallel overflow or bypass pipe for excess flows on Scappoose Creek was initially considered, but upon review was screened out due to the extensive length and associated costs necessary to complete the piping.

4.2.5 Modification of Road Crossings

Flow in the overbank areas of South Scappoose Creek occasionally flows over the roads at J.P. West and E.M. Watts. New, smaller roadway crossings for drainage are suggested for low points outside of the South Scappoose Creek main channel,

4.3 EAST OF HIGHWAY 30

Initial alternatives considered for the east side of Highway 30 included:

1) On-site detention standards
2) New pipeline conveyance systems
3) Continued and expanded use of dry wells
4) Add capacity to the Jackson Creek system

4.3.1 On-Site Detention

The City currently has stormwater detention standards for Scappoose Creek. This policy should be continued for the Jackson Creek basin.

4.3.2 New Pipeline Conveyance Systems

Much of the northeast area (north of High School Way and east of 4th) has no drainage system. New piping systems are suggested for this area in Columbia Avenue, Elm Street and West Lane. The service areas for these systems are generally not suitable for dry well systems. In addition, because many of these areas could discharge to potential wetlands, on-site, developer-provided water quality control systems should be required by the City.

4.3.3 Continued and Expanded Use of Dry Wells

Future use of dry wells should be limited and consistent with OAR guidance provided in Appendix A. In areas where existing dry wells fail in the future, and no piping systems exist, new two-stage (sedimentation, water quality manhole connected upstream) dry wells should be installed.

4.3.4 Add Capacity to the Jackson Creek System

Recent flooding events on Jackson Creek have demonstrated that the channel system does not have capacity to convey flows for extended periods when the south diversion is closed due to high water on the Columbia River. To alleviate this problem, temporary, portable pumping systems are suggested (see Appendix C). Trailer-mounted pumping units could pump

approximately 16,000 gallons per minute (35 cubic feet per second) each. Two units could effectively pump the entire 2-year storm flows from Upper Jackson Creek (west of Highway 30), or about 60% of the 5-year storm event. This would only be necessary during high stage events on the Columbia River. The units could also be shared in agreement with Scappoose Drainage District for application at other locations. These units could be purchased for a small fraction of a new, permanent stormwater pump station.

4.4 HYDROLOGIC ANALYSIS

4.4.1 Rational Method

For sizing new piping systems in this plan, KCM utilized the Rational Method to develop future runoff conditions.

The Rational Method was used because of the relative ease with which it can be applied, its general acceptance by the engineering community, and its reliable results. There are several other methods of runoff estimation, such as the unit hydrograph, the Storm Water Management Model (SWMM), and the Hydrologic Engineering Center (HEC) computer models. These methods rely upon measurable rainfall/runoff relationships and are more applicable to larger drainage areas (> 1 square mile) where timing and storage of storm runoff may be of greater importance. When properly applied to drainage areas of 200 acres or less, the Rational Method provides reliable results.

The Rational Method is based on the formula: $Q=CIA$

where: Q = the runoff rate, cubic feet per second
C = the runoff coefficient, determined by land use
A = the contributing drainage area, acres
I = the rainfall intensity, inches per hour

The basic assumptions for application of the rational method are:

- The computed maximum rate of runoff to the design point is a function of the average rainfall rate during the time of concentration to that point.
- The maximum rate of rainfall occurs during the time of concentration, and the design rainfall depth during the time of concentration is converted to the average rainfall intensity for the time of concentration.
- The maximum runoff rate occurs when the entire area is contributing flow, i.e. at the time of concentration.

4.4.2 Runoff Coefficient and Land Use

The runoff coefficient represents a ratio of surface storm runoff to total rainfall and is dependent upon:

- Type of vegetation
- Type of soil
- Type of land use
- Evaporation
- Soil saturation at the time of rain
- Retention of water in surface depressions.

As part of the study process, two runoff coefficients (existing and future conditions) were determined for each drainage area. The future condition is based on land use zoning as set forth in the City of Scappoose Comprehensive Plan. These land use designations each correspond to a certain percentage of impervious area. The Oregon Department of Transportation Drainage Design Manual establishes "C" values for these zoning designations. Table 4.1 shows the runoff coefficients used for this study according to the land use zoning.

TABLE 4.1
RUNOFF COEFFICIENTS FOR STORM SEWERS

Description	Runoff Coefficient
Parking Area	0.90
Institutional	0.85
Commercial	0.85
Residential (High)	0.75
Mobile Home	0.75
Residential (Medium)	0.55
Residential (Low)	0.40
Open Space	0.20
Park	0.20

These runoff coefficients were used to establish the stormwater runoff at future buildout conditions per the current zoning ordinances.

4.4.3 Time Of Concentration

In order to calculate the peak rate of runoff at any point, it is necessary to know the time of concentration to that point. This time must be known in order to determine the rainfall intensity of a given recurrence interval storm. The time of concentration consists of an inlet time, or time required for overland flow to reach an inlet, and the time of flow within a pipe to the point of consideration. The inlet time is a function of the surface slope, soil conditions, depression storage, surface cover, antecedent rainfall, and the distance of the surface flow. The time in the pipe is calculated by dividing the known length by a computed velocity.

4.4.4 Design Storm Frequency

The selection of the design storm recurrence interval requires selection of the degree of protection desired from the storm drainage system. A design storm with a low probability of being exceeded, such as the 100-year design storm (1% chance of being exceeded in any given year), provides a high degree of safety in the drainage system design. A design storm with a high exceedance probability, such as a 2-year storm (50% chance of being exceeded any given year), will result in a lower cost drainage system whose capacity is exceeded every few years, with possible property damage, public inconvenience and personal hazard. For this plan, and consistent with current City standards, the 10-year storm event was used for pipe sizing in Columbia Avenue, Elm Street, West Lane, and the 5th, 6th, 7th Street system (see Appendix D).

4.4.5 Intensity Duration Frequency Curve

The intensity-duration-frequency (IDF) curve is used to determine the rainfall intensity. Given a time of concentration and a selected design storm frequency, the rainfall intensity is found graphically. The City of Scappoose is located in Zone 8 per the Oregon State Highway Department Drainage Design Manual.

4.5 HYDRAULIC ANALYSIS

4.5.1 Open Channel Flow - Manning's Formula

Most pipes within the storm drainage system were assumed to be flowing full under open channel flow conditions. Most inlet conditions are such that little or no surcharge can be developed and therefore this is a reasonable and conservative assumption. The formula used to evaluate pipes under these circumstances is the Manning Formula, which is expressed as:

$$Q = 1.49/_n \times A \times R^{2/3} \times S^{1/2}$$

where
- Q = flow, cubic feet per second
- A = cross-sectional area, square feet
- R = hydraulic radius, feet
- S = slope, feet/feet
- n = Manning roughness coefficient

The roughness factor for pipes varies according to the material used and the age of the pipe material. For this planning effort, the *n* values were assumed at 0.013 for smooth pipe.

4.5.2 Open Channel Flow - FEMA HEC-2 (South Scappoose Creek)

The flood profile and HEC-2 computer file for the current effective flood insurance study, was used to evaluate open channel and bridge hydraulics for South Scappoose Creek (see Appendix E).

4.6 COMPUTATIONS FOR FUTURE CONDITIONS

Based on future land use conditions, a spreadsheet-based analysis method was developed following a field inventory of the existing drainage system. Subdrainage basins to each pipe segment were determined using recent aerial mapping, and future runoff conditions and runoff coefficients based on zoning were applied. Based on previous discussions, time of concentrations were determined to each inlet. From this information, a rainfall intensity was found for a 10-year storm event. Flows at junctions were summed and carried forward to the next pipe segment. Physical data describing each proposed pipe segment was input and used to calculate pipe capacity based on the projected flow conditions.

Chapter 5

MANAGEMENT MEASURES

Scappoose Storm Drain System Master Plan

CHAPTER 5.
MANAGEMENT MEASURES

5.1 INTRODUCTION

The purpose of this chapter is to present background and guidance for nonstructural issues related to management of storm drainage systems. Specifically, the following sections address design standards, maintenance issues, and legal/liability issues related to storm drainage in Scappoose.

5.2 DESIGN STANDARDS REVIEW

Based on review of the existing drainage design criteria for Scappoose, potential stormwater discharge to wetland areas, and in anticipation of future nonpoint source stormwater regulations, the following sections present suggested approaches for future use by the City.

Erosion and Sediment Control Guidelines
The City should develop a set of erosion and sediment control guidelines as a separate section added to the existing design standards. Alternatively, the City could adopt or modify standards currently in use in Washington County.

Water Quality Control Guidelines
Because areas projected for new development have the potential for discharge to wetlands, and in anticipation of future non-point source regulations, the City should develop a set of water quality control guidelines. The existing design standards should be expanded to include facilities such as: biofiltration swales, oil/water separators, water quality detention facilities, vegetated filter strips, wet/dry storage vaults and sand filters.

Sheet Flow Escape Routes
In addition to existing City criteria, sheet flow escape routes should be investigated for situations in which storms of greater than design magnitude are encountered or when the downstream drainage system becomes clogged. For example, during design of improvements or development review, site grading should be checked and modified where necessary to ensure that excess flows or volumes have a route for escape without endangering property or jeopardizing public safety.

Catch Basins and Manholes
It is suggested that the City continue using sediment trapping catch basins and not inlets. This will facilitate maintenance of the system, ensure that pipe capacity is not reduced by inflowing debris, and will likely be a long-term benefit to water quality. Most of the surface water pollutants are held within the solids that enter the drainage system, and catch basins will allow for easy removal.

Dry Wells

Dry wells, or stormwater sumps, are an alternative means of stormwater disposal which discharge to the ground. However, dry wells are not an effective means of stormwater disposal. Dry wells can become clogged or plugged during storm events causing potential damage to downstream property owners. Dry wells also require regular cleaning and maintenance to ensure proper functioning during storm events. Also, long-term discharge to the ground could pose geotechnical and slope stability hazards.

In addition, potential discharge of pollutants could occur over long periods of time and be unnoticed. While dry wells are not strictly prohibited, Oregon Administrative Rules (OAR 340-44-050) contain provisions under which dry wells should be considered/not considered feasible.

The City should use the above described guidelines for drainage improvements or develop design standards for design and implementation of drainage improvements throughout the City's urban growth boundary (UGB). The standards provided herein should be viewed as guidance for design, implementation, and construction of public drainage improvements.

5.3 MAINTENANCE ISSUES

To ensure that the City's storm drainage system will continue to function effectively, and to make full utilization of the existing storm drainage system capacity, a regular program of maintenance is suggested. The City currently has over 30,000 feet of storm drainage piping (almost 6 miles), 300 storm catch basins, 140 manholes, as well as detention ponds, detention pipes and other structures in the storm drainage system inventory (see Appendix F). For purposes of evaluating the storm drainage maintenance requirements for the City of Scappoose, a recommended level of maintenance service was applied to the existing system inventory. Costs were then derived using projected production rates and unit costs for the various maintenance functions. The total annual maintenance budget for the existing system is estimated at $50,000. In summary, this maintenance budget allows for cleaning of all catch basins up to twice annually, all pipes on a 2-year cycle, and other repair, replacement, maintenance and system inventory requirements (see Appendix F).

5.4 RIPARIAN CORRIDOR PROTECTION

Open drainageways throughout the City should be protected. Jackson Creek, South Scappoose Creek and its hillside tributaries to the west, and other open drainageways should have setback requirements for all new development. Establishing setback requirements for ravines and other steep slope areas is difficult, but METRO has developed a model ordinance which provides guidance for establishing stream buffers (see Appendix G). The City should adopt an ordinance which uniformly considers setbacks for both wetlands and open drainageways.

5.5 LEGAL/LIABILITY ISSUES

This section presents a general background on drainage-related legal/liability issues and should not be used in lieu of advice from the City's legal counsel. Therefore, the following items present a general overview of potential storm drainage liabilities. Historically, the basis for stormwater litigation has been a tort action, as follows:

A municipality undertaking a public drainage improvement is treated like a private party (Harbison v. City of Hillsboro) and is liable for damage resulting from negligence or an omission of duty. *(Reference 10)*

Municipalities are generally under no legal duty to construct drainage improvements unless public improvements require drainage facilities (Denver v. Mason) *(Reference 11)*

Municipalities are not liable for damages due to overflow of its drainage system in cases of extraordinary/unforseeable rains or floods. (McQuillan) *(Reference 12)*

Municipalities will likely be liable in cases where they take responsibility for collection of surface waters which are then released onto private property which has not historically received runoff; where dams/diversions cause an overflow onto another's land; or where there is failure to exercise reasonable care in the maintenance and repair of drainage improvements. *(Reference 12)*

In the State of Oregon, the civil law doctrine of drainage applies. Under this doctrine, adjoining landowners are entitled to have the normal course of natural drainage maintained. The lower landowner must accept water which naturally comes to his land from above, but he is entitled not to have the normal drainage changed or substantially increased. The lower landowner may not obstruct the runoff from the upper land, if the upper landowner is properly discharging the water. *(Reference 7)*

Chapter 6

FUNDING ALTERNATIVES

Scappoose Storm Drain System Master Plan

CHAPTER 6.
FUNDING ALTERNATIVES

6.1 OVERVIEW

This section describes the range of alternative funding sources that municipalities have used in implementing drainage improvements.

State/Federal Grants and Loans
Various grant/loan programs are available at both the federal and state level. However, no single grant/loan program is available on a consistent, on-going basis for funding of local stormwater management. With communities competing on both a state-wide and even nation-wide basis, and with constraints on how grant/loan money is to be used, these sources can only serve to supplement an existing local funding program for stormwater management.

Debt Financing
General obligation bonds and revenue bonds are two commonly used forms of debt financing for public infrastructure improvements. General obligation bonds, primarily used for major capital improvements, are subject to voter approval and are backed by the full credit of the government issuing them. Revenue bonds, on the other hand, may be sold and secured only by those specific revenue sources which are earmarked for their payment.

System Development Charges
These charges are imposed on new development as a way of recovering costs for that portion of existing system capacity solely attributable to new development or for that portion of required system up-sizing. System development charges can begin to answer questions of who should pay for required up-sizing of the stormwater system due to new development, or how historical payers into the system can recover their costs in over-sizing facilities that enable future growth.

Fee-In-Lieu of On-Site Detention
These fees afford a land developer the option of either constructing an on-site stormwater detention facility in accordance with established design criteria, or paying a fee into a fund dedicated to the construction of an off-site or regional stormwater detention facility serving multiple properties. These fees tend to promote siting and construction of regional versus on-site detention facilities, however, cash flow necessary for a regional stormwater detention facility may not necessarily coincide with the required construction timing.

Improvement Districts and Special Assessments
The concept of deriving funding from local improvement or special assessment districts is founded on quantifying benefits. For water, sewer or street improvements, these benefits can often be easily identified and thus quantified. However, drainage differs in the respect that upstream or hillside properties that are major contributors of runoff may not be specific recipients of benefits.

Plan Review and Inspection Fees
These fees are intended to recover the expense of examining development plans to ensure consistency with comprehensive land use and stormwater master plans, and to ensure that construction standards and regulations are met at the construction site. These fees are not intended to be a primary revenue generating source.

Stormwater Service Charges
Another method gaining popularity for financing stormwater management is the utility-based service charge. Historically, the concept of considering stormwater as a public utility attracted very few communities. However, as other more conventional funding sources became difficult to obtain, and as federal requirements increase, the service charge concept has generated greater appeal. Service charges for stormwater management reflect a rationale that those who contribute to stormwater problems should logically contribute to the costs of providing mitigative services.

Ad Valorem Taxes
Ad valorem taxes are taxes levied on a property as a direct result of *"value added"* to the subject property. However with stormwater, there is no clear correlation between property value and contribution of runoff. Ad valorem taxes could provide a significant source of revenue, however with the apparent lack of equity, should not be considered a primary source for funding stormwater programs.

6.2 SUMMARY

Stormwater service charges and system development charges have typically been viewed by municipalities as the most equitable and reliable methods for funding stormwater capital and maintenance needs. When used in combination, these methods also distinguish both public and private responsibilities.

6.3 BASIS FOR STORMWATER FUNDING IN SCAPPOOSE

Previous sections of this ***Storm Drain System Master Plan*** have identified the problems and necessary improvements for the stormwater system within the City. The key recommendations resulting from this Plan are:

- Scappoose has significant stormwater facility requirements;
- Maintenance of the City's existing stormwater system cannot be adequately funded within current revenues;
- Phase II NPDES and Clean Water Act compliance mandate local funding for which Scappoose may be a future permit applicant;
- Virtually all jurisdictions in Clackamas, Washington and Multnomah Counties have formed or are in the process of forming stormwater utilities; and
- In May of 1993, the Oregon Supreme Court rendered its decision and in a unanimous vote, overturned the Oregon Tax Court decision and ruled that stormwater utility fees are "incurred charges" under the Measure 5 interpretation and not a "tax".

6.4 REGULATORY MANDATES & PROPOSED SERVICE LEVELS

National Pollutant Discharge Elimination System (NPDES)
Under the Clean Water Act, as implemented through the State's Department of Environmental Quality (DEQ), the City of Scappoose may be required to prepare and implement a plan for characterization and reduction of "nonpoint source" pollution (pollution carried by stormwater runoff). Additional and significant new costs are anticipated in terms of water quality monitoring, staff time and field screening analysis. This program affects all stormwater discharges to "waters of the United States", i.e., the Columbia River system.

Overall Stormwater Needs in Scappoose
The City has determined that its initial stormwater program will focus on facility improvements and an enhanced level of service for system maintenance. The expenditure categories are summarized as follows:

Operations and Maintenance service levels are based on the need to allocate staff to the system in order to continue current maintenance, undertake remedial maintenance projects and increase maintenance frequencies. It is expected that stormwater utility field activities will be expanded to include maintenance of open system, piped system, catch basins/inlets, roadside ditches, erosion control installations, detention/retention facilities and culverts. Exhibit A contains a maintenance worksheet summarizing maintenance activities, frequencies, crewing, equipment and estimated costs.
Estimated Annual Budget = $55,000 - $70,000

Engineering Services relates to engineering, design management and technical support functions. Specifically, this will include project management, maintaining technically current design criteria and standards. While plan review and construction inspection will also be performed, these activities are funded through plan review/inspection fees which are paid to the City's General Fund. Therefore, these costs are not reflected in the stormwater budget.
Estimated Annual Budget = $20,000 - $25,000

Public Works Administration and Support represents the administrative and technical staff time committed to management and development of the stormwater program in terms of intergovernmental coordination, regulatory compliance and code development.
Estimated Annual Budget = $15,000 - $20,000

Small Works Program will be directed at minor structural improvements, repairs and replacement of the stormwater system and basin analysis/master plan updates. Smaller, localized problems arising in the future and not specifically identified in the master plan (such as broken pipes and catch basins, pipe outfall protection and ditch erosion) can be dealt with through this program.
Estimated Annual Budget = $25,000 - $30,000

Public Information includes expenditures for public awareness brochures/flyers regarding stormwater program needs, costs and rates. Billing stuffers and newsletters/fact sheets will also be developed as part of the short-term utility implementation information effort and longer term program of public involvement regarding site quantity/quality controls.
Estimated Annual Budget = $3,000 - $4,000

Finance/Billing/Accounting/Payroll are the utility support functions related to stormwater data processing, invoicing, remittance handling and accounting. The stormwater program's pro rata share of revenue generated in relation to the City's other utility programs is estimated based on projected staffing impacts and allocations based on the total number of additional accounts generated as a result of the program.
Estimated Annual Budget = $8,000 - $10,000

Indirect Cost for the FY 99 period includes the costs which are allocated to Scappoose's stormwater utility for city manager, city attorney and human resources time. This category also includes the utilities allocation for general government support. The current indirect cost pool is not expected to increase as a result of the stormwater utility.
Estimated Annual Budget = $6,000 - $8,000

6.5 RATE METHODOLOGY

Contribution Base
Stormwater service charges must be based on factors which relate customer payment with use of the stormwater system and program. In most cases, stormwater programs quantify this relationship in terms of a property's developed condition and the corresponding increase of impervious area. Engineering analysis and legal *precedent (Teter vs. Clark County Storm Water Utility - State of Washington; Long Run Baptist Association vs. Metropolitan Sewer District - State of Kentucky)* have established the correlation between impervious factors and impact on the stormwater system. Accordingly, rate making for stormwater programs attempts to quantify a property's contribution of runoff to the stormwater system in an equitable and cost-effective manner.

The base unit of the service charge is referred to as an "Equivalent Service Unit" (ESU). An ESU in the Scappoose area has been estimated as 2,750 square feet of impervious surface for the "average" single family home.

Impervious Area Measurement
The development factor most related to contribution of runoff is impervious area. Impervious area is typically defined as hard surface area including roof lines, parking, and driveways which impede the natural infiltration of stormwater into the soil. Due to the overall similarity of single family dwellings in terms of impervious coverage, the City may choose to treat single family residences as 1 ESU. All non single family residential customers would be charged based on measured impervious area. These measurements have not been undertaken to date but are anticipated over the next 6 months.

Rate Issues

- Exemptions - This issue addresses the rate treatment of tax-exempt properties, such as churches and schools, as well as properties such as streets, direct discharge areas, and undeveloped parcels. The issue is critical in maintaining the legal integrity of the service charge. Once artificial classes of customers - or non-customers - are allowed, then the distinction between a service charge and tax is blurred. For this reason, it is not possible to exclude typically "tax-exempt" properties from the charge, and still remain a service charge under either Measure 5 or generally accepted utility rate making standards.

  Public streets are generally exempted from the fee as they are designed to operate as part of the stormwater system. Direct discharge properties have, in some cases, been exempted because they do not drain to the City's system. The same logic applies to undeveloped property which, by definition, do not contain any impervious coverage. Lacking any impervious area would place these parcels outside the established rate structure.

  An issue which the City may wish to consider is the City's current policy of exempting its own facilities from utility service charges (water and sewer). Applying this same policy to the proposed stormwater utility may impact its ability to defend against allegations that it is a "tax" under the Measure 5 definition because there is no "use/nonuse of system" logic to support different rate treatment of City-owned facilities.

- Credits - Most stormwater programs offer service charge credits for on-site stormwater mitigation facilities which they construct and maintain. This service charge credit is limited to a maximum allowable reduction based on the demonstrated ability of the facility to attain pre-development flows from the developed site. Conversely, some utilities do not allow a service charge credit based on the fact that on-site mitigation is a known condition of development and reducing post development flows from the site is mandatory under most stormwater ordinances. Rewarding developers for simply meeting stormwater requirements is not considered equitable by some utilities. In Oregon, however, it is essential that the service charge meet the "Measure 5" test of controllability. It is expected that a credit provision will provide the control mandated under recent Tax Court rulings.

  The City does have a low income utility fee reduction which can be incorporated into the stormwater rate structure. This reduction will be the same percentage as the other utility discounts and will require the same eligibility review as in the City's other utility operations.

- Service Charge Waiver - This rate provision represents further legal protection against the stormwater charge being interpreted as a tax. The intent is to enable those rare, if any, properties to show complete non-service from the utility. The criteria for waiver revolves around the property's ability to show (1) complete on-site retention of stormwater, (2) no up-stream protection from storm events, and (3) no connection or access to publicly owned stormwater conveyances/facilities. All these criteria must be proven by the rate payer prior to receiving a waiver. Again, under Measure 5, it is necessary to establish that the charge is "avoidable" and it is expected that this type of waiver provision will meet this test.

6.6 PROGRAM FINANCING

The financial analysis has evaluated specific options for structuring the stormwater funding program. In doing this, preliminary budget forecasts have been prepared for initial program operations. At the same time, an impervious surface analysis of the Scappoose area has been prepared through review of land use planning data and current mapping. These two elements comprise the cost and revenue components of the stormwater utility financial analysis. A stormwater rate model has been constructed which evaluates the impacts of alternative financial strategies on the actual amount of the service charge.

The proposed rate structure will need to be translated into a specific utility formation and rate ordinance/resolution. Draft ordinance language (Appendix H) should be jointly reviewed by staff, legal counsel and financial consultant to assure consistency with program priorities and compliance with the provisions of Measure 5 and recent Tax Court decisions.

Rate Structure

The following elements should be considered for inclusion in Scappoose's stormwater rate structure:

- Rate based on impervious surface area;
- Two general customer categories: 1) single family, 2) multi family/commercial/industrial;
- Uniform rate applied to single family;
- Rate based on measured impervious area for multi family/commercial/industrial;
- Publicly owned streets are not charged, publicly owned facilities are;
- Rate reduction available to those customers providing on-site controls of stormwater quantity and quality; low income reduction; and
- Rate waiver available to those customers able to show non-use of the City's stormwater system and program.

6.7 REVENUE FORECAST/BUDGET

Revenue Forecast

Actual impervious surface measurements have not been developed to date. However, based on data provided by City staff, estimates have been prepared resulting in the following equivalent service unit totals:

Single Family Residential	1,310	
Multi-Family Residential	200	
Commercial	670	
Industrial	1,600	
Parks/Schools	100	
Other	20	
TOTAL	**3,900**	**ESUs**

Given alternative rates per ESU, the following annual revenue profile would result:

$3.00 per ESU per month	$140,400
$4.00 per ESU per month	$187,200
$5.00 per ESU per month	$234,000

It is important to highlight the fact that the City's rate structure may include both mitigation credits and waivers from the service charge. The fiscal impacts of these rate adjustment provisions have not been incorporated into the above revenue estimates, however, it is reasonable to estimate that these impacts will not exceed 10 to 15 percent of the revenues identified above.

Budget

The initial operating budget is targeted at providing a basic level of stormwater service with emphasis on capital improvements, regulatory compliance, maintenance, public information and water quality programming. Labor costs would focus on allocations of engineer and engineering technician time, maintenance field crew of three persons, along with the Finance Department's program support. Professional service fees would be directed at NPDES permitting costs, along with water quality related sampling, equipment and testing. Based on the existing inventory of capital requirements, an improvements allocation has been included.

The Public Works Department has prepared a CIP for stormwater which will be included in the final rate structure. Options for funding these improvements include both the pay as you go method and issuance of 10 or 20 year revenue bonds. There has also been discussion of combining the City's utility operations under a single/comprehensive utility umbrella with dedicated funds. This type of approach would likely impact the timing for debt financing of capital improvements and the cost of borrowing money for these improvements.

A sample of stormwater rates charged in other Northwest jurisdictions follows:

Portland	$4.05
Unified Sewerage Agency	$4.00
Eugene	$4.00
Lake Oswego	$3.75
West Linn	$3.75
Lower Tualatin	$3.25
Bellevue, WA	$7.25
King County, WA	$6.80

Rate Impacts

Under a rate of $4.00 per ESU, all single family homes in Scappoose would pay $4.00 per month. All non single family residential properties would pay a multiple of this base rate depending on their measured impervious area. The formula for calculating the monthly service charge is illustrated as follows:

$$\frac{\text{Measured Impervious Area}}{\text{2,750 sq ft (est)}} = \text{\# of ESUs} \times \$4.00 = \text{total charge}$$

By way of example (as no measurements are available as yet), some sample stormwater bills might resemble the following types of development:

- smaller strip mall..... $200.00/month *(50 ESUs/137,000 sf/3.2 ac imperv.)*
- apartment building..... $250.00/month *(63 ESUs/172,000 sf/4.0 ac imperv.)*
- larger supermarket..... $450.00/month *(112 ESUs/309,000 sf/7.1 ac imperv.)*

These rates do not reflect any service charge credits or waivers for on-site stormwater quantity or quality management.

6.8 SYSTEM DEVELOPMENT CHARGES FOR STORM DRAINS

SDC Legal Authority

System Development Charges are authorized by Oregon Revised Statutes (ORS) 223.297-314. The statute is specific in establishing the structure for SDCs, how they can be applied, how these funds can be used and the means of their accounting. SDCs are a one time fee imposed on new development, intended to promote equity between new and existing users of public facilities by recovering a proportionate share of existing and planned capital facilities which serve or will serve developing property within Scappoose.

ORS 223 further provides that the charge be calculated based on two fee components. These components are:

- Reimbursement - designed to recover costs associated with capital improvements already constructed or under construction; and
- Improvement - designed to recover costs associated with capital improvements to be constructed.

Under ORS 223, the **reimbursement fee** must consider the cost of existing facilities, prior contributions by existing users of those facilities, the value of the unused/available capacity, and generally accepted ratemaking principles. The objective is to assure that future system users contribute no more than their fair share to the cost of existing facilities.

The reimbursement fee can be spent on capital costs or debt service related to the systems for which the SDC is applied. This means that the reimbursement fee revenues can be used on capital outlays for BOTH existing and future construction, but must be used only for type of facility for which they are collected.

The **improvement fee** addresses the cost of future capital improvements needed to increase the capacity or level of service of the system. In other words, the cost of planned projects which correct existing deficiencies may not be included in the improvement fee calculation. Also, there must be made available to new development a credit to this fee which recognizes any additional costs which new construction incurs in providing a qualified public improvement.

A draft ordinance and resolution for storm drainage system development charges are included in Appendix I.

Chapter 7

RECOMMENDED PLAN

Scappoose Storm Drain System Master Plan

CHAPTER 7.
RECOMMENDED PLAN

7.1 INTRODUCTION

Based upon review of existing and potential future problems, and projects as discussed in Chapter 4, project costs have been estimated as shown in Table 7-1. The projects are presented graphically in Figures 7-1 (A-F).

IMMEDIATE NEED - These projects representing current existing system deficiencies or problem areas needing immediate attention. Immediate is defined as within five years to be accomplished as soon as practical considering construction time requirements and timing associated with other related projects.

FUTURE NEED - These projects representing minor existing system deficiencies and near-term growth related improvements. These are expected to be constructed after the five-year immediate scheme, however, some might be moved to more immediate based on demonstrated need.

POSSIBLE FUTURE NEED - These projects are deemed less desirable due to cost/benefit, impact or long-range future need.

7.2 BASIS OF COST ESTIMATE

Cost estimates for the improvements reflect a total project cost for October 1998 (Engineering News Record Construction Cost Index 6749, Seattle, Washington). These estimates were made using construction costs for similar projects and manufacturers information. The costs do not reflect a detailed investigation of existing utilities and soils. It is important to note that the cost estimates are budget level estimates, not engineering estimates, and are intended to be within the range of plus 35% to minus 20% of the actual project cost. The elements which comprise these budget estimates are:

- Component Cost (materials and installation) - $6.50 per inch-diameter per foot
- Construction Contingencies - 20% of construction cost
- Allied Costs (engineering, administration, legal financing and construction administration) - 30% of construction cost plus contingencies

Example: 870 lineal feet of new 24-inch storm pipe

Construction Cost =	870 feet x 24 inches x $6.50 =	$135,700
Contingencies =	$135,700 x 20% =	27,100
Allied Cost =	($135,700 + $27,100) x 30% =	48,900
Total Project Cost =		$211,700

Once the Master Plan is adopted by the City, the projects listed can be selected for completion through the City's budgeting process. The steps for completion are:

- Project identification and budget level cost estimate (Master Plan)
- Project selection and project budget approval
- Consulting engineer contract to design and construct project
- Preparation of plans, specifications and engineering cost estimates
- Bidding and contract award
- Construction

7.3 ADDITIONAL RECOMMENDATIONS

- The City should add provisions to the current design standards for erosion control, water quality control, sheet flow escape routes and dry wells.

- The City should develop an ordinance for stream and wetland protection buffers.

- The City should establish funding mechanisms (stormwater utility rates and system development charges) based upon and in support of anticipated capital and maintenance costs. Utility rate charges in the range of $3.50 to $4.00 are necessary to support a stormwater program as outlined in Chapter 6. System development charges of approximately $500 per equivalent service unit have been estimated from the capital improvement project list (development allocation $1,723,000 / remaining ESUs 3570).

- The City should establish, as part of the stormwater utility, a budget for a routine storm drainage maintenance program. This has been estimated at $50,000 per year.

- The City should establish as part of the stormwater utility, a budget for small capital projects, such as replacement of broken pipes or catch basins, pipe outfall protection, ditch erosion control and other projects not included in the capital project list.

Table 7-1 Project List

East side of Highway 30					**Utility/ Revenue Bonds**	**Local Improvement District**	**Developer Provided Improvement**	**System Development Charge**
West Lane				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
1,700	15	$6.50	$166,000	$259,000	$259,000			
870	24	$6.50	$136,000	$212,000	$212,000			
1,570	30	$6.50	$306,000	$477,000	$477,000			
1,720	42	$6.50	$470,000	$733,000	$733,000			
5,860			**$1,078,000**	**$1,681,000**	**$1,681,000**	**$0**	**$0**	**$0**
Columbia Avenue				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
700	30	$6.50	$137,000	$213,000	$68,000			$145,000
800	36	$6.50	$187,000	$291,000	$92,000			$199,000
2,000	48	$6.50	$624,000	$974,000	$309,000			$665,000
3,500			**$948,000**	**$1,478,000**	**$469,000**	**$0**	**$0**	**$1,009,000**
Elm Street				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
1,550	15	$6.50	$151,000	$235,000	$235,000			
1,000	24	$6.50	$156,000	$243,000	$243,000			
600	30	$6.50	$117,000	$182,000	$94,000			$88,000
1,600	36	$6.50	$374,000	$584,000	$303,000			$281,000
4,750			**$798,000**	**$1,244,000**	**$875,000**	**$0**	**$0**	**$369,000**
Vine Street				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
600	15	$6.50	$59,000	$92,000	$92,000			
500	18	$6.50	$59,000	$92,000	$92,000			
1,230	24	$6.50	$192,000	$299,000	$299,000			
600	36	$6.50	$140,000	$218,000	$65,000			$153,000
700	42	$6.50	$191,000	$298,000	$89,000			$209,000
3,630			**$641,000**	**$999,000**	**$637,000**	**$0**	**$0**	**$362,000**
Sawyer Street				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
400	15	$6.50	$39,000	$61,000	$61,000			
800	18	$6.50	$94,000	$147,000	$147,000			
1,400	24	$6.50	$218,000	$341,000	$341,000			
2,600			**$351,000**	**$549,000**	**$549,000**	**$0**	**$0**	**$0**
Airport Industrial				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
0	0	$6.50	$0	$0			***Developer***	
0	0	$6.50	$0	$0			***Provided***	
0			**$0**	**$0**	**$0**	**$0**	***Improvement*** **$0**	**$0**
Jackson Creek								
Temporary Pumping Facilities (Trailer Pumps)								
16,000 gpm pump on trailer with separate diesel engine on trailer								
gpm	cfs							
16,000	35.7			$40 - $50K				
16,000	35.7			$40 - $50K				
32,000	**71.3**			**$100,000**	**$100,000**			
East Side of Highway 30 Subtotal				**$6,051,000**	**$4,311,000**	**$0**	**$0**	**$1,740,000**

Table 7-1 Project List (continued)

West side of Highway 30					Utility/ Revenue Bonds	Local Improvement District	Developer Provided Improvement	System Development Charge
5th, 6th, 7th, (Smith Road)				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
1,000	36	$6.50	$234,000	$365,000				
200	18	$6.50	$23,000	$36,000				
200	18	$6.50	$23,000	$36,000				
200	18	$6.50	$23,000	$36,000				
1,600			**$303,000**	**$473,000**	**$0**	**$473,000**	**$0**	**$0**
5th, 6th, 7th (Wheeler Road)				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
1,000	24	$6.50	$156,000	$243,000				
200	18	$6.50	$23,000	$36,000				
200	18	$6.50	$23,000	$36,000				
200	18	$6.50	$23,000	$36,000				
1,600			**$225,000**	**$351,000**	**$0**	**$351,000**	**$0**	**$0**
JP West Storm Pipeline				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
1,000	15	$6.50	$98,000	$153,000	$153,000			
750	24	$6.50	$117,000	$182,000	$182,000			
1,750			**$215,000**	**$335,000**	**$335,000**	**$0**	**$0**	**$0**
Callahan - Dutch Canyon Area				Total				
Length (feet)	Diameter (inches)	Unit Cost $/in-dia-ft	Constr. Cost	Proj Cost				
0	0	$6.50	$0	$0	$0		*Developer Provided Improvement*	
0	0	$6.50	$0	$0	$0			
0			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Scappoose Creek								
US Hwy 30 / Scappoose-Vernonia Hwy ODOT, Columbia County, City of Scappoose								
JP West (low flow culvert)				**$39,000**	$39,000			
EM Watts (low flow culvert)				**$39,000**	$39,000			
West Side of Highway 30 Subtotal				**$1,237,000**	**$413,000**	**$824,000**	**$0**	**$0**
East Side of Highway 30 Subtotal				**$6,051,000**	**$4,311,000**	**$0**	**$0**	**$1,740,000**
TOTAL				**$7,288,000**	**$4,724,000**	**$824,000**	**$0**	**$1,740,000**

fig7-1a 1=600 2640064 11.2.98 CLRBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1A
RECOMMENDED PLAN

N

300 0 300 600
GRAPHIC SCALE 1"=600'

DUTCH CANYON RD
MOUNTAIN VIEW DR
WEST RD
EM WATTS RD
EM WATTS DRAINAGE IMPROVEMENT
SOUTH SCAPPOOSE CREEK
JP WEST DRAINAGE IMPROVEMENT
CALLAHAN-DUTCH CANYON IMPROVEMENT
CALLAHAN COUNTY RD
DUTCH CANYON RD
JENNY
4TH ST
EM WATTS RD
MAPLE ST
JP WEST RD
JP WEST STORM PIPELINE
1ST ST
C.J.D. COLUMBIA RIVER HWY
COLUMBIA RIVER HWY 30
ELM ST
MCINTOSH ST
MAPLE ST
OAK ST
MYRTLE ST
OLIVE ST
COLUMBIA AVE
PRAIRIE ST

fig7-1B 1=600 2640064 11.2.98 CURBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1B
RECOMMENDED PLAN

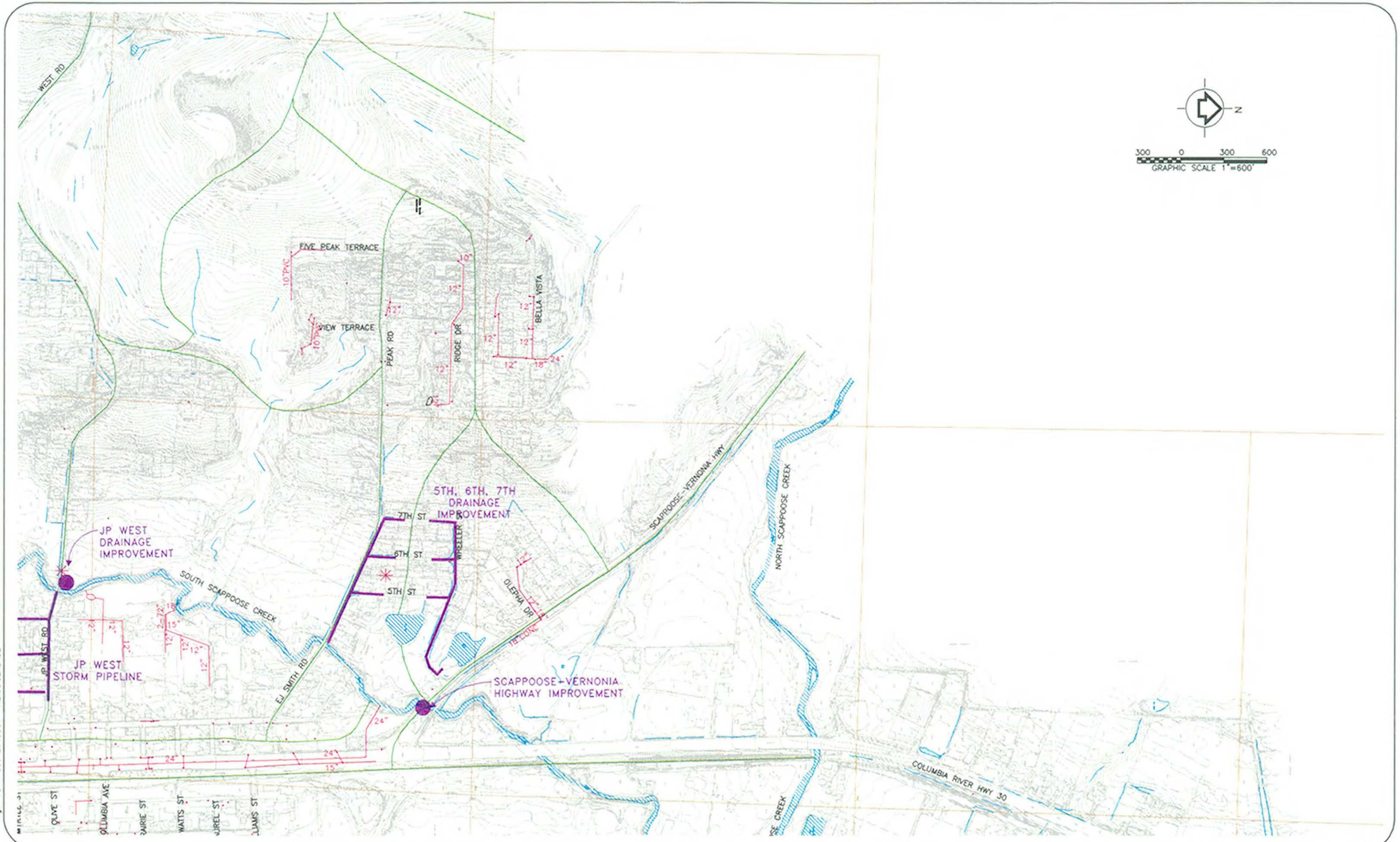


fig7-1C 1=600 2640064 11.2.98 CURBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1C
RECOMMENDED PLAN

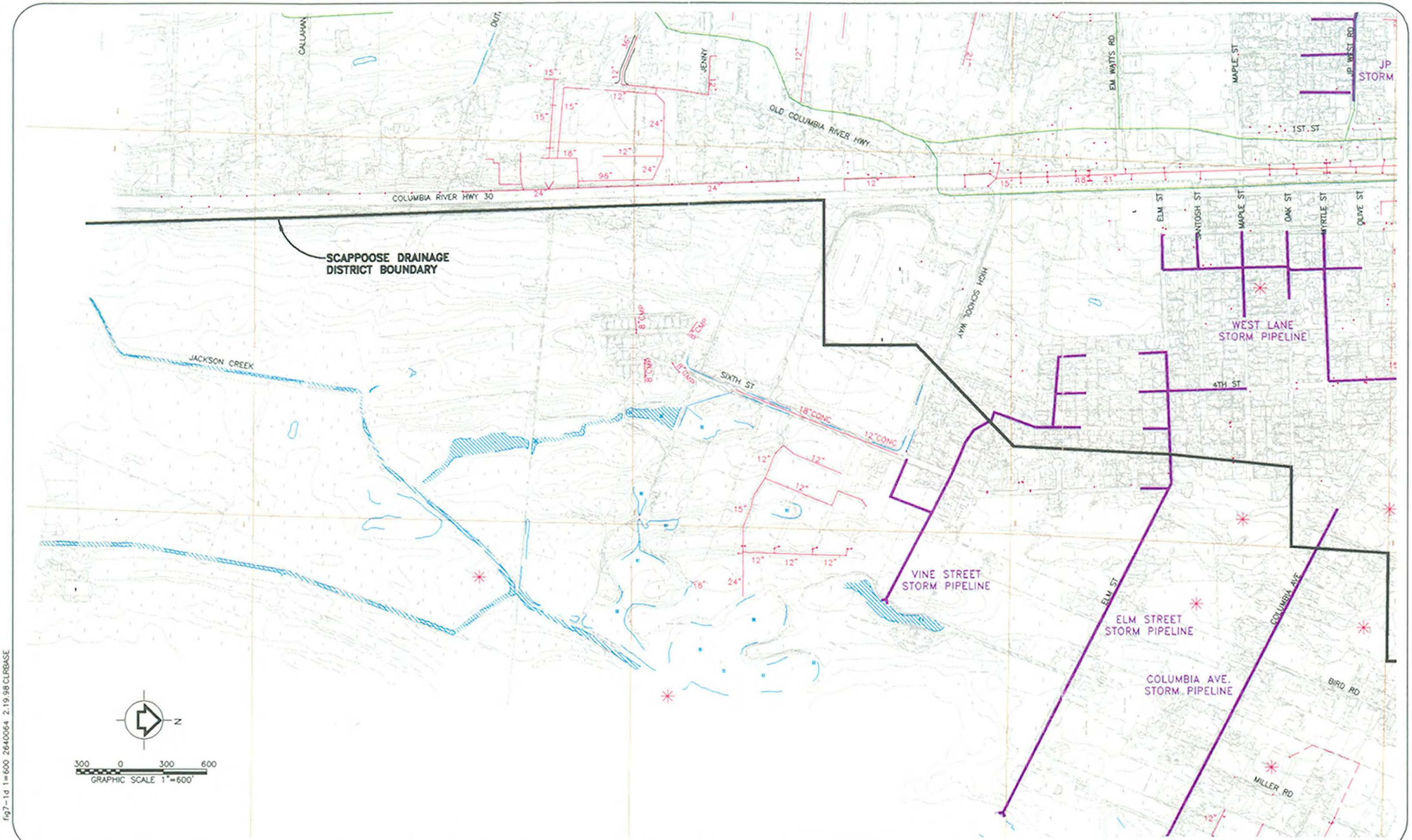


fig7-1d 1=600 2640064 2.19.98 CURBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1D
RECOMMENDED PLAN

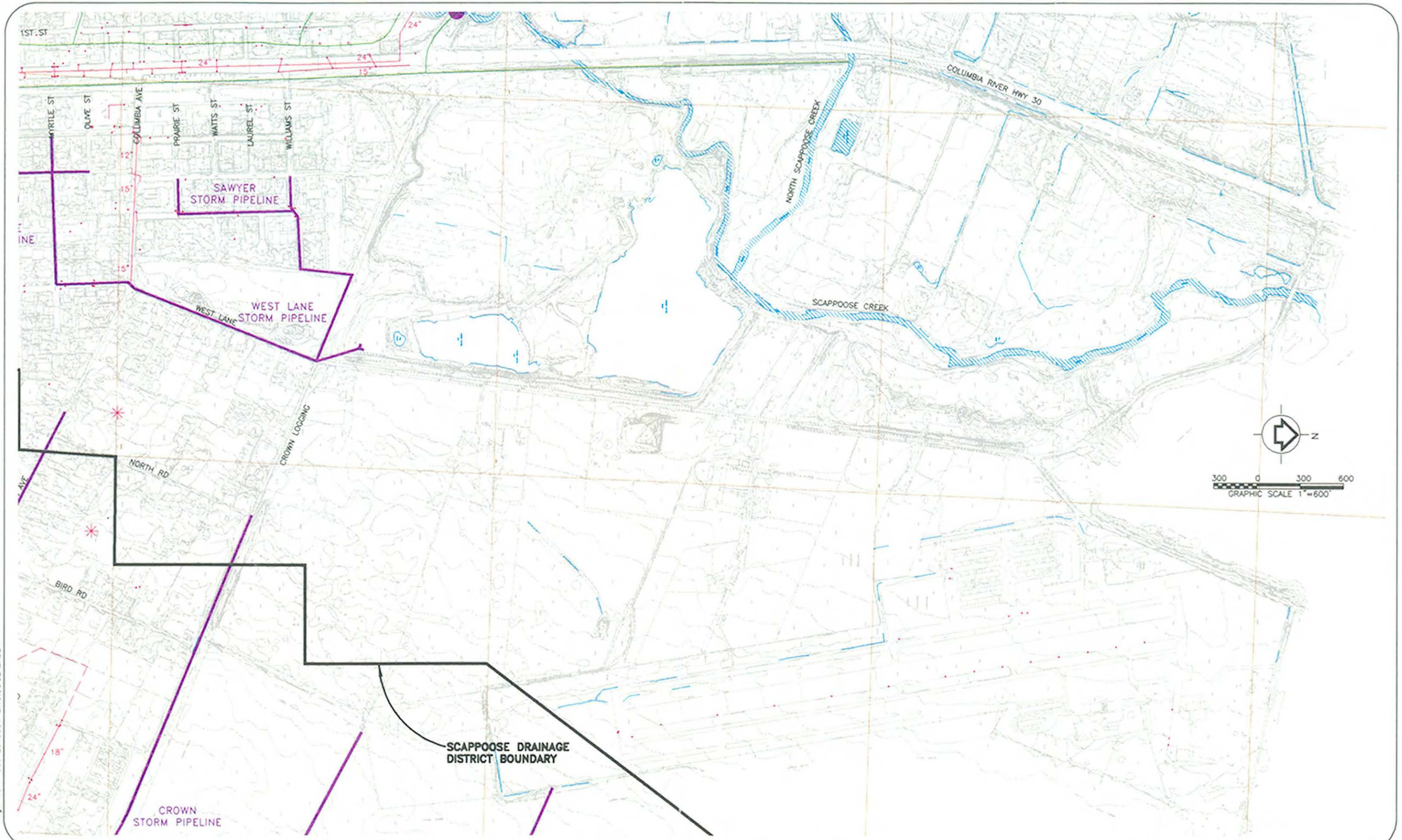


fig7-1e 1=600 2640064 2.19.98 CURBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1E
RECOMMENDED PLAN

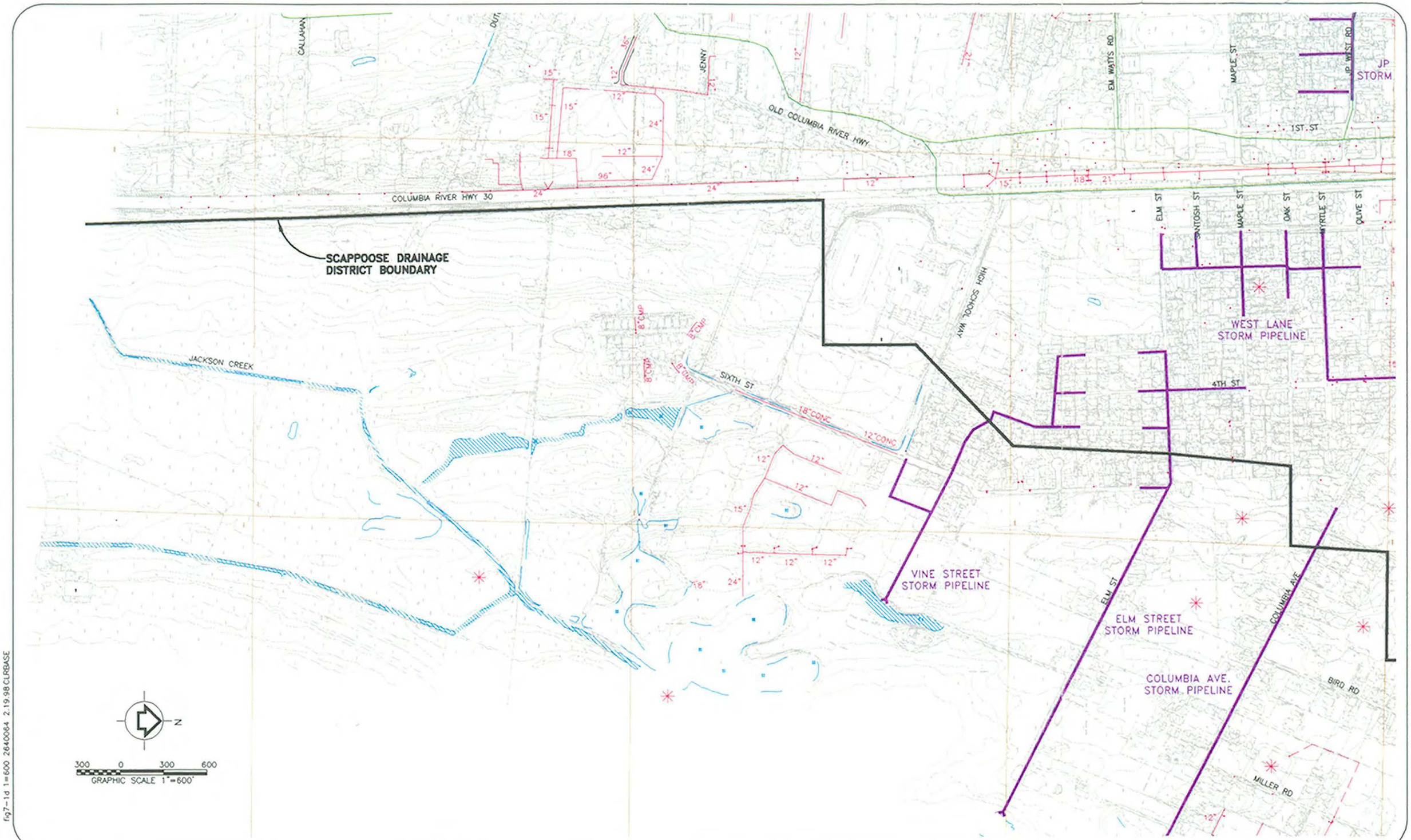


fig7-1d 1=600 2640064 2.19.98 CLRBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1D
RECOMMENDED PLAN

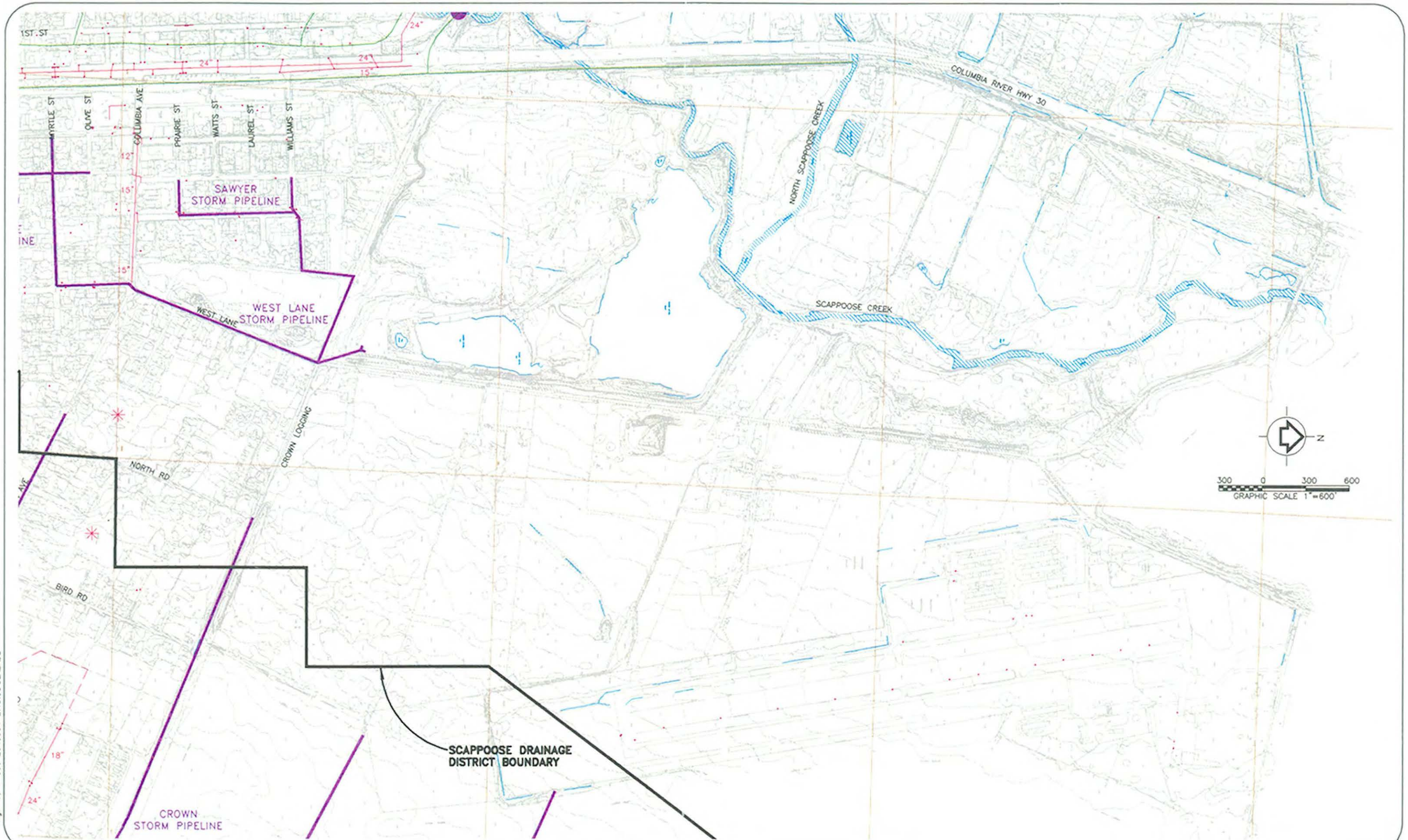


fig7-1e 1=600 2640064 2.19.98 CLRBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1E
RECOMMENDED PLAN

VINE STREET
STORM PIPELINE

ELM ST

ELM STREET
STORM PIPELINE

COLUMBIA AVE

COLUMBIA AVE.
STORM PIPELINE

NORTH RD

BIRD RD

MILLER RD

12"
12"
12"
12"
12"
18"
18"
24"
24"

SCAPPOOSE DRAINAGE
DISTRICT BOUNDARY

CROWN
STORM PIPELINE

FUTURE
STORM PIPELINE

JACKSON CREEK

N

300 0 300 600
GRAPHIC SCALE 1"=600'

fig7-1F 1=600 2640064 11.2.98 CURBASE

KCM

LEGEND

- STREAMS, OPEN CHANNELS
- PIPE SYSTEMS
- DRAINAGE BOUNDARIES
- RECOMMENDED IMPROVEMENTS
- DRY WELL
- PROBLEM LOCATION

City of Scappoose, Oregon
STORM DRAIN SYSTEM
MASTER PLAN

FIGURE 7-1F
RECOMMENDED PLAN

APPENDICES

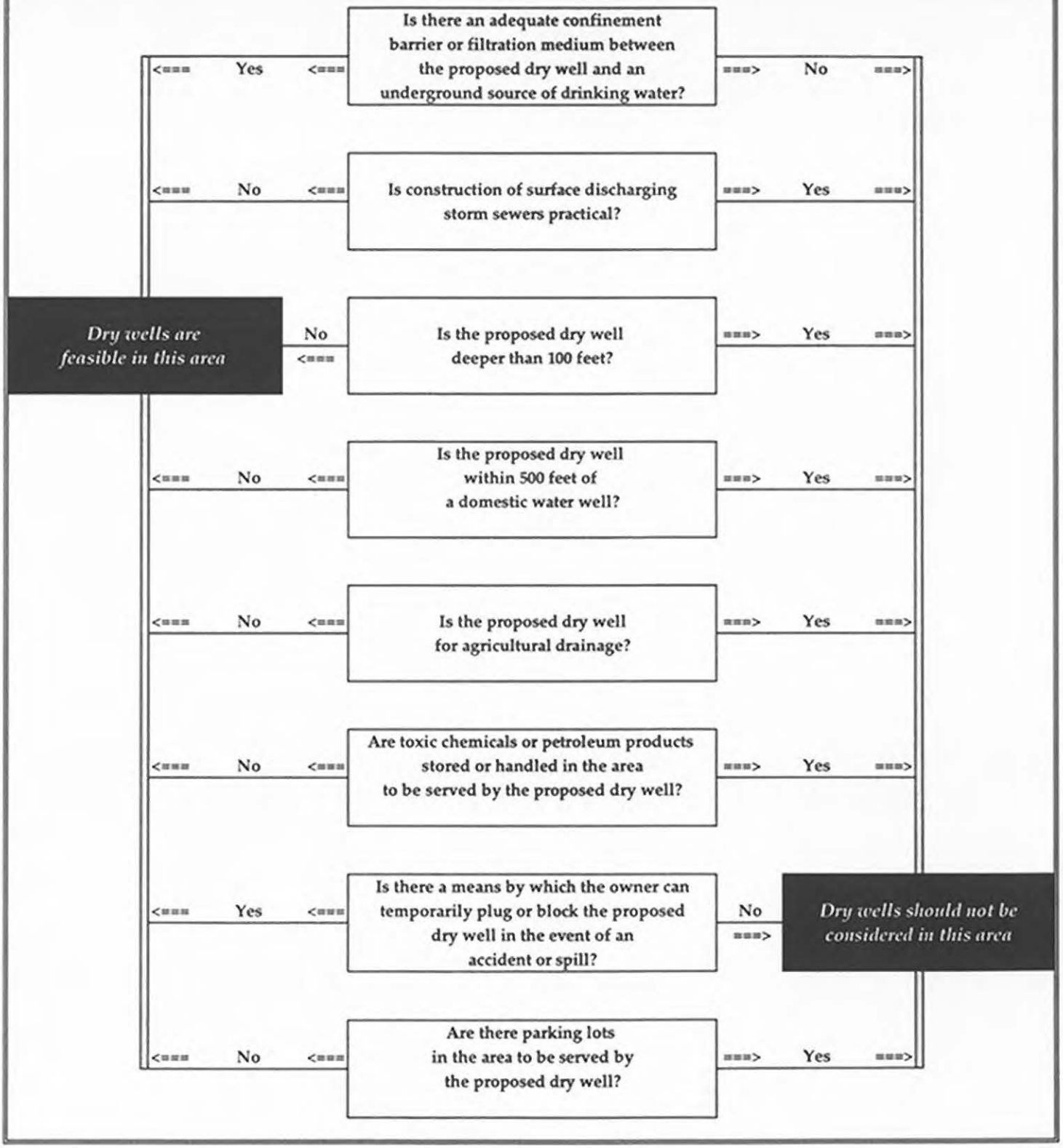
Scappoose Storm Drain System Master Plan

Appendix A

GROUNDWATER DISCHARGE

Scappoose Storm Drain System Master Plan

Flow Chart Summary
Waste Disposal Well for Surface Drainage
(OAR 340-44-050)



Appendix B

PUBLIC INPUT

Scappoose Storm Drain System Master Plan

Form # 4.

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN

CITIZEN COMMENT FORM
Public Open House - March 5, 1997

Please complete this form and return it to Brad Moore at the Sign-in table -OR- return it by mail no later than March 7, 1997, to Ben Shaw, City of Scappoose, P.O. Drawer "P", Scappoose, OR 97056. Thank you.

Name: BOB PINDER.
Address: 34345 NE SUNSET LP. SCAPPOOSE OR 97056.
Phone: 543-5688.

1. **A. Have you experienced any flooding on your property?** XXX **Yes** ____ **No**

   B. If so, what areas of your house/property were flooded?
   ____ **First Floor** ____ **Basement** X **Garage** X **Crawl Space Under House**
   X **Yard/Land** ____ **Other** ____.

   C. If your property has flooded, please describe in detail the extent of the flooding and any damages that occurred. Please include dates and times of the day of the flooding if possible.

FEBRUARY 7, 1996 FLOODING OCCURRED DUE TO STORM. RAINWATER RUNOFF FROM BIRD RD. AND SURROUNDING AREAS CONTRIBUTED TO FLOODING ON PROPERTY IN LOT NEXT TO MINE. WATER WAS APPROXIMATELY 2' DEEP IN STREET. WATER CONTINUED TO RISE AND FLOODED CRAWL SPACE UNDER HOUSE. WATER WAS HALFWAY UP INTO YARD, AND CRAWL SPACE WAS ABOUT 8" DEEP AT THAT POINT. I STARTED TO PUMP OUT SPACE. I HAD TO CONTINUE PUMPING FOR 1½ WEEKS AFTER RAIN STOPED. THERE WAS ABOUT 2" AN HOUR COMING IN [redacted] FOR ABOUT 5 DAYS. WATER RUNOFF FROM PRIVATE ROAD BEHIND HOUSE WENT UNDER GARAGE DOOR AND INTO GARAGE. IN ATTEMPT TO REDUCE STANDING WATER IN ROAD, BEN SHAW OPENED SEWER LINES TO STREET, TO HELP DRAIN THE ROAD. DAMAGE TO PROPERTY RESULTED IN REPLACEMENT OF HEAT DUCTS AND INSULATION AT A COST OF $1000.00.

DECEMBER 28, 1996 RAIN FELL AGAIN AND FLOODED STREET WITHIN TWO DAYS. X-MAS VACATION WAS CUT SHORT WITH A CALL FROM NEIGHBORS WITH CONCERN TO OUR PROPERTY. UPON ARRIVING HOME WATER WAS ALREADY HALF WAY IN FRONT YARD. THE WATER STAYED APPROXIMATELY 1½ WEEKS AND RESULTED IN PUMPING OUT CRAWL SPACE AGAIN FOR A PERIOD OF 1 WEEK

2. **Based on your observations, did it appear that the flooding came from the street, or another property or source? Please describe in detail.**

BASED ON MY OBSERVATION THE WATER IN THE STREET WAS A DEFINITE SOURCE OF FLOODIN THE DRY WELL SUMPS ARE NOT ADEQUATE. WATER TABLE IS TOO HIGH TO START WITH, AND WATER WAS ALSO FORCED STRAIGHT OUT OF THE GROUND. ALL STANDING WATER WAS ALSO TESTED, AND FOUND TO BE CONTAMINATED, DUE TO SEPTIC AND FARM LAND. SUNSET LOOP IS ALSO A LOW SPOT FOR WATER RUNOFF OF ROADS AND LAND BETWEEN BYRD RD. AND MILLER RD.

3. **Have you had any other significant drainage related problems? X Yes _____ No**
If so, please describe in detail.

ANYTIME IT RAINS FOR MORE THAN 2 DAYS, WE HAVE STANDING WATER IN THE STREET. AT ANY GIVEN TIME THE DRYWELL SUMP IS ALWAYS NO LESS THAN HALF FULL. EVEN PEOPLE JUST WASHING THERE CARS ADDS TO THE SUMP IN STREET, AND WATER TABLE WILL NOT [redacted] ALLOW WATER TO DRAIN PROPERLY.

RECEIVED
MAR 10 1997
PORTLAND OFFICE
KCM, INC.

4. **Have you made any changes to your home or property as a result of flooding?**
_____ Yes X No
If so, please describe in detail.

PRETTY HARD TO DO WHEN YOUR HOME WAS BUILT AND APPROVED BY CITY OR COUNTY TO BE IN A LOW AREA RESULTING IN BEING A POND. A SUMP PUMP MAY BE SOMETHING TO LOOK AT IN THE FUTURE. BUT AS IT IS NOW, THERE IS ONLY A RECIRCULATION EFFECT TO TRY TO KEEP AS MUCH WATER OUT OF CRAWL SPACE AS POSSIBLE, UNTIL WATER LEVEL GETS TO A CERTAIN POINT, AND THEN IT'S NO GOOD WITHOUT THE WATER IN STREET GOING SOMEWARE. WE ARE UNSURE WHETHER OR NOT TO EVEN DO LANDSCAPING OR FENCE ETC. WHEN PROBLEM IS REACURRING.

Form # 6 .

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN

CITIZEN COMMENT FORM
Public Open House - March 5, 1997

Please complete this form and return it to Brad Moore at the Sign-in table -OR- return it by mail no later than March 7, 1997, to Ben Shaw, City of Scappoose, P.O. Drawer "P", Scappoose, OR 97056. Thank you.

Name: R. Dale Grubb.
Address: 33918 NE Prairie St. Scappoose.
Phone: 503-543-6037.

1. **A. Have you experienced any flooding on your property?** X **Yes** ____ **No**

B. If so, what areas of your house/property were flooded?
____ First Floor ____ Basement ____ Garage ____ Crawl Space Under House
__✓__ Yard/Land ____ Other ____.

C. If your property has flooded, please describe in detail the extent of the flooding and any damages that occurred. Please include dates and times of the day of the flooding if possible.

We are on a dead end street. The water runs down to us for 2 blocks. There is no place for the water to go except around 3 houses then.
Feb, 1996 afternoon.

2. **Based on your observations, did it appear that the flooding came from the street, or another property or source? Please describe in detail.**

Street. We are on a dead-end with no storm drainage. It is easy to see rain water running down the street during heavy rains

3. **Have you had any other significant drainage related problems?____Yes__✓__No**
If so, please describe in detail.

4. **Have you made any changes to your home or property as a result of flooding?**
_____Yes__✓__No
If so, please describe in detail.

Form # 8

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN

CITIZEN COMMENT FORM
Public Open House - March 5, 1997

Please complete this form and return it to Brad Moore at the Sign-in table -OR- return it by mail no later than March 7, 1997, to Ben Shaw, City of Scappoose, P.O. Drawer "P", Scappoose, OR 97056. Thank you.

Name: LYNN H MILLS
Address: 34361 N.E. SUNSET LOOP
Phone: 543-7519

1. **A. Have you experienced any flooding on your property?** X **Yes** ____ **No**

   B. If so, what areas of your house/property were flooded?
   ____ First Floor ____ Basement ____ Garage X Crawl Space Under House
   X Yard/Land X Other STREET, DRIVE WAY

   C. If your property has flooded, please describe in detail the extent of the flooding and any damages that occurred. Please include dates and times of the day of the flooding if possible.

1.) DEC. 1995 - AFTER MAJOR WINDSTORM, APPROX 2/3 OF BACK YARD FLOODED TO A DEPTH OF 6-8".

2.) FEB. 1996 - DURING MAJOR FLOOD, ENTIRE BACK YARD, SIDE YARD, DRIVE WAY AND PORTION OF FRONT YARD FLOODED. WATER RAISED TO A LEVEL IN CRAWL SPACE UNDER HOUSE WHERE ALL VENTILATION DUCTS WERE SUBMERGED TO JUST UNDER THE REGISTERS IN EVERY ROOM OF THE HOUSE. REQUIRED ALL DUCTWORK UNDER THE HOUSE TO BE REPLACED. WATER DID NOT TOTALLY RECEED FOR APPROX. 8-WEEKS.

3.) DEC./JAN. (96-97) WATER FLOODED OVER 1/2 OF BACK YARD, AS WELL AS ADJACENT PROPERTY AND STREET IN FRONT OF HOUSE.

2. Based on your observations, did it appear that the flooding came from the street, or another property or source? Please describe in detail.

FLOODING OCCURS AFTER WATER TABLE FILLS UP AND SURFACES OUTO PROPERTY.

3. Have you had any other significant drainage related problems? X Yes_____No
If so, please describe in detail.

AFTER SEVERAL DAYS OF SEVERE COLD AND/OR SNOW AND QUICK THAW, LAWN FLOODS.

4. Have you made any changes to your home or property as a result of flooding?
__X__Yes_____No
If so, please describe in detail.

1) REPLACE ALL VENTILATION FLEX DUCT UNDER HOUSE -
2) CANT DO ANYTHING TO PREVENT LAWN FROM FLOODING. HAVE CONSIDERED ELEVATING BACK YARD TO ELIMINATE THAT PROBLEM BUT IT WILL CAUSE ADDITIONAL PROBLEMS TO NEIGHBORS.

Form # 9 .

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN

CITIZEN COMMENT FORM
Public Open House - March 5, 1997

Please complete this form and return it to Brad Moore at the Sign-in table -OR- return it by mail no later than March 7, 1997, to Ben Shaw, City of Scappoose, P.O. Drawer "P", Scappoose, OR 97056. Thank you.

Name: ROSS TILANDER (SCAPPOOSE DRAINAGE IMPROV. CO.)
Address: 3363 OAKRIDGE DR., SCAPPOOSE, OR .
Phone: 543-7762 .

1. **A. Have you experienced any flooding on your property?** DISTRICT **Yes** HOME **No**

   B. If so, what areas of your house/property were flooded?
   _____First Floor____Basement_____Garage_____ Crawl Space Under House
   _____Yard/Land____Other_____.

   C. If your property has flooded, please describe in detail the extent of the flooding and any damages that occurred. Please include dates and times of the day of the flooding if possible.

LAST TWO YEARS. EXCESSIVE FLOW INTO JACKSON CREEK AT JOHNSON'S LANDING RD. DIVERSION / TIDEGATE.

2. **Based on your observations, did it appear that the flooding came from the street, or another property or source? Please describe in detail.**

HWY 30, FRED MEYER ET AL.

3. **Have you had any other significant drainage related problems?** __V__ **Yes** _____ **No**
If so, please describe in detail.

DRAINAGE IMPROVEMENT CO. HAS INCURRED GEOMETRIC ADVANCES IN PUMPING RELATED COSTS.

DISTRICT

4. **Have you made any changes to your ~~home or property~~ as a result of flooding?**
__X__ **Yes** _____ **No**
If so, please describe in detail.

- ARMY CORPS HAS BEEN BROUGHT TO THE TABLE TO CORRECT FLAWS, REPAIR DIKE, ETC.
- FEE STRUCTURE IS BEING REASSESSED.
- I WOULD LIKE TO SEE (FMDAR) CONTINUED DISCUSSION OF FEES ASSESSED IN SCAPPOOSE (CITY OF) APPLIED TO DRAINAGE DISTRICT PUMPING COSTS.

Form # _____.

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN

CITIZEN COMMENT FORM
Public Open House - March 5, 1997

Please complete this form and return it to Brad Moore at the Sign-in table -OR- return it by mail no later than March 7, 1997, to Ben Shaw, City of Scappoose, P.O. Drawer "P", Scappoose, OR 97056. Thank you.

Name: Michael & Lisa Schott
Address: 34369 NE Sunset Loop Scappoose
Phone: 543-7950

1. A. Have you experienced any flooding on your property? X **Yes** ____ **No**

B. If so, what areas of your house/property were flooded?
____ **First Floor** ____ **Basement** ____ **Garage** X **Crawl Space Under House**
X **Yard/Land** ____ **Other** _____.

C. If your property has flooded, please describe in detail the extent of the flooding and any damages that occurred. Please include dates and times of the day of the flooding if possible.

During the Feb. 1996 flooding, the corner of our backyard extending up to the deck was under water. Also, the crawl space accumulated about 10 inches of water. We purchased a sump pump to keep it under control. We had the heat ducts fumigated as a precaution.

Again, during the Nov. 1996 flooding we had about 8 inches of water in the crawl space. Our backyard only flooded about halfway (15ft) to the deck.

2. **Based on your observations, did it appear that the flooding came from the street, or another property or source? Please describe in detail.**

It appeared to be coming from the street and straight up out of the ground.

3. **Have you had any other significant drainage related problems?____Yes__X__No**
If so, please describe in detail.

4. **Have you made any changes to your home or property as a result of flooding?**
_____Yes__X__No
If so, please describe in detail.

Form # _____.

CITY OF SCAPPOOSE
STORM DRAIN SYSTEM MASTER PLAN

CITIZEN COMMENT FORM
Public Open House - March 5, 1997

Please complete this form and return it to Brad Moore at the Sign-in table -OR- return it by mail no later than March 7, 1997, to Ben Shaw, City of Scappoose, P.O. Drawer "P", Scappoose, OR 97056. Thank you.

Name: _____.
Address: _____.
Phone: _____.

1. A. Have you experienced any flooding on your property?_____Yes_____No

   B. If so, what areas of your house/property were flooded?
   _____First Floor_____Basement_____Garage_____ Crawl Space Under House
   _____Yard/Land_____Other_____.

   C. If your property has flooded, please describe in detail the extent of the flooding and any damages that occurred. Please include dates and times of the day of the flooding if possible.

2. Based on your observations, did it appear that the flooding came from the street, or another property or source? Please describe in detail.

3. Have you had any other significant drainage related problems?____Yes_____No
If so, please describe in detail.

4. Have you made any changes to your home or property as a result of flooding?
_____Yes_____No
If so, please describe in detail.

SCAPPOOSE DRAINAGE MASTER PLAN

PLEASE SIGN IN

	Name	address	Phone
1.	Brad Moore, KCM	7080 SW Fir Loop	684-9097
2.	Ben Shaw		397-5167
3.	Lorne Hampton	33363 Stone Rd. Warren	
4.	BOB & TRACY PINDER	34345 NE SUNSET LOOP SCAPPOOSE	543-5688
5.	Marie Gadotto	33717 Johnsons Landing Rd Scappoose	543-6573
6	Dale Grubb	33918 N E Prairie St. Scappoose	543-6037
7	David + Pauly Lawson	34385 NE Sunset Loop Scapp.	543-6414
8.	LYNN MILLS	34361 N.E. SUNSET LOOP "	543-7519
9.	ROSS TICAHOOK	33963 OAKRIDGE DR.	543-7762

Appendix C

PORTABLE PUMPING SYSTEMS

Scappoose Storm Drain System Master Plan

City of Scappoose *Jackson Creek at Highway 30*														
Recurrence Interval Years	Exceedance Probability %	Regression Constant	Drainage Area, Square Miles			Drainage Area Exponent	Rainfall Intensity (in/hr)	Intensity Exponent	Peak Flow (cfs)	Unit Peak Flow (cfs/sqmi)	Pumping Rate			
			Multnomah County	Columbia County	Total						15,708	31,416	47,124	62,832
											35	70	105	140
											Remaining peak flow			
2	50	8.7	1.32	1.65	2.97	0.87	2.00	1.71	73.4	24.7	38.4	3.4	-31.6	-66.6
5	20	15.6	1.32	1.65	2.97	0.88	2.00	1.55	119.1	40.1	84.1	49.1	14.1	-20.9
10	10	21.5	1.32	1.65	2.97	0.88	2.00	1.46	154.2	51.9	119.2	84.2	49.2	14.2
25	4	30.3	1.32	1.65	2.97	0.88	2.00	1.37	204.1	68.7	169.1	134.1	99.1	64.1
50	2	38.0	1.32	1.65	2.97	0.88	2.00	1.31	245.6	82.7	210.6	175.6	140.6	105.6
100	1	46.9	1.32	1.65	2.97	0.88	2.00	1.25	290.7	97.9	255.7	220.7	185.7	150.7

Appendix D

PROJECT BACKGROUND

Scappoose Storm Drain System Master Plan

SRS Crisafulli

• Makers of *quality* Sludge Removal Systems •

November 18, 1997

Brad Moore Water Resources Engineer
KCM, Inc.
7080 SW Fir Loop
Portland, OR 97223

RECEIVED
NOV 19 1997
PORTLAND OFFICE
KCM, INC.

Dear Mr. Moore:

Thank you for your request for information about SRS Crisafulli pumps and sludge removal systems. I am enclosing a variety of information for your review. SRS Crisafulli manufactures a wide range of submersible pumps, typically used for high volume, low head applications. In very brief terms, here are just a few of their benefits:

+ Pumping capacities from 200 to 18,000 GPM to precisely fit your needs;
+ Move large volumes of water, as well as solids-laden, viscous fluids economically;
+ Fully submersible to eliminate the need for priming and suction hoses;
+ Long, useful life because of design simplicity & rugged construction;
+ PTO, diesel engine, electric or hydraulic motors, whichever you prefer;
+ Supported by warranty as well as our entire staff.

We are often told that our greatest strength is problem solving. For nearly 40 years, together with our industrial, agricultural and municipal customers, we've solved many water & wastewater management problems by applying the best Crisafulli **pump** or **dredge** for the job. Here are just a few of the solutions we've found for customers we regularly serve:

+ Municipal water & wastewater treatment — Our fully articulating cutterhead minimizes turbidity & resuspension of solids while dredging the light sludges most of our municipal customers handle.
+ Power generation — coal-fired plants have found that SRS dredges & pumps capably handle problematic ash, coal fines, and sediment, while maintaining the capacity of run-off ponds.
+ Chemical companies — long-time SRS customers, often prefer the FLUMP (our remote-controlled, unmanned dredge unit) for those hazwaste containments where operator control from shore is preferable to operator "on-board".
+ Mining — metals & minerals producers use SRS dredges & pumps for sludges, slurries, & tailings. We've customized dredges in stainless steel to handle acidic wastes at zinc & bauxite operations.
+ We can now handle weeds while dredging — cleaning & desilting of lakes & waterways is simpler!

Our Factory Representative for your area is:

Mr. Howard Taub • Granich Engineering
127 10th St S, Ste 100, Kirkland WA 98033
Phone: 206-889-8744 • Fax: 206-889-9348

We have informed that office of your interest. Your SRS rep is well equipped to advise you concerning product applications, performance, and pricing. On behalf of SRS, we look forward to serving you.

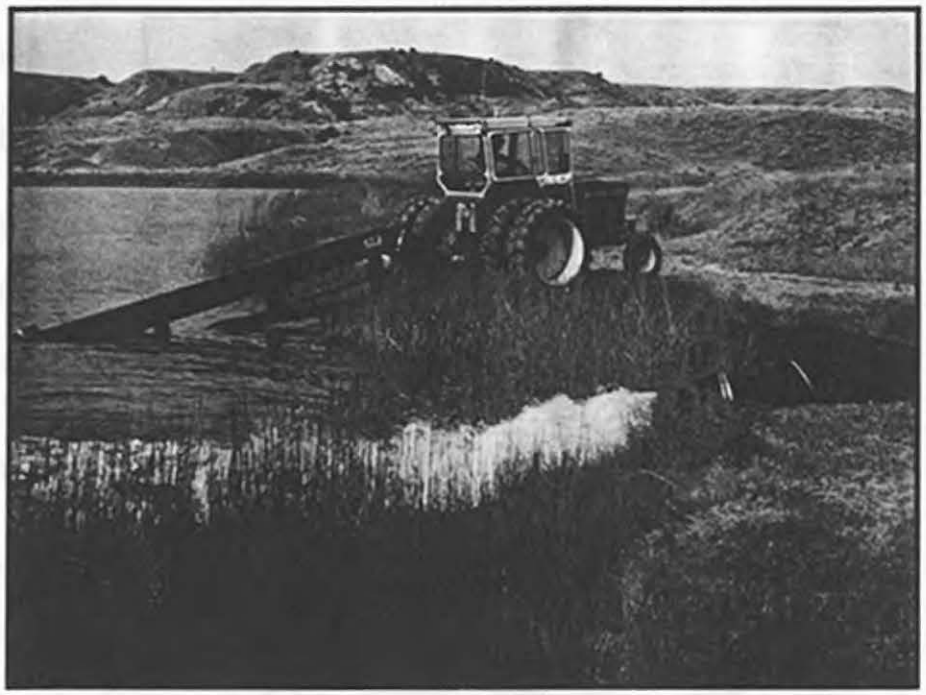
Sincerely,
SRS Crisafulli, Inc.

Kathy Airheart

Kathy Airheart, Marketing Representative

P.O. Box 1051 • Crisafulli Drive • Glendive MT 59330-1051 • USA
Phone: 406-365-3393 • Toll-free: 800-442-7867 • Fax: 406-365-8088 Admin. • Fax: 406-365-2249 Sales

Crisafulli



TRAILER PUMPS

- equipped with PTO shaft to connect pump to your tractor power take-off
- options for diesel, electric, or gasoline power
- simple to operate
- easy to transport
- discharge sizes from 4" - 24"
- pumping outputs from 1,000 to 20,000 gpm

Call or Fax Today for Quotations & Specifications.

Moving large volumes of water . . .

. . . is what your Crisafulli trailer pump will do best! You can simplify your irrigation, dewatering, water transfer and flood control projects with trailer pump portability. At an unimproved pumping site, your trailer pump can be installed and operating within minutes, without check valves, suction hose or priming. **You can pump it — quickly !**

For Purchasing Agents

Price Range:
$5,000 - $15,000

Delivery:
3 - 4 Weeks ARO

Terms:
Net 30 days
with approved credit

Ship By:
Truck

CRISAFULLI PUMP COMPANY CRISAFULLI DRIVE GLENDIVE, MT 59330
TOLL-FREE: 800-442-7867 TELEPHONE: 406-365-3393 FAX: 406-365-8088

Your discharge hose is ready, sir.

4″
6″
8″
10″
12″
16″

- Easy to transport
- Butyl-nylon-rubber
- Weather resistant
- Low friction loss
- Quantity discounts
- Immediate delivery

****

You can load several rolls into a pickup, with no special trailer needed. This hose will go over uneven ground, across ridges, through places where metal pipe won't work.

****

ORDER A ROLL TODAY. Each roll is fifty feet long, ready for your job site.

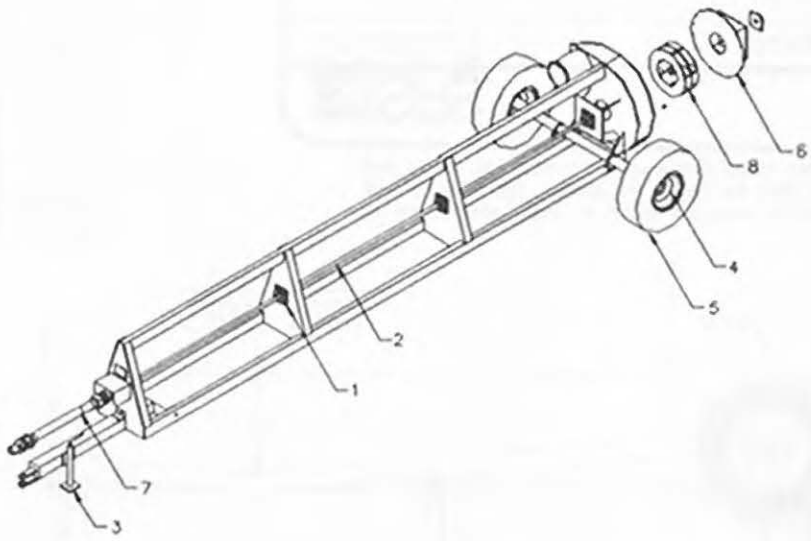
Many contractors also use Crisafulli pumps for their dewatering or sewage work. You can use diesel, gasoline, electric or hydraulic power. And they pump almost anything.

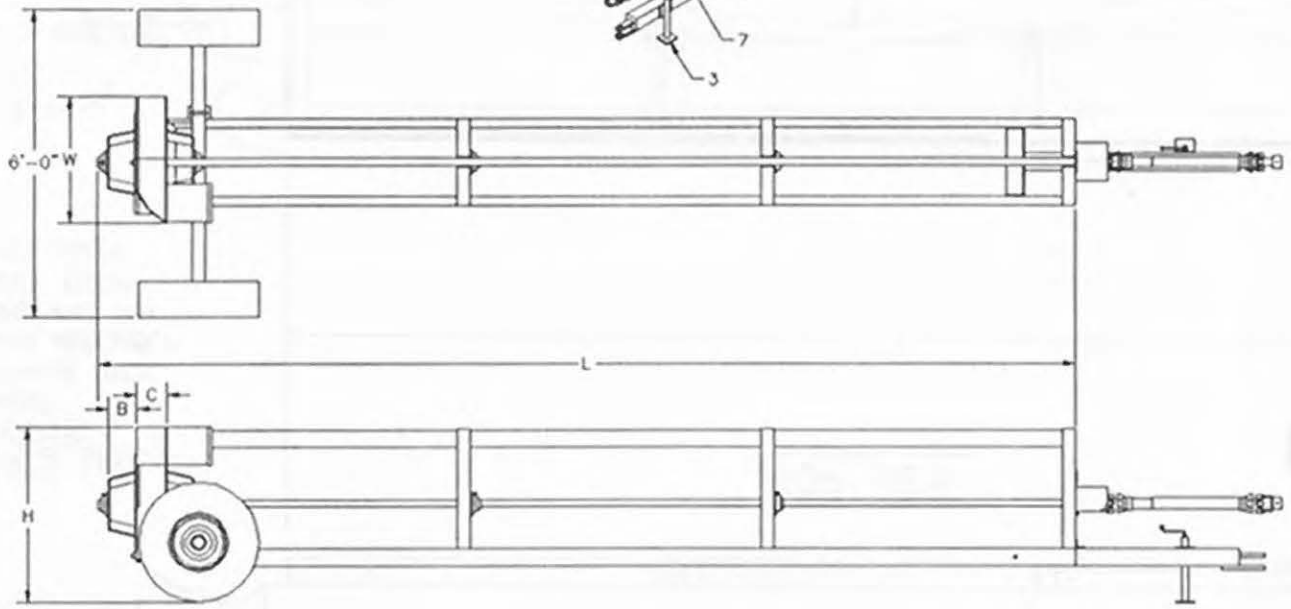
1-800-442-7867
CALL TODAY

Crisafulli Pump Company
Crisafulli Drive
Glendive, Montana 59330

BOSS Printing, Glendive, MT 59330

PARTS LIST
1. BEARING
2. SHAFT
3. TONGUE JACK
4. HUB ASSEMBLY
5. TIRE AND RIM
6. BACK DOOR
7. PTO SHAFT
8. IMPELLER





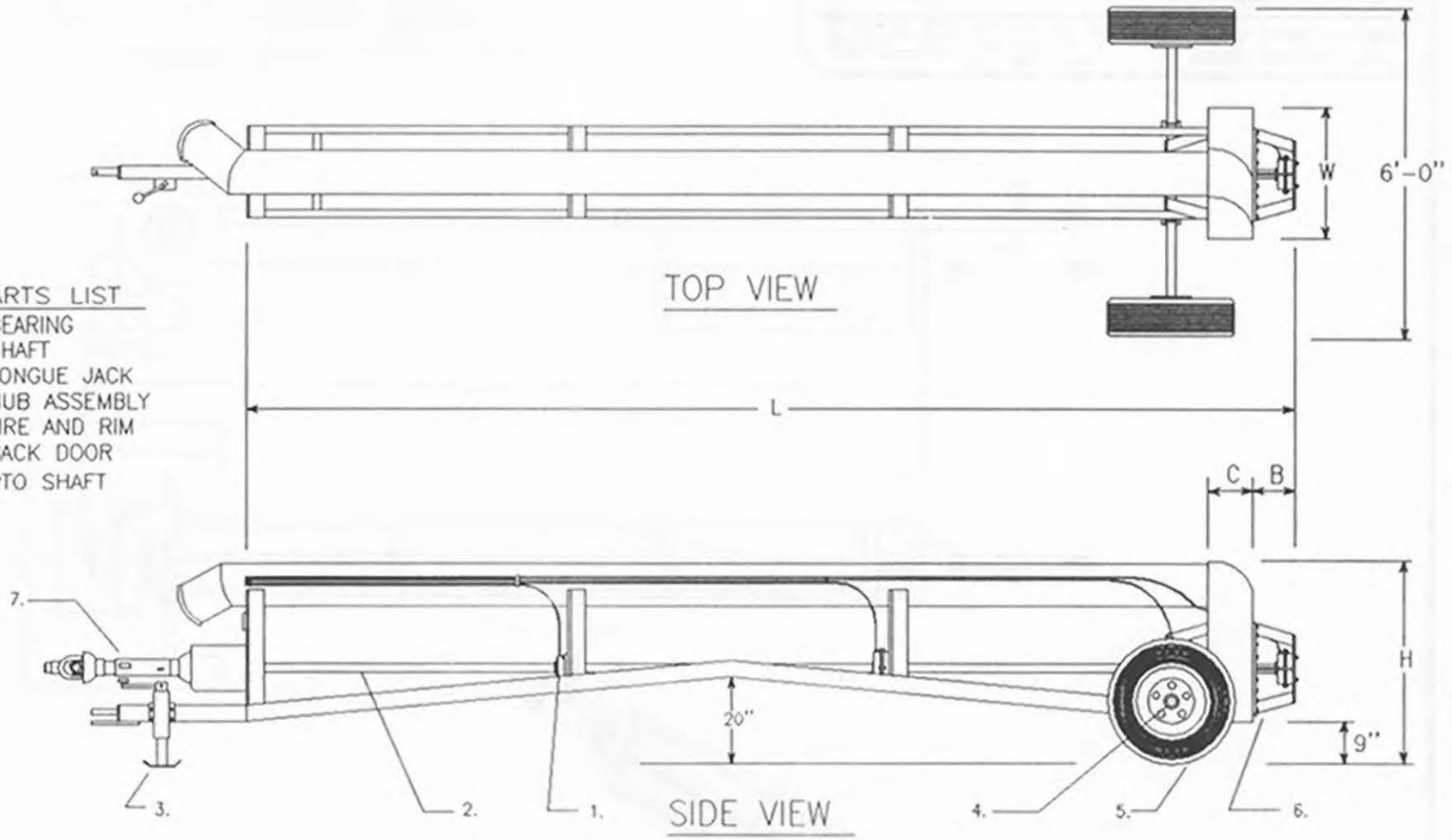
PUMP MODEL #	DIMENSIONS (INCHES)							
	L	H	W	C	B		INTAKE	
					SINGLE	DOUBLE	SINGLE	DOUBLE
LH08RAE	18'-10"	41"	30"	6.5"	0"	9"	9"	7"
LH16RAE	19'-4"	44"	41"	12.5"	N.A.	9"	N.A.	12"

SRS Crisafulli
P.O. Box 1051
Crisafulli Dr.
Glendive, MT 59330 USA
PHONE: 800-442-7867
FAX: (406) 365-8088
Sludge Removal Systems

ECONOMY TRAILER PUMP
L-SERIES

DWG #:CPC-97126

PARTS LIST
1. BEARING
2. SHAFT
3. TONGUE JACK
4. HUB ASSEMBLY
5. TIRE AND RIM
6. BACK DOOR
7. PTO SHAFT



PUMP MODEL #	DIMENSIONS (INCHES)								APPROX. WEIGHT (lbs)
	L	H	W	C	B		INTAKE		
					Single	Double	Single	Double	
HB04	18'-5"	39"	26"	4.5"	3"	9"	9"	7"	1410
HB06	18'-6"	43"	27.5"	5.5"	3"	9"	9"	7"	1520
HB08	18'-7"	48"	30"	6.5"	3"	9"	9"	7"	1640
HB10	18'-8"	50"	30.5"	8"	3"	9"	10"	9"	1840
HB12	18'-10"	52"	31"	9.5"	N.A.	9"	N.A.	9"	1980
HB16	19'-1"	60"	35.5"	12.5"	N.A.	9"	N.A.	12"	2190
HB24	19'-6"	84"	52"	18"	N.A.	9"	N.A.	15"	2850

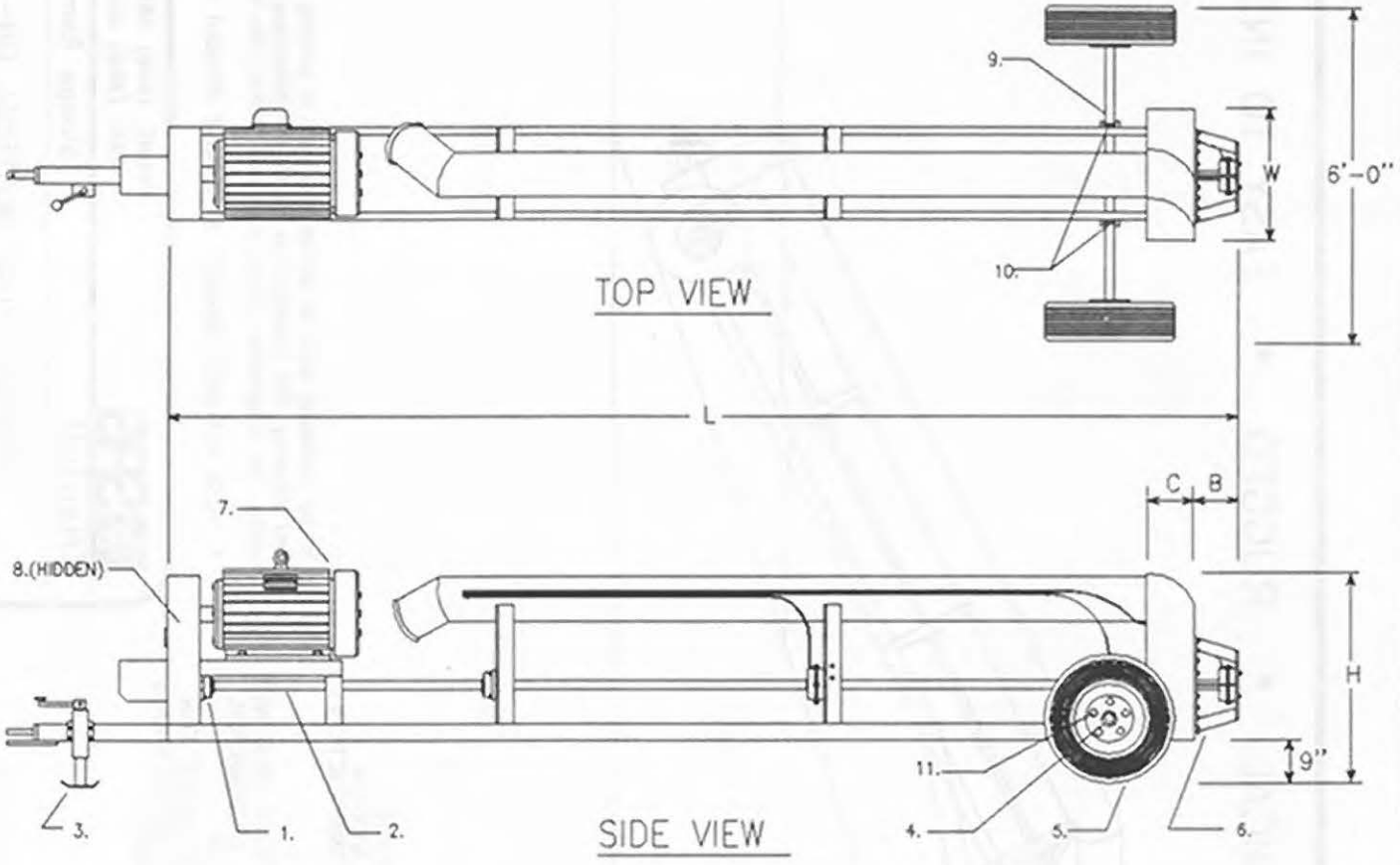
REV.(1) CTT 12/06/94

*In our continuing effort to provide excellence in pumping performance and efficiency, SRS Crisafulli may modify the pump dimensions without prior notice. For construction dimensions please contact the factory.

SRS Crisafulli
Sludge Removal Systems

HUMPBACK TRAILER PUMP L-SERIES

Dwn By: CKR | Ckd.: | Date: 3/14/90 | Dwg.#: CPC-88314



PARTS LIST

1. BEARING
2. SHAFT
3. TONGUE JACK
4. HUB ASSEMBLY
5. TIRE AND RIM
6. BACK DOOR
7. ELECTRIC MOTOR
8. BELTS & SHEAVES
9. AXLE ASSEMBLY
10. U-BOLTS (2 REQ.D)
11. LUG NUTS

PUMP MODEL #	DIMENSIONS (INCHES)								APPROX. WEIGHT (lbs)
	L	H	W	C	B		INTAKE		
					Single	Double	Single	Double	
LE04	18'-5"	39"	26"	4.5"	3"	9"	9"	7"	2000
LE06	18'-6"	43"	27.5"	5.5"	3"	9"	9"	7"	2050
LE08	18'-7"	48"	30"	6.5"	3"	9"	9"	7"	2300
LE10	18'-8"	50"	30.5"	8"	3"	9"	10"	9"	2450
LE12	18'-10"	52"	31"	9.5"	N.A.	9"	N.A.	9"	2550
LE16	19'-1"	60"	35.5"	12.5"	N.A.	9"	N.A.	12"	3350
LE24	19'-6"	84"	52"	18"	N.A.	9"	N.A.	15"	5000

*In our continuing effort to provide excellence in pumping performance and efficiency, SRS Crisafulli Inc. may modify the pump dimensions without prior notice. For construction dimensions please contact the factory.

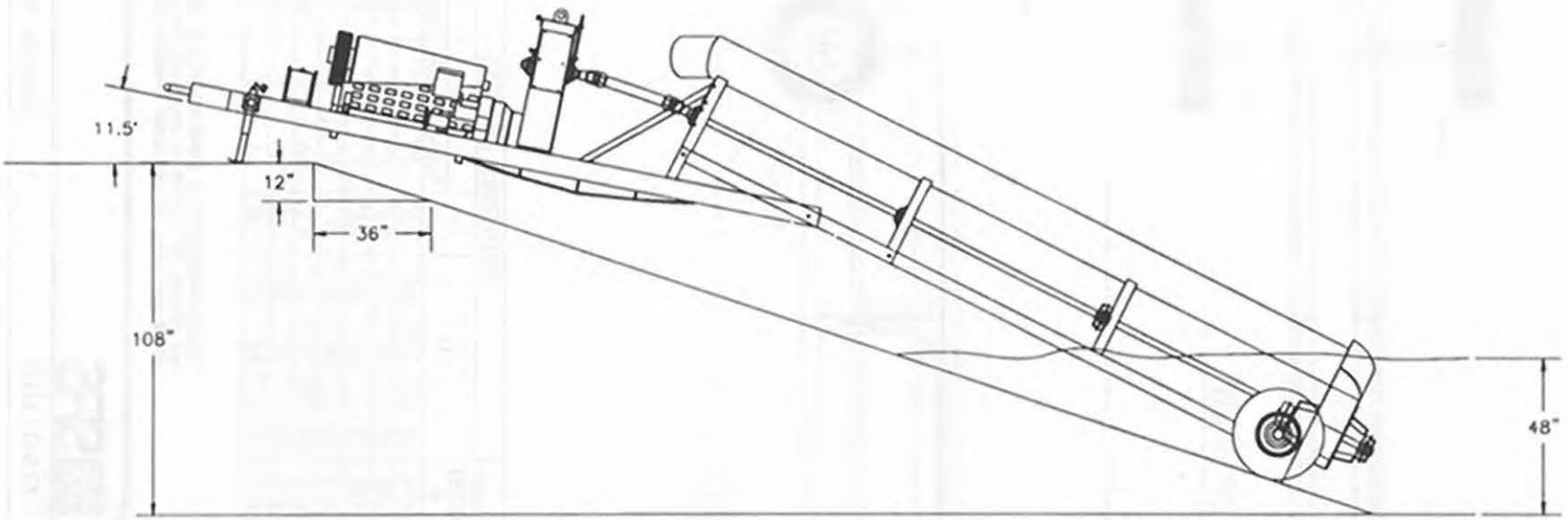
SRS Crisafulli — Sludge Removal Systems

LONG HITCH ELECTRIC TRAILER PUMP

REV. (2) 1/7/97

Dwn By: CKR	Ckd.:	Date: 4/29/1992	Dwg.#: CPC-92206

SELF-CONTAINED * ECONOMICAL * RUGGED * EASY TO INSTALL



* FEATURES

TRAILER HITCH	TOW RING TYPE
TRAILER JACKS	DUAL HEAVY DUTY JACKS
ENGINE	DEUTZ AIR COOLED DIESEL ENGINE WITH EMERGENCY SHUTDOWN SYSTEM
FUEL TANK	10 HOUR CAPACITY, STEEL CONSTRUCTION
BATTERY	12 VOLT
SPEED REDUCTION	BELT AND SHEAVE
BEARING PROTECTION	ENCLOSURES AROUND SUBMERGED BEARINGS
INSTRUMENTATION	WATER TEMP, OIL PRESSURE, TACHOMETER, AND ALTERNATOR FAILURE LIGHT
FRAME	STEEL CONSTRUCTION WITH 15° ANGLE FOR EASE OF OPERATON IN STEEP APPLICATIONS
LUBRICATION	EXTENDED LINES FROM BEARINGS
PAINT	RED ENAMEL

* OPTIONS

-SKID MOUNTED 24 HOUR FUEL RESERVOIR
-OTHER ENGINE MANUFACTURERS AVAILABLE

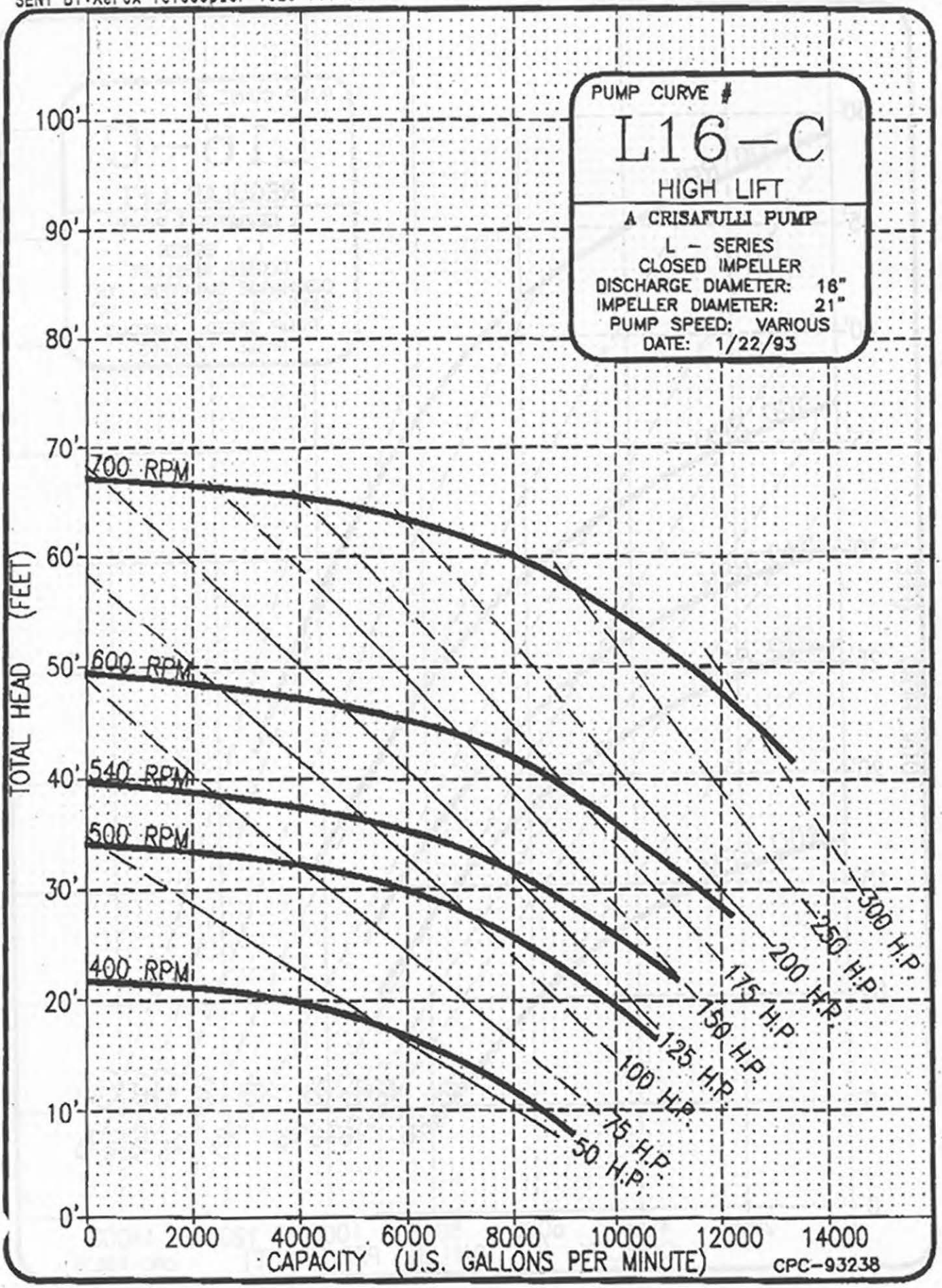
In our continuing effort to provide excellence in pumping performance and efficiency, SRS Crisafulli may modify the dimensions without prior notice. For construction dimensions please contact the factory.

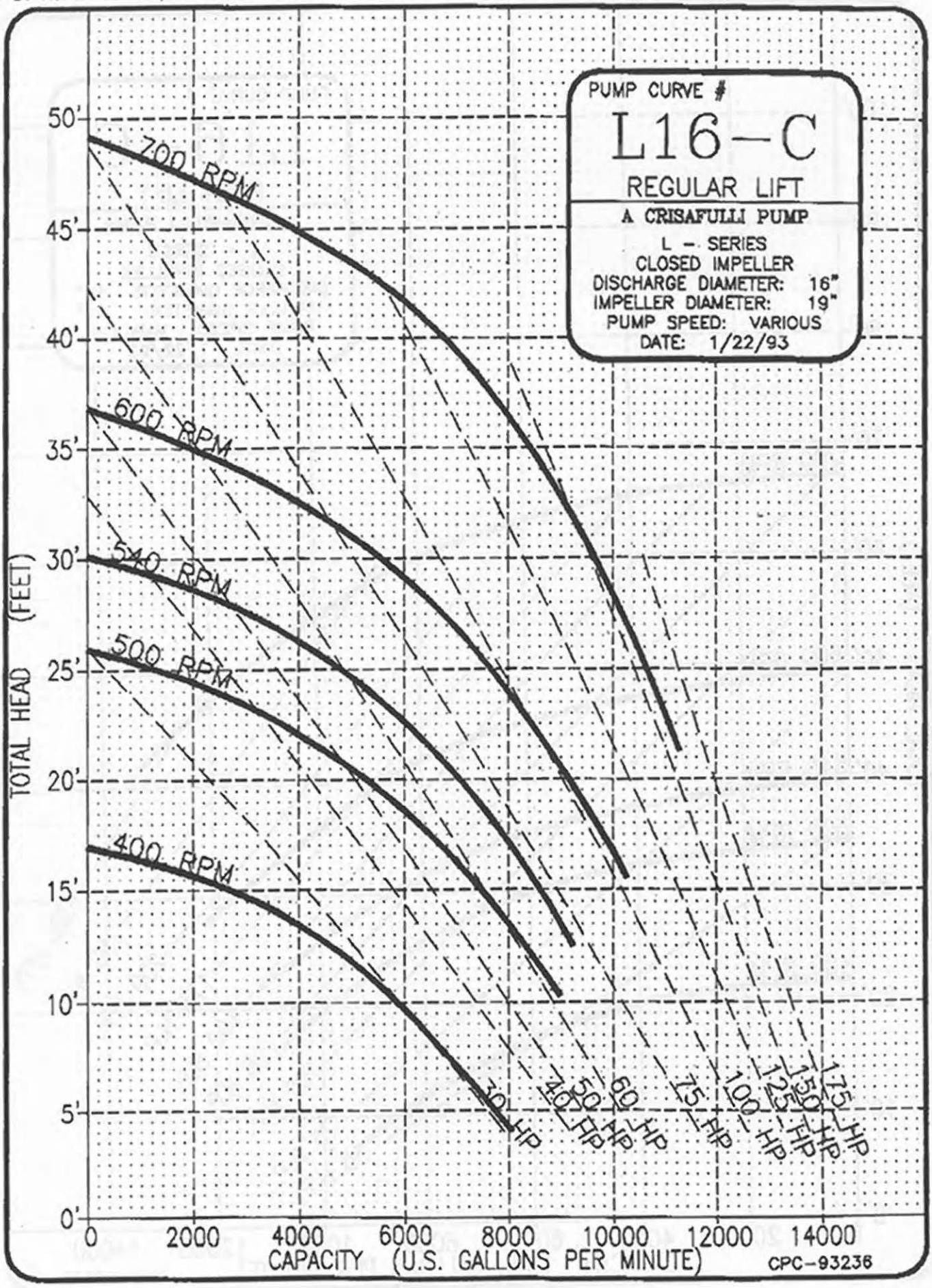
• THESE FEATURES SUBJECT TO CHANGE WITHOUT NOTICE

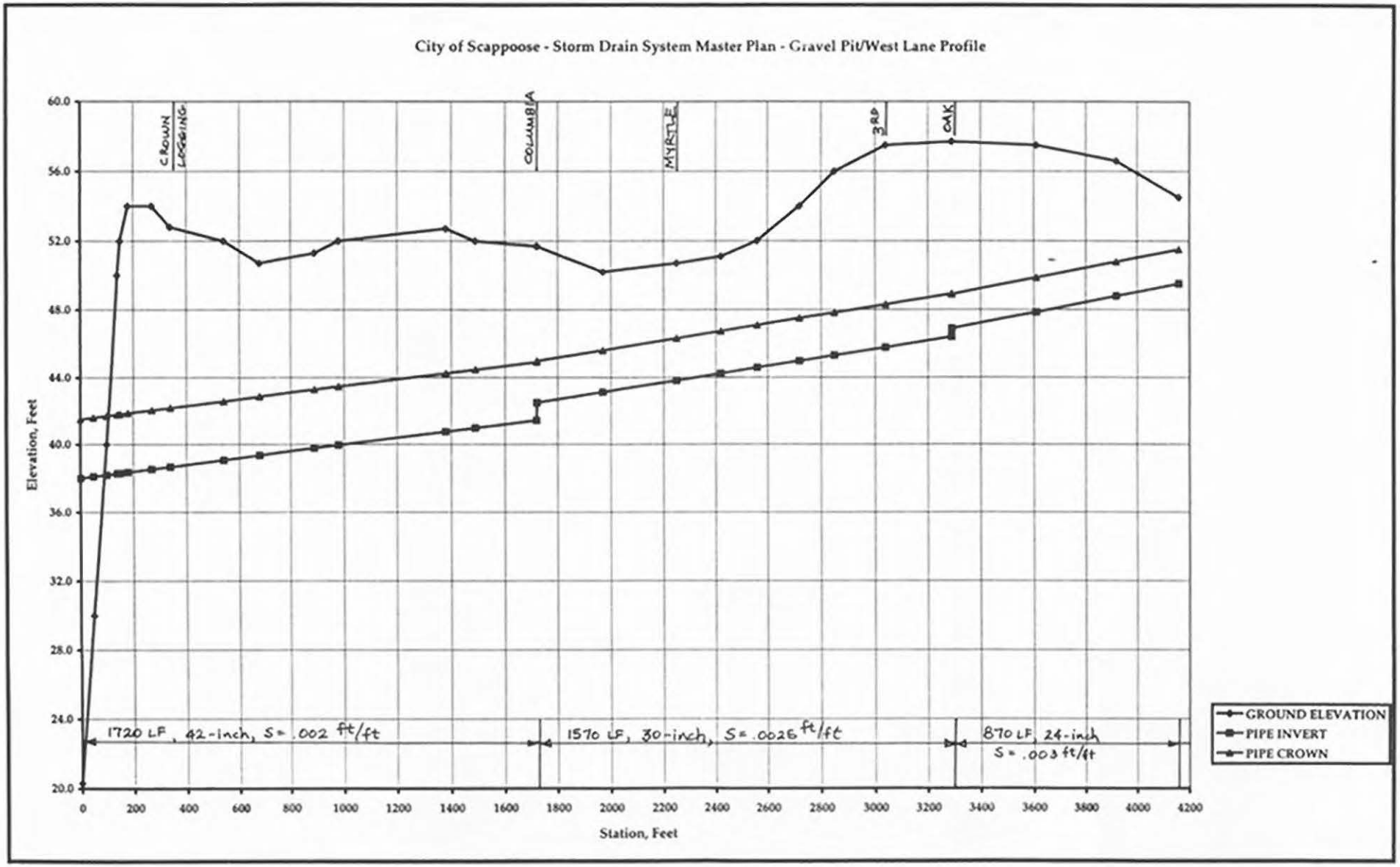
SRS Crisafulli
PHONE: (406) 365-3393
FAX: (406) 365-8088
Sludge Removal Systems

STRAIGHT PUMP W/DIESEL ON-FRAME
STANDARD UNIT

Dwn By: MDM	Ckd.:	Date: 7-7-97	Dwg.#: CPC-97558


PUMP CURVE #
L16-C
HIGH LIFT
A CRISAFULLI PUMP
L - SERIES
CLOSED IMPELLER
DISCHARGE DIAMETER: 16"
IMPELLER DIAMETER: 21"
PUMP SPEED: VARIOUS
DATE: 1/22/93
TOTAL HEAD (FEET)
100'
90'
80'
70'
60'
50'
40'
30'
20'
10'
0'
700 RPM
600 RPM
540 RPM
500 RPM
400 RPM
300 H.P.
250 H.P.
200 H.P.
175 H.P.
150 H.P.
125 H.P.
100 H.P.
75 H.P.
50 H.P.
0
2000
4000
6000
8000
10000
12000
14000
CAPACITY (U.S. GALLONS PER MINUTE)
CPC-93238


PUMP CURVE #
L16-C
REGULAR LIFT
A CRISAFULLI PUMP
L - SERIES
CLOSED IMPELLER
DISCHARGE DIAMETER: 16"
IMPELLER DIAMETER: 19"
PUMP SPEED: VARIOUS
DATE: 1/22/93
700 RPM
600 RPM
540 RPM
500 RPM
400 RPM
30 HP
40 HP
50 HP
60 HP
75 HP
100 HP
125 HP
150 HP
175 HP
TOTAL HEAD (FEET)
0'
5'
10'
15'
20'
25'
30'
35'
40'
45'
50'
0
2000
4000
6000
8000
10000
12000
14000
CAPACITY (U.S. GALLONS PER MINUTE)
CPC-93236


City of Scappoose - Storm Drain System Master Plan - Gravel Pit/West Lane Profile
Elevation, Feet
Station, Feet
CROWN LOGGING
COLUMBIA
MYRTLE
3RD
OAK
1720 LF, 42-inch, S=.002 ft/ft
1570 LF, 30-inch, S=.0026 ft/ft
870 LF, 24-inch S=.003 ft/ft
GROUND ELEVATION
PIPE INVERT
PIPE CROWN

WEST LANE / GRAVEL PIT

Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
at Oak	21.47	0.35	7.51	900	3	10.0	1.78	13.4
at Olive	*19.07*	*0.35*	*6.67*	*1280*	*3*	*7.1*		
Oak + Olive	40.54	0.35	14.19			17.1	1.40	19.9
at Crown Logging	*38.73*	*0.60*	*23.24*	*1650*	*3*	*9.2*		
Oak + Olive + Crown Loggi	79.27	0.47	37.43			26.3	1.14	42.7

COLUMBIA AVENUE

Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
at North	38.05	0.45	17.12	800	3	10.0	1.78	30.5
at Bird	*47.32*	*0.35*	*16.56*					
at North + Bird	85.37	0.39	33.68	1800	3	15.0	1.50	50.5
at Miller	*41.69*	*0.30*	*12.51*					
North + Bird + Miller	127.07	0.36	46.19	2600	3	20.0	1.30	60.1

ELM STREET / ROAD

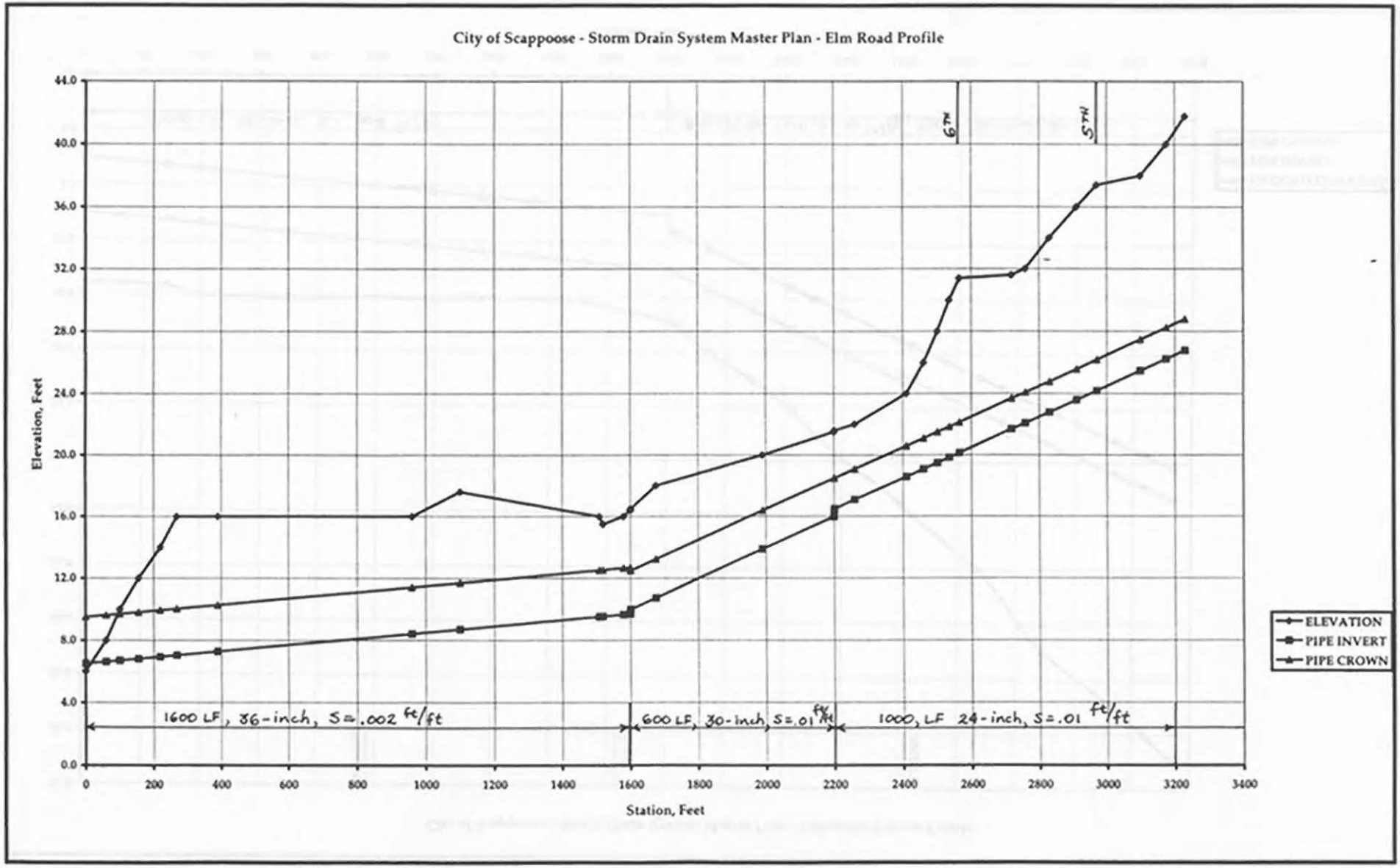
Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
at North	36.65	0.35	12.83	1000	3	10.0	1.70	21.8
at Bird	*20.09*	*0.30*	*6.03*					
at North + Bird	56.75	0.33	18.86	1900	3	16.0	1.50	28.3
at Miller	*19.68*	*0.30*	*5.90*					
North + Bird + Miller	76.43	0.32	24.76	2700	3	20.0	1.30	32.2

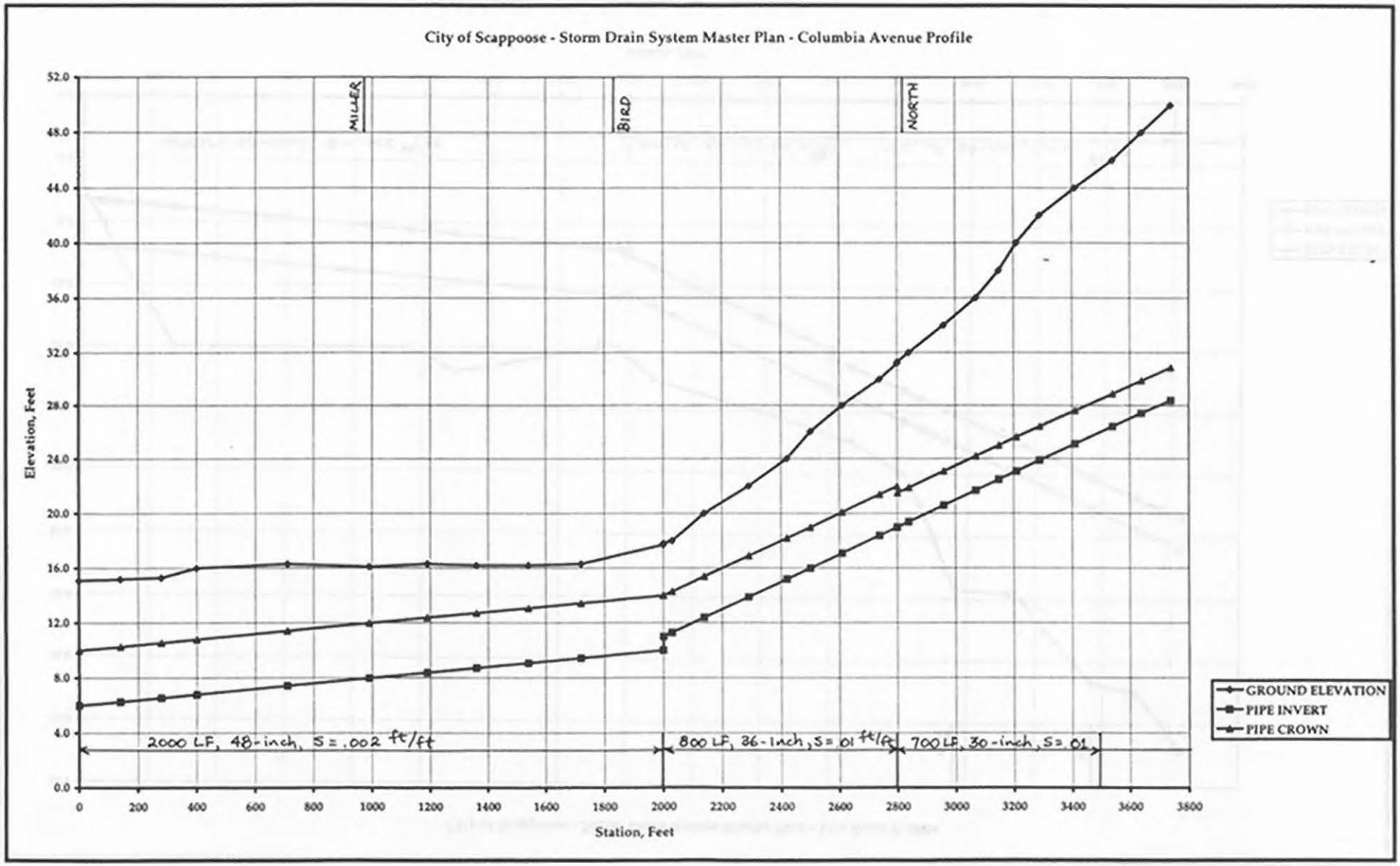
WHEELER								
Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
	14.69	0.30	4.41				1.78	7.8

SMITH								
Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
	32.14	0.30	9.64				1.78	17.2

SAWYER								
Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
	13.77	0.30	4.13				1.78	7.4

VINE								
Location	Drainage Area (acres)	Runoff Coefficient C	C x A	Length feet	Velocity fps	Time	Intensity in/hr	Peak Flow cfs
	30.18	0.65	19.62	900	3	10.0	1.78	34.9
at	*23.93*	*0.35*	*8.38*	*1280*	*3*	*7.1*	*1.78*	*14.9*
Oak + Olive	54.11	0.52	27.99			17.1	1.40	39.2


City of Scappoose - Storm Drain System Master Plan - Elm Road Profile
Elevation, Feet
Station, Feet
44.0
40.0
36.0
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0.0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
6TH
5TH
1600 LF, 36-inch, S=.002 ft/ft
600 LF, 30-inch, S=.01 ft/ft
1000, LF 24-inch, S=.01 ft/ft
ELEVATION
PIPE INVERT
PIPE CROWN


City of Scappoose - Storm Drain System Master Plan - Columbia Avenue Profile
Elevation, Feet
Station, Feet
MILLER
BIRD
NORTH
2000 LF, 48-inch, S = .002 ft/ft
800 LF, 36-inch, S = .01 ft/ft
700 LF, 30-inch, S = .01
GROUND ELEVATION
PIPE INVERT
PIPE CROWN

Appendix E

SOUTH SCAPPOOSE CREEK - HYDRAULIC EVALUATION

Scappoose Storm Drain System Master Plan

City of Scappoose Storm Drainage Master Plan

Hydraulic Losses at Roadway Crossings on South Scappoose Creek

Burlington Northern Railroad Bridge

Roadway Elevation 53.40
Minimum Road Elev 53.40
Low Chord 50.70

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
5.900	40.49		41.71		42.20		43.21	
		0.20		0.26		0.27		0.31
5.920	40.69		41.97		42.47		43.52	
		0.09		0.12		0.14		0.18
5.925	40.78		42.09		42.61		43.70	
		0.19		0.21		0.21		0.22
5.935	40.97		42.30		42.82		43.92	
Total		**0.48**		**0.59**		**0.62**		**0.71**

US Highway 30

Roadway Elevation 47.60
Minimum Road Elev 44.50
Low Chord 43.20

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
5.935	40.97		42.30		42.82		43.92	
		0.02		0.03		0.13		0.37
5.950	40.99		42.33		42.95		44.29	
		0.30		0.40		0.50		0.10
5.960	41.29		42.73		43.45		44.39	
		0.21		0.36		0.41		0.59
5.990	41.50		43.09		43.86		44.98	
Total		**0.53**		**0.79**		**1.04**		**1.06**

Crown Zellerbach (Private) Logging Road Bridge

Roadway Elevation 47.80
Minimum Road Elev 45.60
Low Chord 46.50

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
6.110	42.19		43.71		44.43		45.54	
		0.03		0.04		0.03		0.04
6.115	42.22		43.75		44.46		45.58	
		0.02		0.05		0.06		0.35
6.120	42.24		43.80		44.52		45.93	
		0.18		0.33		0.42		0.45
6.130	42.42		44.13		44.94		46.38	
Total		**0.23**		**0.42**		**0.51**		**0.84**

City of Scappoose Storm Drainage Master Plan
Hydraulic Losses at Roadway Crossings on South Scappoose Creek

Scappoose-Vernonia Highway

Roadway Elevation 48.50
Minimum Road Elev 45.00
Low Chord 45.10

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
6.130	42.42		44.13		44.94		46.38	
		0.02		0.03		0.26		0.37
6.135	42.44		44.16		45.20		46.75	
		0.20		0.28		0.30		0.35
6.150	42.64		44.44		45.50		47.10	
		0.22		0.27		0.27		0.18
6.230	42.86		44.71		45.77		47.28	
Total		**0.44**		**0.58**		**0.83**		**0.90**

E.J. Smith Road

Roadway Elevation 47.00
Minimum Road Elev 45.10
Low Chord 44.80

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
6.300	43.31		45.14		46.06		47.44	
		0.10		0.05		-0.02		0.01
6.310	43.41		45.19		46.04		47.45	
		0.02		0.15		0.01		0.00
6.315	43.43		45.34		46.05		47.45	
		0.21		0.57		0.61		0.25
6.320	43.64		45.91		46.66		47.70	
Total		**0.33**		**0.77**		**0.60**		**0.26**

J.P. West Road

Roadway Elevation 48.80
Minimum Road Elev 46.00
Low Chord 46.70

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
6.750	45.46		47.16		47.75		48.72	
		0.08		0.05		0.05		0.05
6.760	45.54		47.21		47.80		48.77	
		0.05		0.67		0.54		0.31
6.770	45.59		47.88		48.34		49.08	
		0.41		0.05		0.05		0.04
6.780	46.00		47.93		48.39		49.12	
Total		**0.54**		**0.77**		**0.64**		**0.40**

City of Scappoose Storm Drainage Master Plan
Hydraulic Losses at Roadway Crossings on South Scappoose Creek

E.M. Watts Road

Roadway Elevation 56.30
Minimum Road Elev 52.40
Low Chord 51.40

Section No.	10-Year		50-Year		100-Year		500-Year	
	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)	Elev (feet)	Change (feet)
7.430	50.37		51.88		52.38		53.27	
		0.10		0.10		0.15		0.21
7.440	50.47		51.98		52.53		53.48	
		0.03		0.35		0.50		0.71
7.450	50.50		52.33		53.03		54.19	
		0.11		0.19		0.10		0.10
7.460	50.61		52.52		53.13		54.29	
Total		**0.24**		**0.64**		**0.75**		**1.02**

HEC2 S/N: 1363000362 HMVersion: 6.52 Data File: SCAPC875.DAT

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*****************************************
*  HEC-2 WATER SURFACE PROFILES         *
*                                       *
*  Version   4.6.2;  May 1991           *
*                                       *
*  RUN DATE    18NOV97    TIME   13:50:57 *
*****************************************
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*************************************
*  U.S. ARMY CORPS OF ENGINEERS     *
*  HYDROLOGIC ENGINEERING CENTER    *
*  609 SECOND STREET, SUITE D       *
*  DAVIS, CALIFORNIA 95616-4687     *
*         (916) 756-1104            *
*************************************
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X     X  XXXXXXX   XXXXX             XXXXX
X     X  X        X     X          X     X
X     X  X        X                      X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXXXXXX
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:::                                           :::
:::   FULL MICRO-COMPUTER IMPLEMENTATION     :::
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        ============================
        H A E S T A D   M E T H O D S
        ============================
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS RUN EXECUTED 18NOV97 13:50:57

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**********************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
**********************************


THIS IS AN ARCHIVAL RUN ALL DATA AND RESULTS ARE SAVED ON UNIT   96

AC      HEC-2 PC FILE NAME  : SCAPC875.DAT
AC      INPUT TAPE 400 NAME : SCAPICF7
AC      OUTPUT TAPE 314 NAME: SCAPOCF7
AC      *******
AC      SCAPPOOSE AND SOUTH SCAPPOOSE CREEK  R.M. 4.10 TO 10.01
AC      COLUMBIA COUNTY, OREGON  F.I.S.
AC      VICINITY OF SCAPPOOSE, OR
AC      10-,50-,100-,AND 500-YEAR FLOOD PROFILES
AC      REVISED MAY 1987
AC      *******
AC      US ARMY ENGINEER DISTRICT, PORTLAND, OREGON
AC      PLANNING DIVISION, ADVANCE PLANNING BRANCH, FPM & TS SECTION
AC        KEN MCGOWEN, F.I.STUDY MANAGER, CIVIL ENG.
AC      ORIGINAL COMPUTER FILE BY :  OTT WATER ENGINEERS
AC      REVIEWED BY:
AC       ENGINEERING DIV, H & H BR, HYDROLOGY SECTION
AC         KEN SODERLIND, HYDRAULIC ENGINEER
AC      *******
AC      REVISIONS MADE APRIL 1985 BY SODERLIND
AC      REVISIONS MADE NOV AND DEC 86, AND FEB AND MAY 87 BY MCGOWEN
AC       X-SEC ADDED: 4.11, 4.82, 5.31, 5.38, 5.55, 5.63, 5.86, 5.89,
AC                  : 9.60, 9.93, 9.99-10.01
AC       X-SEC REVISED: 5.21(5.26), 5.83, 5.98, 6.02, 6.09, 8.77, 9.50,
AC                      9.71-9.73, 9.86, 9.98
AC      *******
T1      SCAPPOOSE AND SOUTH SCAPPOOSE CREEK  MILE 4.11 TO 10.01
T2      CORPS OF ENGINEERS, FLOOD PLAIN MANANGEMENT SERVICES
T3      SCAPPOOSE CREEK  10-YEAR FLOOD PROFILE

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                2                         .00010                                  21.50

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     1                  -1

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     38         1          2         43         13         14         15         55         26         56
     25         5         10                    38         39         43          1          3         40
```

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     41        42         4        53        21        22        54
J5  LPRNT    NUMSEC                  ********REQUESTED SECTION NUMBERS********
    -10       -10
J6  IHLEQ     ICOPY     SUBDIV    STRTDS     RMILE
      1
NC    0.070     0.070     0.045       0.2       0.4
QT        7      3470      5270      6120      8300      6120      6120      6250
ET    4.11                                    9.1       9.5                   370      1530
                X-SEC 1 OF 1971 SURVEY
X1    4.11        39       825       890         0         0         0
GR    34.3         0      33.3        50      32.9        54      24.7        70      17.6        85
GR    15.6       100      16.4       200      16.8       245      15.2       300      13.7       376
GR    13.2       400      14.1       500      13.6       600      13.5       700      15.0       758
GR    13.6       772      13.2       782      14.9       800      15.3       825      12.1       828
GR     5.9       832       5.1       849       4.9       858       5.9       871      14.7       890
GR    14.9       900      10.5       968      17.6       987      17.5      1037      16.6      1100
GR    17.2      1200      16.2      1300      14.8      1400      13.9      1500      14.0      1600
GR    15.2      1700      20.8      1726      25.3      1750      31.4      1800

ET    4.13                                    9.1                             400      1500
X1    4.13         0                        100       100       100                 0.2

NC    0.082     0.082     0.056       0.3       0.5
ET    4.48                                    9.10      9.5                   1870      2069
                DOWNSTREAM OF WEST LANE ROAD
X1    4.48        25      1990      2069      1000      1700      1850
X3      10                                                        16.0      23.5
GR    30.0       920      24.0       950      22.0      1750      21.0      1780      16.7      1800
GR    12.8      1810      16.9      1818      16.7      1900      16.0      1990      14.7      2005
GR    12.2      2018      11.0      2026       9.6      2033      10.5      2048      11.4      2054
GR    12.1      2058      14.4      2062      22.2      2069      22.3      2084      22.4      2100
GR    24.0      2150      24.0      3000      26.0      3070      24.0      3100      30.0      3140

NC                                    0.5       0.9
ET    4.65                                    9.10      9.50                  1990      2121
X1    4.65        29      1990      2124       650       450       850
X2                                                                                    15
X3      10                                                        25.7      24.5
GR    40.0      1570      36.0      1660      32.0      1780      30.0      1820      28.0      1890
GR    26.0      1910      24.0      1990      20.0      2005      16.3      2017      14.3      2019
GR     9.3      2035      10.6      2043      11.8      2052      13.0      2059      15.3      2065
GR    16.3      2066      18.6      2067      22.1      2086      22.2      2113      25.7      2124
GR    24.0      2214      24.0      2414      24.5      2630      25.5      3050      26.0      3130
GR    26.5      3250      28.0      3440      32.0      3540      40.0      3650
```

ET	4.66					9.11			2007	2114
X1	4.66	34	2000	2114	70	10	50			
X3	10							25.7	24.7	
GR	40.0	1570	33.8	1700	30.1	1807	29.6	1834	28.6	1853
GR	28.6	1900	28.6	2000	25.7	2006.7	19.9	2006.8	16.3	2017
GR	14.3	2019	9.3	2035	10.6	2043	11.8	2052	13.0	2059
GR	15.3	2065	16.3	2066	18.6	2067	22.1	2086	20.0	2107.2
GR	25.7	2107.3	24.7	2114	24.7	2170	24.7	2214	24.7	2314
GR	24.6	2372	24.7	2414	24.7	2630	25.5	3050	26.0	3130
GR	26.5	3250	28.0	3440	32.0	3540	40.0	3650		
SB		1.5	2.6		24		942.0	2.55	10.0	10.0
ET	4.67					9.11	9.51		2007	2114
		WEST LANE ROAD BRIDGE								
X1	4.67				31	31	31			
X2			1	25.7	24.7					15
X3	10									
BT	-12	1900	28.6	28.6	2000	30.2	28.6	2006.7	32.6	25.7
BT		2006.8	32.6	25.8	2107.2	32.6	25.8	2107.3	32.6	25.7
BT		2114	30.3	24.7	2170	28.8	24.7	2214	27.3	24.7
BT		2314	25.0	24.7	2372	24.6	24.6	2414	24.7	24.7
ET	4.68					9.11			2007	2114
X1	4.68				50	10	50		0.3	
NC				0.2	0.4					
ET	4.82					9.10	6.50		950	1300
		X-SEC 3 OF 1971 SURVEY								
X1	4.82	34	950	1103	850	500	850			
X2										15
GR	36.0	300	30.0	350	28.0	390	26.0	670	25.5	800
GR	24.9	850	23.6	900	24.5	950	19.4	951	16.9	960
GR	15.0	961	15.6	985	17.6	994	18.4	1020	19.6	1022
GR	18.1	1033	17.3	1074	16.2	1084	15.4	1094	15.4	1099
GR	21.1	1103	21.9	1118	25.0	1126	25.3	1132	25.1	1143
GR	22.3	1158	22.8	1166	22.5	1236	22.5	1550	25.5	1560
GR	26.0	1640	26.5	1750	28.0	1950	40.0	2160		
NC	0.115	0.085	0.058							
ET	4.90					9.10	7.50		1935	2225
		UPSTREAM OF WEST LANE ROAD, X-SEC 5.0 OF 1984 SURVEY								
X1	4.90	29	2023	2067	400	300	400			
X2										15
GR	30.0	1290	28.0	1410	28.0	1690	27.5	1700	26.0	1750
GR	23.5	1800	23.7	1900	21.1	1933	18.0	1953	21.5	1973
GR	21.3	2000	19.4	2023	18.3	2029	16.3	2032	15.9	2040
GR	15.5	2047	15.8	2051	15.8	2058	17.1	2062	18.3	2065
GR	22.7	2067	22.8	2100	22.4	2200	22.7	2300	22.5	2370
GR	26.0	2380	28.0	2500	30.0	2550	40.0	2700		

```
NH       4      0.115       2023       0.058       2067       0.085       2200         1.0        2700
ET    4.94                                                     9.10       4.50                    1850        2150
X1    4.94          0          0           0        150        200        200                      0.5

NC   0.115      0.085      0.058
ET    4.97                                                     9.10       6.50                    1780        2080
                GEOGRAPHICAL FEATURE, X-SECTION FROM ORTHOPHOTO-TOPO
X1    4.97         20       2025        2080        125        175        150
GR    32.0       1130       30.0        1240       28.0       1300       28.0        1600        26.0        1660
GR    26.0       2010       20.0        2025       19.3       2029       17.3        2032        16.9        2040
GR    16.5       2047       16.8        2051       16.8       2058       18.1        2060        19.3        2065
GR    20.0       2070       30.0        2080       32.0       2085       34.0        2120        40.0        2140

NH       4      0.115       2025       0.058       2075       0.085       2250         1.0        2450
ET    5.00                                                     9.10                                1730        2120
                UPSTREAM OF GEOGRAPHICAL FEATURE, FROM ORTHOPHOTO-TOPO
X1    5.00         24       2025        2120        130        130        130
GR    32.0       1020       30.0        1230       28.0       1560       26.0        1590        24.0        2000
GR    20.0       2025       20.0        2029       18.0       2032       17.6        2040        17.2        2047
GR    17.5       2051       17.5        2058       18.8       2060       20.0        2065        20.0        2075
GR    22.0       2100       24.0        2105       30.0       2112       34.0        2120        34.0        2130
GR    32.0       2140       32.0        2250       32.5       2400       40.0        2450

NH       4        1.0       1500        .087       2003        .058       2111        .087        2520
ET    5.21                                                     9.10       6.50                    1960        2130
                X-SEC 5.35 OF 1984 SURVEY
X1    5.21         31       2003        2111       1000       1100       1100
GR    34.0        600       32.0         720       31.0        800       30.0        1080        36.0        1330
GR    32.0       1500       30.0        1620       30.2       1700       30.3        1751        30.0        1800
GR    29.3       1900       27.6        2000       27.2       2003       25.5        2009        24.1        2020
GR    22.6       2044       23.7        2068       23.3       2085       22.6        2093        22.3        2106
GR    23.4       2109       26.5        2111       26.6       2121       23.3        2159        28.0        2175
GR    38.2       2187       38.4        2194       38.3       2198       36.0        2230        36.0        2480
GR    44.0       2520

NC   0.080      0.087      0.045
ET    5.32                                                     9.10       3.50                    1930        2085
                X-SEC FROM TOPO MAP
X1    5.32         19       2000        2085        630        530        560
GR    36.0       1400       34.0        1450       34.0       1490       35.0        1530        34.0        1600
GR    34.0       1810       32.5        1850       32.5       2000       32.0        2005        30.0        2010
GR    24.0       2035       23.3        2050       24.0       2065       30.0        2075        36.0        2085
GR    38.0       2130       40.0        2145       44.0       2150       45.0        2200

ET    5.38                                                     9.10        6.5                    1900        2105
                X-SEC FROM TOPO MAP, DOWNSTREAM OF CONFLUENCE
X1    5.38         25       1980        2105        320        340        330
GR    41.0        900       40.0        1050       39.0       1250       38.0        1350        37.0        1380
GR    36.0       1510       36.0        1600       38.0       1700       36.0        1770        37.0        1840
GR    36.0       1870       34.0        1930       35.0       1980       34.0        2000        32.0        2030
GR    30.0       2040       26.0        2050       25.0       2060       24.5        2070        25.0        2077
GR    26.0       2080       30.0        2095       40.0       2105       44.0        2110        45.0        2150
```

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NC     0.06       0.08      0.040
ET     5.43                                        9.10                                1910        2110
               X-SEC 5.6 (1984), IMMEDIATELY DS OF CONF OF N SCAPPOOSE CK
X1     5.43         20       2003       2102        260         280        280
GR     38.5       1400       38.0       1800       34.3        1997       34.2       2000       33.9       2003
GR     30.8       2008       29.7       2029       32.2        2032       30.8       2050       28.8       2053
GR     27.6       2056       26.4       2063       26.0        2072       25.8       2082       25.4       2095
GR     27.5       2100       27.6       2101       28.6        2102       41.0       2119       52.2       2133

NH        5        .08       1590       .040       1760        .075       2020       .035       2075        .09
NH     2150
ET     5.55                                        9.10        3.50                   1590        2070
               X-SEC FROM TOPO MAP, ACROSS BOTH N. AND S. SCAPPOOSE CKS
X1     5.55         30       2020       2070        580         660        640
X2                                                                                                 15
GR     41.0       1000       40.0       1050       39.0        1250       38.5       1400       38.5       1500
GR     38.5       1550       38.0       1570       36.0        1590       35.0       1610       34.0       1650
GR     33.0       1670       32.5       1700       33.0        1720       34.0       1735       36.0       1760
GR     37.0       1800       36.0       1830       36.0        1850       37.0       1900       36.0       1940
GR     34.0       2020       32.0       2030       29.0        2035       27.0       2045       25.5       2050
GR     27.0       2055       29.0       2065       40.0        2070       44.0       2075       45.0       2150

QT        7       1930       2900       3360       4450        3360       3360       2750
NC    0.060       0.08      0.035
ET     5.63                                        9.10        5.50                    980        1160
               X-SEC FROM TOPO MAP, ACROSS JUST S. SCAPPOOSE CK
X1     5.63         20       1000       1060        420         400        410
GR     45.0        499       43.0        500       42.0        590       40.0        750       38.0        940
GR     36.0       1000       34.0       1020       32.0        1025       30.0       1030       27.0       1035
GR     26.0       1040       27.0       1045       30.0        1050       36.0       1060       37.0       1100
GR     37.0       1220       38.0       1225       40.0        1230       44.0       1240       45.0       1300

NH        6      0.065       1828        1.0       1900        0.07       2004      0.040       2075       0.07
NH     2400        1.0       2800
ET     5.83                                        9.10         9.4                    1930        2060
               X-SEC 5.8 (1984)
X1     5.83         25       2004       2060       1140         950       1060
X3       10                                                                 37.8       42.0
GR     52.7       1740       40.0       1755       38.0        1770       38.0       1800       40.5       1828
GR     37.0       1900       37.2       1988       39.8        1998       39.4       2000       37.8       2004
GR     33.2       2009       28.2       2014       28.2        2018       27.7       2024       27.4       2031
GR     33.2       2038       36.6       2044       41.3        2052       42.0       2060       42.6       2075
GR     41.0       2100       41.0       2400       40.0        2500       40.0       2770       45.0       2800

NC     0.08       0.08      0.050
ET     5.86                                        9.10        9.10                    1940        2010
X1     5.86         19       1930       2005        170         180        180
GR     53.4       1400       53.4       1530       38.2        1540       38.2       1570       53.4       1580
GR     53.4       1790       44.0       1810       42.0        1850       42.0       1930       38.0       1945
GR     32.0       1960       28.0       1970       27.5        1975       28.0       1980       32.0       1990
GR     40.0       2005       42.0       2010       44.0        2020       44.0       2050
```

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ET     5.89                                                  9.10       9.10                1940       2030
                X-SEC FROM ODOT TOPO AND CREEK PROFILE MAP #31429, MARCH 1976
                LOCATED 175 FT D/S FROM B.N. R/R AT HIGH POINT IN CHAN THALWEG
X1     5.89          20       1975       2030        130        140        150
GR     53.4        1400       53.4       1530       38.2       1540       38.2       1570       53.4       1580
GR     53.4        1880       44.0       1900       40.0       1920       38.0       1925       38.0       1960
GR     40.0        1965       40.0       1975       36.0       1990       32.0       2000       31.0       2005
GR     31.0        2010       32.0       2015       40.0       2030       44.0       2035       52.0       2100

NC     0.08        0.09      0.057        0.5        0.9
ET     5.90                                                  9.10       9.10                1970       2065
X1     5.90          24       1995       2065         50        100         80
X2                                                                                                        15
GR     53.4        1400       53.4       1530       39.0       1540       39.0       1570       53.4       1580
GR     53.4        1930       40.5       1940       40.5       1995       38.1       2000       36.7       2005
GR     31.7        2009       30.2       2011       30.0       2016       29.6       2020       28.6       2030
GR     28.9        2035       30.7       2040       31.7       2045       38.1       2050       40.0       2055
GR     44.0        2065       44.0       2100       44.0       2200       53.8       2250

ET     5.92                                                  9.10       9.10                1960       2099
X1     5.92          22       1959       2100         60        140        100       0.77
X3       10                                                                          39.0       53.8
GR     53.4        1400       53.4       1480       38.5       1490       38.5       1520       53.4       1530
GR     53.4        1959       47.8       1960       40.0       1978       38.0       1990       36.0       1998
GR     32.0        2005       30.0       2012       29.5       2022       28.9       2030       29.9       2035
GR     32.0        2043       38.0       2056       40.0       2068       44.0       2084       49.0       2099
GR     53.8        2100       53.8       2500

ET     5.925                                                 9.10       9.10                1831       1938
SB     1.10          1.8        2.6        700       12.3        9.3       1170        3.2       30.0       30.0
                BURLINGTON NORTHERN RAILROAD BRIDGE
X1     5.925            0          0          0         20         20         20       1.0
X2                                 1       50.7       53.4                                                  15
X3       10                                                                          39.0       53.8

ET     5.935                                                 9.11       9.11                1965       2097
                D/S EDGE OF U.S. HWY 30 FOUR LANE BRIDGE
X1     5.935          19       1965       2097         70         70         70       0.71
X3       10                                                                          44.5       45.7
GR     46.0        1000       45.0       1250       44.5       1450       45.0       1700       45.4       1937
GR     45.5        1965       43.0       1966       43.0       1970       36.5       1991       29.7       2031
GR     28.9        2031       29.7       2051       36.5       2071       43.2       2092       43.2       2096
GR     45.7        2097       45.7       2125       46.0       2250       48.0       2450

SB     0.95        1.76        2.6                    27        5.0        806        2.0       30.1       30.1
ET     5.95                                                  9.11       9.11                1685       1779
                U/S EDGE OF U.S. HWY 30 FOUR LANE BRIDGE
                SURVEY ELEV'S DIFFER FROM 1971 ORTHOPHOTO-TOPO, NEW ROAD GRADE.
X1     5.95             0          0          0        120        120        120       1.0
X2                                 1       43.2       44.5                                      0.71         15
X3       10                                                                          44.5       45.1
BT      -12        1000       46.0                  1250       45.0                 1450       44.5
BT                 1700       45.0                  1937       45.4                 1965       47.5       45.5
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BT              1966        47.5        43.0        2096        47.7        43.2        2097        47.7        45.7
BT              2125        45.7                    2250        46.0                    2450        48.0

ET      5.96                                                    9.11        9.11                    1685        1779
X1      5.96          0           0           0           1           1           1
X5        -4        0.3         0.4         0.5         0.1

NH         5        1.0        1850       0.085        1950       0.057        2010         .09        2085         .05
NH      2450
ET      5.99                                                    9.10        3.40                    1950        2050
                  X-SEC FROM ODOT TOPO AND CREEK PROFILE MAP #31429, MARCH 1976
                  REFLECTS CHANNEL REALIGNMENT U/S OF NEW HWY 30 BRIDGE
X1      5.99          18        1950        2010         180          90         140
X2                                                                                                              15
GR      50.0        1100        44.0        1250        44.5        1600        45.0        1700        42.0        1720
GR      40.0        1730        39.0        1850        40.0        1950        30.0        1965        29.5        1980
GR      30.0        1995        40.0        2010        40.0        2050        41.0        2075        45.7        2085
GR      46.0        2095        46.6        2140        50.0        2450

NC                                          0.2         0.4
QT         7        1930        2900        3360        4450        3360        3360        2750
NH         4         1.0        1600       0.085        1977       0.057        2030       0.085        2450
ET      6.02                                                    9.10        9.40                    1970        2100
                  X-SEC 6.1 (1984 SURVEY) UPSTREAM OF HWY 30
                  SURVEY ELEVATIONS DIFFER FROM 1971 ORTHOPHOTO-TOPO, NEW LAND
                  DEVELOPMENT ON LEFT BANK, WITH FILL TO ELEV 44+ FT.
X1      6.02          20        1977        2030         180         180         200
X4         1        43.8        1700
GR      50.0        1300        44.2        1600        44.5        1823        45.0        1900        44.4        1960
GR      42.0        1970        40.0        1977        34.0        1991        30.0        2000        29.5        2005
GR      30.0        2010        32.0        2015        39.4        2030        41.7        2050        40.0        2100
GR      40.0        2150        41.0        2230        42.0        2260        47.0        2270        50.0        2450

NC      0.09        0.09       0.057         0.5         0.9
NH         5         1.0        1910         .08        1970        .057        2051         .08        2200         1.0
NH      2350
ET      6.09                                                    9.10        8.40                    1950        2100
X1      6.09          25        1950        2051         350         250         360
GR      48.0        1500        46.0        1620        45.6        1765        45.5        1800        46.0        1900
GR      38.0        1910        40.2        1950        38.0        1970        34.0        2000        31.9        2003
GR      31.0        2009        30.5        2019        30.0        2028        30.5        2036        31.0        2042
GR      31.9        2046        37.0        2051        36.0        2062        36.0        2085        42.0        2100
GR      39.5        2130        42.0        2200        48.0        2278        48.6        2300        49.3        2350

NH         5         1.0        1950        0.08        1980        .057        2062        0.08        2100         1.0
NH      2374
ET      6.11                                                    9.10        9.40                    1970        2062
                  55' D/S OF PVT (CROWN ZELLARBACH) LOGGING ROAD BRIDGE
                  X-SEC 9 (1971 SURVEY)
X1      6.11          24        1980        2062          50         100          90
GR      48.0        1500        46.0        1620        45.6        1765        45.5        1800        46.0        1900
GR      39.0        1910        39.5        1950        39.0        1980        36.0        2003        31.0        2009
GR      29.0        2019        28.5        2028        29.0        2036        31.0        2042        31.9        2046
GR      36.0        2051        41.0        2062        40.0        2075        39.5        2100        42.0        2200
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GR     42.9      2278      48.4      2300      49.3      2341      52.5      2374
NC     0.09      0.09     0.057
ET    6.115                                    9.11      9.11                2001      2059
X1    6.115        25      2001      2059        50        50        50
X3       10                                                          45.5      47.7
GR     50.0      1250      48.0      1500      46.0      1620      45.6      1765      44.9      1832
GR     44.7      1897      44.5      1933      44.7      1965      44.1      2001      44.1      2006
GR     37.6      2007      32.2      2018      28.7      2020      27.7      2030      28.7      2036
GR     30.2      2042      32.2      2043      37.8      2049      38.3      2053      44.4      2054
GR     44.4      2059      44.4      2080      44.4      2165      44.4      2235      50.0      2350
SB     1.10      1.62       2.6                  18      2.33       605      1.27        30        30
ET     6.12                                     9.11      9.51                2001      2059
                U/S SIDE OF PVT LOGGING ROAD  BRIDGE
X1     6.12                                    14        14        14
X2                          1      46.5      45.6                                                15
X3       10                                                          45.7      47.9
BT      -12      1250      50.0                1500      48.0                1620      46.0
BT               1765      45.6      45.6      1832      46.0      44.9      1933      46.5      44.5
BT               2001      47.8      46.5      2059      47.8      46.5      2080      48.0      44.4
BT               2165      49.0      44.4      2235      50.0      44.4      2350      50.0      50.0
ET     6.13                                     9.11      9.11                2011      2093
X1     6.13        25      2011      2093        50        50        50
X3       10                                                          45.7      49.0
GR     50.0      1250      48.0      1500      46.0      1620      45.0      1765      45.0      1832
GR     46.0      1900      46.5      1933      44.9      1990      44.6      2011      42.0      2011
GR     37.6      2020      32.2      2040      29.7      2044      28.9      2052      29.7      2058
GR     30.2      2064      32.2      2065      37.8      2071      38.3      2075      42.0      2080
GR     43.1      2093      45.6      2093      49.3      2130      50.0      2235      50.0      2350
SB     1.10      1.63       2.6                  20      2.33       588      1.38        30        30
ET    6.135                                     9.11      9.11                2011      2093
                U/S SIDE OF SCAPPOOSE-VERNONIA ROAD BRIDGE
X1    6.135                                    26        26        26
X2                          1      45.6      45.0                                                15
X3       10                                                          45.7      49.0
BT      -11      1250      50.0                1500      48.0                1620      46.0
BT               1765      45.0      45.0      1900      46.0      46.0      1990      47.9      44.9
BT               2011      48.1      44.6      2093      49.0      45.6      2130      49.3
BT               2235      50.0                2350      50.0
NH        4      0.25      1920      .085      2000      .057      2090      .090      2350
ET     6.15                                     9.11      7.40                1960      2120
X1     6.15        20      1960      2090        70        30        60
X3       10                                                          45.7      49.0
GR     50.0      1250      48.0      1260      46.0      1280      44.0      1290      42.0      1320
GR     42.0      1770      44.0      1790      45.0      1920      44.0      1960      40.0      1980
GR     40.0      2000      32.0      2015      31.0      2025      30.0      2035      31.0      2045
GR     32.0      2060      36.0      2075      40.0      2090      50.0      2140      50.0      2350
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NC    0.084     0.090     0.057       0.2       0.4
ET     6.23                                     9.10      9.40                1900      2064
                UPSTREAM OF SCAPPOOSE-VERNONIA ROAD, FILL ON LEFT BANK
X1     6.23        31      2010      2064       600       500       430
GR       50      1050        48      1150      46.8      1160      44.1      1230      43.7      1360
GR     43.4      1560      44.6      1780      44.0      1860      42.9      1900      41.9      1956
GR     37.8      1967      37.0      2000      36.0      2010      35.0      2013      29.9      2027
GR     27.4      2036      29.0      2046      35.0      2048      37.1      2053      44.0      2064
GR     44.4      2091      44.4      2100      44.4      2107      44.3      2145      44.7      2200
GR     44.2      2211      44.6      2260      44.5      2300      46.0      2420      48.0      2476
GR     50.0      2480

ET     6.30                                     9.10      6.40                1980      2200
X1     6.30        33      2004      2059       350       150       390
GR     50.0      1450      48.0      1520      46.0      1570      46.0      1700      45.8      1786
GR     45.9      1800      45.8      1808      45.4      1871      45.7      1890      44.8      1900
GR     45.7      1967      46.2      1990      45.8      2000      45.2      2004      42.4      2008
GR     34.8      2016      32.0      2023      31.6      2033      31.8      2044      34.8      2046
GR     45.9      2059      46.3      2062      46.0      2100      45.5      2108      43.7      2115
GR     43.4      2200      45.0      2211      44.8      2231      45.4      2269      45.1      2300
GR     46.0      2565      48.0      2600      50.0      2660

ET     6.31                                     9.11      9.11                1980      2200
                E. J. SMITH ROAD BRIDGE
X1     6.31        33      2015      2051        50        50        50
X3       10                                                          45.4      45.1
GR       50      1450      48.8      1520      47.5      1655      46.3      1715      45.8      1786
GR     45.9      1800      45.5      1815      45.4      1871      45.7      1890      45.4      1915
GR     45.7      1967      46.2      1990      46.6      2000      47.0      2015      44.8      2015
GR     33.8    2015.1      32.8      2023      31.6      2033      31.8      2044      33.3    2050.9
GR     44.8      2051      47.0      2051      46.8      2062      46.2      2115      45.8      2140
GR     45.7      2200      45.5      2250      45.4      2269      45.1      2350      45.6      2450
GR     46.7      2550      48.8      2600      50.0      2660

SB     1.05      1.53       2.8                  35         1       435      0.01      32.0      32.0
ET    6.315                                     9.11      9.11                1980      2200
X1    6.315                                      22        22        22
X2                          1      44.6      45.1                                          15
X3       10                                                          45.4      45.1
BT      -21      1655      47.5                1715      46.3                1786      45.8
BT               1800      45.9                1871      45.4                1890      45.7
BT               1915      45.4                1967      45.7                1990      46.2
BT               2015      47.0      44.8      2033      47.2      44.8      2051      47.0      44.8
BT               2062      46.8                2115      46.2                2140      45.8
BT               2250      45.5                2269      45.4                2350      45.1
BT               2450      45.6                2550      46.7                2600      48.8

ET     6.32                                     9.10      9.50                1980      2200
X1     6.32        27      2005      2053        33        33        33
GR     50.0      1450      48.8      1520      47.5      1655      46.3      1715      45.6      1765
GR     44.9      1832      44.7      1897      44.5      1933      44.7      1965      45.1      2005
GR     32.2      2018      29.7      2020      29.3      2027      29.7      2036      30.2      2042
GR     32.2      2043      37.8      2049      42.2      2053      43.6      2065      43.6      2121
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GR     42.6      2165      43.7      2235      45.4      2269      45.1      2300      46.0      2565
GR     48.8      2600      50.0      2660

NC    0.084     0.084     0.057
ET     6.50                                    9.10                          1980      2200
                DOWNSTREAM OF J. P. WEST ROAD
X1     6.50        23      2016      2056       710       690       960
GR       50      1700        45      1800      42.6      1900      42.5      1925      39.7      2000
GR     39.3      2008      39.1      2016      36.3      2017      31.1      2022      29.0      2042
GR     33.5      2046      36.3      2054      29.8      2056      40.8      2100      41.0      2114
GR     43.8      2146      44.5      2200      45.1      2294      44.9      2300      46.1      2350
GR     46.0      2590      48.0      2650      50.0      2680

ET     6.75                                    9.10      9.50                1825      2050
X1     6.75        25      2003      2049      1150      1000      1350                -0.2
GR     52.0      1450      50.0      1500      48.0      1580      46.0      1670      45.2      1700
GR     44.7      1800      44.3      1900      43.4      2003      37.4      2011      34.5      2019
GR     34.5      2029      35.0      2038      37.4      2040      44.0      2049      43.8      2053
GR     47.3      2077      48.4      2100      48.6      2107      48.7      2127      48.4      2200
GR     48.4      2269      48.5      2300      48.4      2325      48.5      2430      50.0      2470

NC                                    0.5       0.9
ET     6.76                                    9.11      9.51                1835      2049
                J. P. WEST ROAD BRIDGE
X1     6.76                                     50        50        50
X3       10                                                          46.0      48.4

SB     1.10      1.63       2.8                 28      2.33     376.4      0.56      35.0      35.0
ET     6.77                                    9.11      9.51                1830      2049
X1     6.77                                     20        20        20                 0.2
X2                          1        46.7      46.0                                     15
X3       10                                                          46.0      48.4
BT        9      1500      50.0      50.0      1650      48.0      46.4      1850      46.0      44.5
BT     1950      48.0      43.8      2000      48.8      43.4      2003      49.3      46.7      2049
BT     49.5      46.7      2050      49.0      43.8      2100      48.4      48.4

ET     6.78                                    9.10      9.50                1810      2049
X1     6.78                                     50        50        50

NC     0.08      0.08      0.05       0.2       0.4
ET     7.02                                    9.10       3.5                1900      2110
                UPSTREAM OF J. P. WEST ROAD
X1     7.02        27      2016      2063       850       700      1250
GR     52.0      1560      50.0      1710      48.0      1760      46.2      1800      45.0      1850
GR     46.5      1950      46.9      2000      46.1      2016      37.6      2018      31.6      2028
GR     31.4      2038      35.1      2044      37.6      2046      46.0      2055      50.4      2063
GR     50.8      2071      50.9      2074      50.1      2100      50.5      2200      49.7      2300
GR     49.6      2350      49.0      2470      48.5      2600      48.0      2700      48.5      2780
GR     50.0      2830      52.0      2850
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ET    7.43                                                  9.10       8.50                 1960       2070
X1    7.43        27       2000       2063       1600      1000       2150
X4       1      54.0       2600
GR    56.0       1670       54.0       1700       54.8      1710       52.3       1800      52.9       1850
GR    52.7       1900       51.5       1990       47.9      2000       41.7       2011      38.3       2018
GR    37.7       2026       38.0       2032       41.6      2036       46.4       2041      50.0       2063
GR    50.6       2100       52.4       2131       53.1      2169       53.8       2200      53.8       2245
GR    53.5       2265       53.7       2287       53.9      2300       54.2       2350      53.0       2550
GR    53.5       2650       56.0       2720

NC                                      0.5        0.9
NH       5       0.08       2000       0.05       2063      0.08       2200        1.0      2550        .08
NH    2720
ET    7.44                                                  9.11       9.50                 1970       2070
X1    7.44                                          50        50         50
X3      10                                                                       52.3       52.4

SB    1.10        1.5        2.6                    15       2.33      507.6       1.92      38.0       38.0
ET    7.45                                                  9.11       9.51                 1970       2070
                E. M. WATTS ROAD BRIDGE
X1    7.45                                          26        26         26
X2                             1       51.4       52.3                                                  15
X3      10                                                                       52.3       52.4
BT      -6       1900       52.7       52.7       1990      52.8       51.5       1991      56.4       51.4
BT                2062       56.2       51.2       2063      52.6       50.0       2131      52.4       52.4

NH       5        .08       2000       0.05       2063       .08       2200        1.0      2550       0.08
NH    2720
ET    7.46                                                  9.10       7.50                 1950       2070
X1    7.46                                          50        50         50
X3      10                                                                       52.3       52.4

NC   0.082      0.082      0.055        0.2        0.4
QT       7       1795       2690       3115       4125      3115       3115       2750
ET    7.87                                                  9.10       9.50                 1900       2070
                UPSTREAM OF E. M. WATTS ROAD
X1    7.87          30       2005       2070       1300      1800       2200
GR    60.0       1520       58.0       1640       58.0      1710       56.0       1725      54.0       1745
GR    54.0       1780       55.0       1800       54.0      1820       52.0       1850      52.0       1900
GR    54.0       1980       52.1       2000       52.2      2005       41.6       2016      38.9       2020
GR    37.3       2031       34.6       2038       37.0      2044       41.6       2051      49.6       2062
GR    52.0       2070       50.4       2100       54.0      2120       56.0       2140      58.0       2150
GR    60.0       2170       60.0       2380       59.0      2420       60.0       2530      61.0       2650

NC   0.082      0.082      0.055
ET    8.58                                                  9.10                            1975       2075
                DOWNSTREAM OF DUTCH CANYON ROAD
X1    8.58          20       2004       2050       2000      2100       3800
GR    71.7       1700       69.1       1725       64.1      1790       61.2       1800      57.7       1900
GR    56.9       2000       56.9       2004       48.0      2013       46.5       2018      44.0       2025
GR    43.9       2032       47.9       2037       55.2      2050       55.0       2071      57.1       2084
GR    57.0       2100       58.3       2130       65.6      2176       65.9       2200      70.4       2300
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ET      8.75                                            9.10        9.10                    1980        2050
X1      8.75        25      1988        2042        850         850         950
X3        10                                                                    52.0        60.1
GR      78.6      1700      70.8        1800        69.3        1816        66.4        1876        62.4        1936
GR      61.7      1960      60.6        1976        53.8        1988        51.1        1999        50.9        2001
GR      50.8      2002      49.8        2008        49.3        2016        50.1        2024        50.4        2032
GR      50.4      2033      51.1        2037        57.1        2042        58.0        2076        59.4        2150
GR      59.6      2176      60.1        2200        62.1        2335        63.0        2355        80.0        2450

NC                                      0.5         0.9
ET      8.76                                            9.11        9.11                    2002        2032
X1      8.76        25      2002        2032        100         100         100
X3        10                                                                    63.4        60.1
GR      78.6      1700      70.8        1800        69.3        1816        66.4        1876        66 0        1900
GR      63.5      1970      63.4        2002        60.5        2002        51.4        2003        49.9        2007
GR      50.2      2013      50.6        2022        51.3        2031        60.5        2032        63.2        2032
GR      61.7      2076      61.0        2100        60.9        2132        60.1        2200        60.7        2212
GR      60.8      2232      61.1        2282        62.1        2300        63.0        2334        80.0        2450

SB      1.10       1.5       2.8                     30        0.01       333.5        0.01        50.0        50.0
ET      8.77                                            9.11        9.11                    2002        2032
                DUTCH CANYON ROAD BRIDGE
                A DUMMY PIER WIDTH IS LISTED SO THAT PRESSURE AND WIER FLOW ARE
                COMPUTED. WITHOUT THE PIER WIDTH, THE PROGRAM COMPUTES LOW FLOW
                WHEN THERE IS ACTUALLY PRESSURE AND WIER FLOW IN THIS CASE.
X1      8.77                                            20          20          20
X2                                  1       60.5        60.1                                                    15
X3        10                                                                    63.4        60.1
BT       -14      1876      66.4                        1900        66.0                    1970        63.5
BT                2002      63.4        60.5            2032        63.2        60.5        2076        61.7
BT                2100      61.0                        2132        60.9                    2200        60.1
BT                2212      60.7                        2232        60.8                    2282        61.1
BT                2300      62.1                        2334        63.0

ET      8.78                                            9.10        9.10                    1980        2060
X1      8.78        25      1988        2042        50          50          50
X3        10                                                                    52.0        60.1
GR      78.6      1700      70.8        1800        69.3        1816        66.4        1876        62.4        1936
GR      61.7      1960      60.6        1976        53.8        1988        51.1        1999        50.9        2001
GR      50.8      2002      49.8        2008        49.3        2016        50.1        2024        50.4        2032
GR      50.4      2033      51.1        2037        57.1        2042        58.0        2076        59.4        2150
GR      59.6      2176      60.1        2200        62.1        2300        63.0        2334        80.0        2450

NC                                      0.2         0.4
QT         7      1730      2585        2990        3960        2990        2990        2750
ET      8.88                                            9.10        7.50                    1880        2110
                UPSTREAM OF DUTCH CANYON ROAD
X1      8.88          17      2003        2076        450         550         600
GR      77.9      1700      69.7        1751        65.8        1800        65.1        1833        61.0        1900
GR      60.4      2000      59.5        2003        52.6        2016        50.9        2021        50.6        2024
GR      50.7      2034      49.4        2043        49.8        2053        52.6        2062        60.2        2076
GR      62.0      2110      80.6        2161
```

```
ET    9.23                                                  9.10       9.50                1830       2054
                X-SEC 9.2 (1984 SURVEY)
X1    9.23        24       2006       2054       1004      1450       1700
X4       2      86.3        748       96.9       2116
GR   102.6       600       77.1        840       70.1       899       68.3        959       67.1       1158
GR    69.0      1320       68.5       1400       68.0      1482       64.3       1590       63.6       1646
GR    64.4      1700       63.0       1800       64.0      1900       64.0       1985       63.3       2000
GR    61.9      2006       59.5       2011       58.6      2014       58.8       2026       58.8       2038
GR    58.7      2049       59.5       2052       60.9      2054      160.0       2375

ET    9.50                                                  9.10                           1930       2130
                DOWNSTREAM OF RR FLATCAR BRIDGE.
X1    9.50        33       2006       2049       1100      1300       1350
X4       1      67.7       2000
GR   100.0       1000       77.7       1112       73.3      1149       72.5       1201       72.0       1239
GR    72.5       1401       73.3       1431       72.5      1442       72.8       1461       74.5       1700
GR    74.4       1731       73.8       1800       69.7      1900       65.2       1912       66.5       1933
GR    67.8       2006       65.4       2013       63.6      2017       64.6       2028       65.2       2034
GR    65.4       2036       65.6       2044       68.6      2049       67.7       2100       69.1       2167
GR    68.7       2200       68.7       2208       69.8      2300       70.0       2350       72.0       2370
GR    76.0       2450       79.4       2650      100.0      2700

NC    0.09       0.08      0.045
ET    9.60                                                  9.10       9.10                 780       1050
                X-SEC INTERPOLATED FROM TOPO, AT PRIVATE BRIDGE
X1    9.60         22       1000       1050        580       480        530                -0.5
GR      84          0         80         20         76        50         74        100        76        170
GR      76        210         74        250         74       550         72        560        72        750
GR      73        800         73        950         74      1000         67       1020      65.5       1025
GR      67       1030         74       1050         75      1090         76       1100        80       1150
GR      84       1170         90       1200

ET    9.62                                                  9.10       9.10                 750       1050
X1    9.62          0          0          0        100       100        100                 0.5

NC    0.08       0.08      0.055        0.2        0.4
ET    9.71                                                  9.10       9.10                1800       2042
X1    9.71         30       2000       2042        420       520        520                -0.8
GR    92.0        900       84.0       1000       80.0      1100       78.3       1400       78.5       1500
GR    78.5       1700       78.2       1800       77.9      1825       77.0       1850       76.6       1875
GR    76.4       1881       76.4       1887       77.3      1913       76.0       1955       76.8       1986
GR    76.8       2000       76.7       2003       71.6      2008       69.0       2013       68.3       2016
GR    68.0       2022       67.0       2029       69.1      2033       71.6       2041       77.4       2042
GR    78.1       2050       79.1       2061       79.5      2091       80.0       2130      100.0       2270

NC    0.10                             0.5        0.9
ET    9.72                                                  9.11       9.11                1800       2042
                RR FLATCAR BRIDGE, NEAR END OF BRANCH ROAD
X1    9.72                                        50        50         50                 0.4
X3      10                                                                    76.4       79.0
```

SB		1.5	2.6		21		210.8	1.60	70.0	70.0
NH	4	0.25	1800	0.09	2000	0.040	2042	0.09	2270	
ET	9.73					9.11	9.11		1800	2042
X1	9.73				11	11	11		0.4	
X2			1	77.7	78.0					15
X3	10							76.5	79.0	
BT	-21	1100	80.0		1400	78.3		1800	78.2	
BT		1825	78.0	77.9	1850	78.0	77.0	1875	78.0	76.6
BT		1881	78.0	76.4	1887	78.0	76.4	1913	78.0	77.3
BT		1955	78.0	76.0	1986	78.2	76.8	2000	78.9	76.8
BT		2000	78.9	77.7	2013	78.9	76.4	2033	78.9	76.4
BT		2042	79.0	77.6	2042	79.0	77.4	2050	79.0	78.1
BT		2061	79.1		2091	79.5		2130	80.0	
ET	9.74					9.10	3.50		1800	2042
X1	9.74				50	50	50		0.4	
NC	0.085	0.085	0.045	0.2	0.4					
ET	9.86					9.11	8.5		1950	2160
	ACROSS S/D BETWEEN BRANCH ROAD AND RAYMOND CR									
X1	9.86	27	2000	2059	600	500	600			
X2										15
GR	92.0	10	87.8	1059	85.0	1174	84.0	1300	83.4	1467
GR	83.5	1483	83.5	1507	83.5	1517	84.0	1700	83.4	1800
GR	83.0	1814	81.2	1824	80.3	1900	79.5	2000	78.4	2008
GR	76.3	2023	75.0	2033	72.4	2041	72.0	2046	72.0	2050
GR	75.3	2054	78.3	2059	79.7	2100	80.1	2130	84.0	2300
GR	88.0	2450	100.0	2480						
ET	9.93					9.10	3.50		1000	1160
	X-SEC INTERPOLATED FROM TOPO									
X1	9.93	24	1000	1059	350	350	350			
GR	92	100	88	150	85	400	86	500	86	550
GR	86	800	85	900	84	980	84	1000	82	1008
GR	80	1023	77	1033	74	1041	78	1046	79	1050
GR	80	1054	82	1059	82	1100	83	1200	84	1250
GR	85	1400	88	1500	92	1530	100	1550		
QT	7	1600	2000	2210	2750	2870	2870	2000		
NH	4	1.0	1800	.085	1995	.055	2037	.085	2300	
ET	9.97					9.10	2.50		1850	2037
	UPSTREAM OF RAYMOND CREEK FLOWS ARE REDUCED TO QUANTITY THAT WOULD STAY WITHIN CHANNEL AND RIGHT OVERBANK THRU BRIDGE. FLOW IN LEFT OVERBANK AT BRIDGE WOULD STILL BE IN LEFT OVERBANK AT THIS X-SEC BUT THE GROUND EL IS HIGHER THAN THE CHANNEL CWSEL, SO THE OVERBANK FLOW WOULD BE OVERLAND AT A HIGHER ELEV THAN THE CWSEL AND FLOWING INTO THE CHANNEL, SO IT IS OMITTED FROM THE TOTAL FLOW AT THIS X-SEC.									
X1	9.97	30	1995	2037	200	200	200			
X2										15
GR	96.0	1000	88.0	1250	87.0	1378	86.7	1516	86.5	1600
GR	86.0	1663	85.7	1700	85.7	1710	85.4	1745	85.4	1800
GR	85.9	1843	85.3	1900	85.5	1925	84.5	1995	81.0	2000

```
GR     80.0      2003      78.0      2006      76.0      2009      74.8      2014      75.5      2020
GR     76.7      2027      77.3      2031      83.0      2033      85.5      2037      87.1      2050
GR     88.7      2092      90.1      2100      92.0      2126      92.3      2132       100      2300

NC                                     0.5       0.9
ET     9.98                                                 9.10      9.10                1800      2031
                D/S EDGE OF RAYMOND CR ROAD BRIDGE
X1     9.98        28      2003      2031       100       100       100                  -0.2
X3       10                                                                 85.5      87.7
X4        1      88.0      1150
GR     92.0       990      88.0      1378      86.7      1516      85.8      1600      85.8      1663
GR     85.7      1700      85.7      1710      85.4      1745      85.4      1800      85.9      1843
GR     86.3      1900      86.5      1925      87.9      2000      87.6      2003      79.4      2006
GR     78.3      2009      75.8      2014      76.5      2020      77.7      2027      78.3      2031
GR     87.9      2033      88.5      2037      88.1      2050      89.7      2092      90.1      2100
GR     92.0      2126      92.3      2132       100      2300

NH        4       .20      1800      .085      2003      .050      2031      .085      2300
QT        7      1660      2480      2870      3800      2870      2870      2600
SB              1.5       2.6                  28                241                 77.5      77.3
ET     9.99                                                 9.11      9.11                1800      2031
                U/S EDGE OF RAYMOND CR ROAD BRIDGE
X1     9.99                                    19        19        19                   0.2
X2                          1      86.2      85.7                                                  15
X3       10                                                                 85.7      87.9
BT      -21       990      92.0                1150      88.0                1378      86.7
BT               1516      85.8                1600      85.8                1663      85.8
BT               1700      85.7                1745      85.7      85.4      1800      85.9      85.4
BT               1843      85.9                1900      86.3                1925      86.5
BT               2000      87.9                2003      88.2      87.6      2003      88.2      86.2
BT               2031      88.3      86.0      2031      88.3      78.3      2033      88.3      87.9
BT               2037      88.5                2050      88.1                2092      89.7

NH        4      0.15      1700     0.085      1994     0.045      2046      .085      2120
ET    10.00                                                9.10     10.50                1800      2046
                X-SEC 22 OF 1971 SURVEY
X1    10.00        20      1994      2046        50        50        50
X2                                                                                             15
GR     92.0       990      89.0      1300      88.0      1450      86.7      1516      85.8      1600
GR     85.7      1700      85.8      1802      85.6      1831      85.2      1852      82.9      1882
GR     83.2      1982      82.9      1994      77.7      2006      76.2      2011      77.3      2018
GR     77.7      2031      82.1      2046      89.3      2070      98.5      2089     100.6      2120
```

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR
DETAILS.
FLOW DISTRIBUTION FOR SECNO= 4.65 CWSEL= 22.06

STA=	1997.	2124.
PER Q=	100.0	
AREA=	585.9	
VEL=	5.9	
DEPTH=	6.6	

FLOW DISTRIBUTION FOR SECNO= 4.67 CWSEL= 22.55

STA=	2007.	2114.
PER Q=	100.0	
AREA=	642.1	
VEL=	5.4	
DEPTH=	6.4	

FLOW DISTRIBUTION FOR SECNO= 4.82 CWSEL= 24.30

STA=	873.	900.	939.	1103.	1118.	1124.	1158.	1166.	1236.	1550.	1556.
PER Q=	0.1	0.1	83.2	1.2	0.1	0.2	0.3	2.4	12.4	0.1	
AREA=	9.5	13.7	1086.0	42.0	7.5	10.7	14.0	115.7	566.1	5.4	
VEL=	0.3	0.3	2.7	1.0	0.6	0.5	0.7	0.7	0.8	0.5	
DEPTH=	0.4	0.4	7.1	2.8	1.2	0.3	1.8	1.7	1.8	0.9	

FLOW DISTRIBUTION FOR SECNO= 4.90 CWSEL= 24.77

STA=	1775.	1933.	1953.	1973.	2000.	2023.	2067.	2200.	2300.	2370.	2376.
PER Q=	5.1	5.7	5.3	3.7	5.0	48.1	11.5	9.3	6.2	0.2	
AREA=	210.6	104.3	100.3	90.9	101.5	352.9	283.0	221.5	151.6	7.3	
VEL=	0.8	1.9	1.8	1.4	1.7	4.7	1.4	1.5	1.4	0.9	
DEPTH=	1.3	5.2	5.0	3.4	4.4	8.0	2.1	2.2	2.2	1.1	

FLOW DISTRIBUTION FOR SECNO= 5.55 CWSEL= 36.36

STA=	1586.	1650.	1670.	1700.	1720.	1735.	2020.	2070.
PER Q=	5.8	5.2	11.6	7.7	3.9	5.3	60.4	
AREA=	92.5	57.3	108.4	72.3	43.0	161.1	343.7	
VEL=	2.2	3.2	3.7	3.7	3.2	1.1	6.1	
DEPTH=	1.5	2.9	3.6	3.6	2.9	0.6	7.1	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 5.90 CWSEL= 40.49

STA=	1539.	1540.	1570.	1571.	2065.
PER Q=	0.0	2.4	0.0	97.5	
AREA=	0.8	44.8	0.8	468.5	
VEL=	0.5	1.0	0.5	4.0	
DEPTH=	0.7	1.5	0.7	7.7	

FLOW DISTRIBUTION FOR SECNO= 5.93 CWSEL= 40.78

STA=	1468.	1469.	1492.	1494.	1939.
PER Q=	0.0	4.1	0.0	95.8	
AREA=	1.3	52.7	1.3	465.6	
VEL=	0.6	1.5	0.6	4.0	
DEPTH=	1.1	2.3	1.1	6.4	

FLOW DISTRIBUTION FOR SECNO= 5.95 CWSEL= 40.99

STA=	1693.	1779.
PER Q=	100.0	
AREA=	547.5	
VEL=	3.5	
DEPTH=	7.1	

FLOW DISTRIBUTION FOR SECNO= 5.99 CWSEL= 41.50

STA=	1722.	1730.	1850.	1950.	2010.	2050.	2075.	2076.
PER Q=	0.0	0.9	8.4	88.2	2.0	0.6	0.0	
AREA=	5.6	240.0	200.0	547.5	60.0	25.0	0.3	
VEL=	0.0	0.1	0.8	3.1	0.6	0.5	0.2	
DEPTH=	0.8	2.0	2.0	9.1	1.5	1.0	0.3	

FLOW DISTRIBUTION FOR SECNO= 6.12 CWSEL= 42.24

STA=	2006.	2059.
PER Q=	100.0	
AREA=	480.1	
VEL=	4.0	
DEPTH=	10.1	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 6.14 CWSEL= 42.44

STA= 2011. 2093.
PER Q= 100.0
AREA= 565.1
VEL= 3.4
DEPTH= 7.6

FLOW DISTRIBUTION FOR SECNO= 6.32 CWSEL= 43.43

STA= 2015. 2051.
PER Q= 100.0
AREA= 397.3
VEL= 4.9
DEPTH= 11.0

FLOW DISTRIBUTION FOR SECNO= 6.77 CWSEL= 45.59

STA= 2003. 2049.
PER Q= 100.0
AREA= 389.8
VEL= 5.0
DEPTH= 8.5

FLOW DISTRIBUTION FOR SECNO= 7.45 CWSEL= 50.50

STA= 2000. 2063.
PER Q= 100.0
AREA= 438.1
VEL= 4.4
DEPTH= 7.0

FLOW DISTRIBUTION FOR SECNO= 8.77 CWSEL= 59.14

STA= 2002. 2032.
PER Q= 100.0
AREA= 247.6
VEL= 7.2
DEPTH= 8.3

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 9.73 CWSEL= 76.19

STA=	2004.	2042.
PER Q=	100.0	
AREA=	252.4	
VEL=	6.9	
DEPTH=	6.6	

FLOW DISTRIBUTION FOR SECNO= 9.86 CWSEL= 79.76

STA=	1967.	2000.	2059.	2100.	2105.
PER Q=	0.1	97.6	2.3	0.0	
AREA=	4.4	240.6	31.4	0.2	
VEL=	0.4	7.0	1.3	0.2	
DEPTH=	0.1	4.1	0.8	0.0	

FLOW DISTRIBUTION FOR SECNO= 9.97 CWSEL= 84.67

STA=	1984.	1995.	2037.
PER Q=	0.0	100.0	
AREA=	0.9	267.2	
VEL=	0.2	6.0	
DEPTH=	0.1	6.6	

FLOW DISTRIBUTION FOR SECNO= 9.99 CWSEL= 85.21

STA=	2004.	2031.
PER Q=	100.0	
AREA=	206.2	
VEL=	8.1	
DEPTH=	7.6	

FLOW DISTRIBUTION FOR SECNO= 10.00 CWSEL= 86.64

STA=	1522.	1802.	1882.	1982.	1994.	2046.	2061.
PER Q=	3.2	4.6	19.2	2.3	69.3	1.3	
AREA=	213.0	131.1	359.1	43.1	413.7	34.4	
VEL=	0.3	0.6	0.9	0.9	2.8	0.6	
DEPTH=	0.8	1.6	3.6	3.6	8.0	2.3	

T1 SCAPPOOSE CREEK MILE 4.11 TO 10.01
T2 CORPS OF ENGINEERS , FLOOD PLAIN MANAGEMENT SERVICES
T3 SCAPPOOSE CREEK 50-YEAR FLOOD PROFILE

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		3			.00010				21.5	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2		-1							

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR
DETAILS.
FLOW DISTRIBUTION FOR SECNO= 4.65 CWSEL= 23.82

STA=	1991.	2124.
PER Q=	100.0	
AREA=	796.8	
VEL=	6.6	
DEPTH=	6.3	

FLOW DISTRIBUTION FOR SECNO= 4.67 CWSEL= 24.26

STA=	2007.	2114.
PER Q=	100.0	
AREA=	813.9	
VEL=	6.5	
DEPTH=	8.1	

FLOW DISTRIBUTION FOR SECNO= 4.82 CWSEL= 26.02

STA=	667.	950.	1103.	1166.	1236.	1550.	1645.
PER Q=	2.8	67.9	3.0	4.5	21.5	0.3	
AREA=	264.2	1349.2	165.4	236.2	1106.5	42.2	
VEL=	0.6	2.7	1.0	1.0	1.0	0.4	
DEPTH=	0.9	8.8	2.6	3.4	3.5	0.4	

FLOW DISTRIBUTION FOR SECNO= 4.90 CWSEL= 26.39

STA=	1737.	1900.	1933.	1953.	1973.	2000.	2023.	2067.	2100.	2200.	2300.	2370.	2403.
PER Q=	6.5	3.2	4.8	4.5	3.8	4.5	35.2	3.8	12.2	12.4	8.5	0.5	
AREA=	362.5	131.5	136.7	132.7	134.6	138.8	424.1	119.9	378.4	383.4	264.9	25.8	
VEL=	0.9	1.3	1.8	1.8	1.5	1.7	4.4	1.7	1.7	1.7	1.7	1.0	
DEPTH=	2.2	4.0	6.8	6.6	5.0	6.0	9.6	3.6	3.8	3.8	3.8	0.8	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 5.55 CWSEL= 38.09

STA=	1566.	1650.	1670.	1700.	1720.	1735.	1760.	1900.	2020.	2070.
PER Q=	10.5	6.0	11.5	7.7	4.5	3.9	4.1	7.7	44.2	
AREA=	217.6	91.9	160.3	106.9	68.9	77.3	233.0	311.2	428.0	
VEL=	2.5	3.4	3.8	3.8	3.4	2.6	0.9	1.3	5.4	
DEPTH=	2.6	4.6	5.3	5.3	4.6	3.1	1.7	2.6	8.7	

FLOW DISTRIBUTION FOR SECNO= 5.90 CWSEL= 41.71

STA=	1538.	1540.	1570.	1572.	1995.	2065.
PER Q=	0.1	5.0	0.1	2.4	92.5	
AREA=	2.6	81.4	2.6	67.4	545.1	
VEL=	0.8	1.8	0.8	1.0	4.9	
DEPTH=	1.4	2.7	1.4	0.2	8.5	

FLOW DISTRIBUTION FOR SECNO= 5.93 CWSEL= 42.09

STA=	1467.	1469.	1492.	1494.	1939.
PER Q=	0.1	6.5	0.1	93.3	
AREA=	3.3	82.9	3.3	565.4	
VEL=	0.8	2.3	0.8	4.8	
DEPTH=	1.8	3.6	1.8	7.1	

FLOW DISTRIBUTION FOR SECNO= 5.95 CWSEL= 42.33

STA=	1690.	1779.
PER Q=	100.0	
AREA=	655.2	
VEL=	4.4	
DEPTH=	7.9	

FLOW DISTRIBUTION FOR SECNO= 5.99 CWSEL= 43.09

STA=	1713.	1730.	1850.	1950.	2010.	2050.	2075.	2079.
PER Q=	0.1	1.5	14.8	77.1	4.4	2.0	0.1	
AREA=	24.8	430.6	358.8	642.8	123.5	64.7	4.6	
VEL=	0.1	0.1	1.2	3.5	1.0	0.9	0.5	
DEPTH=	1.4	3.6	3.6	10.7	3.1	2.6	1.0	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 6.12 CWSEL= 43.80

STA=	2006.	2059.
PER Q=	100.0	
AREA=	553.9	
VEL=	5.2	
DEPTH=	11.6	

FLOW DISTRIBUTION FOR SECNO= 6.14 CWSEL= 44.16

STA=	2011.	2093.
PER Q=	100.0	
AREA=	703.7	
VEL=	4.1	
DEPTH=	8.6	

FLOW DISTRIBUTION FOR SECNO= 6.32 CWSEL= 45.34

STA=	2015.	2051.	2350.	2399.
PER Q=	99.9	0.1	0.1	
AREA=	466.2	8.1	6.0	
VEL=	6.2	0.2	0.2	
DEPTH=	13.0	0.0	0.1	

FLOW DISTRIBUTION FOR SECNO= 6.77 CWSEL= 47.88

STA=	1585.	1670.	1700.	1800.	1900.	2003.	2049.
PER Q=	1.3	2.0	10.2	12.9	17.8	55.7	
AREA=	79.7	68.5	293.2	338.2	415.3	495.3	
VEL=	0.5	0.9	1.0	1.1	1.2	3.3	
DEPTH=	0.9	2.3	2.9	3.4	4.0	10.8	

FLOW DISTRIBUTION FOR SECNO= 7.45 CWSEL= 52.33

STA=	1799.	1990.	2000.	2063.
PER Q=	0.4	1.3	98.3	
AREA=	25.7	26.3	553.1	
VEL=	0.4	1.5	5.2	
DEPTH=	0.1	2.6	8.8	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 8.77 CWSEL= 60.79

STA=	2002.	2032.	2200.	2212.	2231.
PER Q=	99.2	0.7	0.2	0.0	
AREA=	297.0	20.6	4.8	0.9	
VEL=	9.0	0.9	1.0	0.2	
DEPTH=	9.9	0.1	0.4	0.0	

FLOW DISTRIBUTION FOR SECNO= 9.73 CWSEL= 77.21

STA=	1844.	2042.
PER Q=	100.0	
AREA=	271.6	
VEL=	9.5	
DEPTH=	6.5	

FLOW DISTRIBUTION FOR SECNO= 9.86 CWSEL= 80.97

STA=	1842.	1900.	2000.	2059.	2100.	2130.	2168.
PER Q=	0.5	5.6	85.5	6.3	1.7	0.5	
AREA=	19.6	108.1	312.3	81.2	32.4	16.9	
VEL=	0.6	1.3	7.1	2.0	1.3	0.7	
DEPTH=	0.3	1.1	5.3	2.0	1.1	0.4	

FLOW DISTRIBUTION FOR SECNO= 9.97 CWSEL= 85.55

STA=	1727.	1995.	2037.
PER Q=	1.8	98.2	
AREA=	56.6	304.1	
VEL=	0.6	6.5	
DEPTH=	0.2	7.2	

FLOW DISTRIBUTION FOR SECNO= 9.99 CWSEL= 86.09

STA=	1573.	1869.	2031.
PER Q=	1.5	98.5	
AREA=	77.8	229.4	
VEL=	0.5	10.6	
DEPTH=	0.3	8.4	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 10.00 CWSEL= 88.63

STA=	1355.	1600.	1700.	1802.	1852.	1882.	1982.	1994.	2046.	2068.
PER Q=	3.2	3.9	7.1	3.8	4.5	20.9	2.5	52.3	1.8	
AREA=	314.7	288.2	294.0	152.9	137.5	558.2	67.0	517.3	71.1	
VEL=	0.2	0.3	0.6	0.6	0.8	0.9	0.9	2.5	0.6	
DEPTH=	1.3	2.9	2.9	3.1	4.6	5.6	5.6	9.9	3.3	

T1 SCAPPOOSE CREEK MILE 4.11 TO 10.01
T2 CORPS OF ENGINEERS , FLOOD PLAIN MANAGEMENT SERVICES
T3 SCAPPOOSE CREEK 100-YEAR FLOOD PROFILE

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		4			.00010				21.5	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	3		-1							

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR
DETAILS.
FLOW DISTRIBUTION FOR SECNO= 4.65 CWSEL= 24.40

STA=	1990.	2124.
PER Q=	100.0	
AREA=	871.9	
VEL=	7.0	
DEPTH=	6.7	

FLOW DISTRIBUTION FOR SECNO= 4.67 CWSEL= 24.89

STA=	2007.	2114.	2372.	2414.	2630.	2731.
PER Q=	99.6	0.0	0.1	0.3	0.0	
AREA=	877.4	6.2	10.2	41.8	9.8	
VEL=	6.9	0.3	0.5	0.4	0.3	
DEPTH=	8.6	0.0	0.2	0.2	0.1	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 4.82 CWSEL= 26.70

STA=	571.	900.	950.	1103.	1166.	1236.	1550.	1777.
PER Q=	3.1	1.7	62.4	3.4	4.9	23.4	1.1	
AREA=	356.9	132.7	1453.5	208.3	283.8	1320.4	156.3	
VEL=	0.5	0.8	2.6	1.0	1.1	1.1	0.4	
DEPTH=	1.1	2.7	9.5	3.3	4.1	4.2	0.7	

FLOW DISTRIBUTION FOR SECNO= 4.90 CWSEL= 27.03

STA=	1716.	1900.	1933.	1953.	1973.	2000.	2023.	2067.	2100.	2200.	2300.	2370.	2441.
PER Q=	7.9	3.4	4.5	4.3	3.8	4.3	31.9	4.0	12.9	13.1	9.0	0.8	
AREA=	473.0	152.5	149.4	145.4	151.8	153.4	452.1	140.9	442.1	447.1	309.5	59.0	
VEL=	1.0	1.4	1.9	1.8	1.5	1.7	4.3	1.7	1.8	1.8	1.8	0.8	
DEPTH=	2.6	4.6	7.5	7.3	5.6	6.7	10.3	4.3	4.4	4.5	4.4	0.8	

FLOW DISTRIBUTION FOR SECNO= 5.55 CWSEL= 38.69

STA=	1343.	1610.	1650.	1670.	1700.	1720.	1735.	1760.	1850.	1940.	2020.	2070.
PER Q=	3.3	8.4	6.0	11.3	7.5	4.5	4.2	3.7	3.4	7.3	40.3	
AREA=	140.1	167.6	103.8	178.2	118.8	77.8	92.2	207.0	197.0	295.1	457.3	
VEL=	1.4	3.1	3.5	3.9	3.9	3.5	2.8	1.1	1.1	1.5	5.4	
DEPTH=	0.5	4.2	5.2	5.9	5.9	5.2	3.7	2.3	2.2	3.7	9.3	

FLOW DISTRIBUTION FOR SECNO= 5.90 CWSEL= 42.20

STA=	1538.	1540.	1570.	1572.	1940.	1995.	2065.
PER Q=	0.1	5.9	0.1	0.0	3.8	90.2	
AREA=	3.6	95.9	3.6	1.1	93.4	576.5	
VEL=	0.9	2.1	0.9	0.6	1.4	5.3	
DEPTH=	1.6	3.2	1.6	0.0	1.7	8.8	

FLOW DISTRIBUTION FOR SECNO= 5.93 CWSEL= 42.61

STA=	1467.	1469.	1492.	1495.	1939.
PER Q=	0.1	7.3	0.1	92.5	
AREA=	4.4	94.9	4.4	607.3	
VEL=	1.0	2.6	1.0	5.1	
DEPTH=	2.1	4.1	2.1	7.4	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 5.95 CWSEL= 42.95

STA=	1689.	1779.
PER Q=	100.0	
AREA=	707.1	
VEL=	4.8	
DEPTH=	8.2	

FLOW DISTRIBUTION FOR SECNO= 5.99 CWSEL= 43.86

STA=	1708.	1720.	1730.	1850.	1950.	2010.	2050.	2075.	2081.
PER Q=	0.0	0.1	1.8	17.3	72.8	5.3	2.6	0.1	
AREA=	11.5	28.6	522.6	435.5	688.8	154.2	83.9	8.7	
VEL=	0.0	0.1	0.1	1.3	3.6	1.2	1.1	0.6	
DEPTH=	0.9	2.9	4.4	4.4	11.5	3.9	3.4	1.4	

FLOW DISTRIBUTION FOR SECNO= 6.12 CWSEL= 44.52

STA=	2001.	2059.
PER Q=	100.0	
AREA=	591.5	
VEL=	5.7	
DEPTH=	10.2	

FLOW DISTRIBUTION FOR SECNO= 6.14 CWSEL= 45.20

STA=	2011.	2093.
PER Q=	100.0	
AREA=	789.1	
VEL=	4.3	
DEPTH=	9.6	

FLOW DISTRIBUTION FOR SECNO= 6.32 CWSEL= 46.05

STA=	1751.	1983.	2051.	2450.	2491.
PER Q=	1.9	93.8	4.2	0.1	
AREA=	96.7	491.6	188.4	9.2	
VEL=	0.7	6.4	0.8	0.4	
DEPTH=	0.4	13.7	0.5	0.2	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 6.77 CWSEL= 48.34

STA=	1566.	1580.	1670.	1700.	1800.	1900.	2003.	2049.
PER Q=	0.0	2.2	2.4	11.3	13.9	18.5	51.8	
AREA=	2.3	120.8	82.3	339.2	384.2	462.6	516.5	
VEL=	0.2	0.6	1.0	1.1	1.2	1.3	3.4	
DEPTH=	0.2	1.3	2.7	3.4	3.8	4.5	11.2	

FLOW DISTRIBUTION FOR SECNO= 7.45 CWSEL= 53.03

STA=	1774.	2000.	2063.	2100.	2551.
PER Q=	3.9	90.2	4.4	1.5	
AREA=	159.3	597.3	101.0	58.2	
VEL=	0.8	5.1	1.5	0.9	
DEPTH=	0.7	9.5	2.7	0.1	

FLOW DISTRIBUTION FOR SECNO= 8.77 CWSEL= 61.19

STA=	2002.	2032.	2132.	2200.	2212.	2232.	2282.
PER Q=	96.4	0.2	2.3	0.5	0.3	0.3	
AREA=	309.2	8.9	47.9	9.7	9.1	12.7	
VEL=	9.7	0.7	1.5	1.6	1.1	0.8	
DEPTH=	10.3	0.1	0.7	0.8	0.5	0.3	

FLOW DISTRIBUTION FOR SECNO= 9.73 CWSEL= 78.09

STA=	1809.	1913.	1986.	2000.	2042.
PER Q=	4.0	5.3	0.7	90.0	
AREA=	101.7	112.9	18.1	330.4	
VEL=	1.2	1.4	1.2	8.1	
DEPTH=	1.0	1.5	1.3	7.9	

FLOW DISTRIBUTION FOR SECNO= 9.86 CWSEL= 81.48

STA=	1822.	1900.	2000.	2059.	2100.	2130.	2190.
PER Q=	1.8	8.4	78.8	7.3	2.5	1.3	
AREA=	55.8	158.2	341.9	101.7	47.4	41.6	
VEL=	0.9	1.6	6.9	2.1	1.6	0.9	
DEPTH=	0.7	1.6	5.8	2.5	1.6	0.7	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 9.97 CWSEL= 85.84

STA=	1682.	1995.	2037.	2040.
PER Q=	4.0	96.0	0.0	
AREA=	129.6	316.2	0.5	
VEL=	0.7	6.7	0.4	
DEPTH=	0.4	7.5	0.2	

FLOW DISTRIBUTION FOR SECNO= 9.99 CWSEL= 87.17

STA=	1466.	1663.	1745.	1800.	1843.	1900.	1961.	2031.
PER Q=	6.3	5.2	3.2	5.2	5.1	1.8	73.3	
AREA=	175.0	118.5	75.3	54.5	60.9	31.2	232.9	
VEL=	1.0	1.3	1.2	2.7	2.4	1.6	9.0	
DEPTH=	0.9	1.4	1.4	1.3	1.1	0.5	8.4	

FLOW DISTRIBUTION FOR SECNO= 10.00 CWSEL= 88.50

STA=	1375.	1700.	1802.	1852.	1882.	1982.	1994.	2046.	2067.
PER Q=	6.7	6.8	3.7	4.5	20.9	2.5	53.2	1.8	
AREA=	558.6	280.5	146.3	133.5	545.0	65.4	510.4	68.3	
VEL=	0.3	0.7	0.7	1.0	1.1	1.1	3.0	0.7	
DEPTH=	1.7	2.7	2.9	4.4	5.4	5.4	9.8	3.2	

T1 SCAPPOOSE CREEK MILE 4.11 TO 10.01
T2 CORPS OF ENGINEERS , FLOOD PLAIN MANAGEMENT SERVICES
T3 SCAPPOOSE CREEK 500-YEAR FLOOD PROFILE

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		5			.00010				21.5	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15		-1							

IHLEQ = 1. THEREFORE FRICTION LOSS (HL) IS CALCULATED AS A FUNCTION OF
PROFILE TYPE, WHICH CAN VARY FROM REACH TO REACH. SEE DOCUMENTATION FOR
DETAILS.
FLOW DISTRIBUTION FOR SECNO= 4.65 CWSEL= 25.42

STA=	1990.	2124.	2214.	2414.	2630.	3017.
PER Q=	87.4	0.7	5.7	4.5	1.7	
AREA=	1006.0	53.5	284.4	253.1	178.5	
VEL=	7.2	1.1	1.7	1.5	0.8	
DEPTH=	7.6	0.6	1.4	1.2	0.5	

FLOW DISTRIBUTION FOR SECNO= 4.67 CWSEL= 26.51

STA=	2005.	2114.	2314.	2372.	2414.	2630.	3050.	3130.	3250.
PER Q=	69.3	0.7	2.6	2.1	10.5	13.5	0.9	0.2	
AREA=	968.6	49.9	99.4	78.3	391.9	594.1	61.2	31.7	
VEL=	5.9	1.2	2.1	2.3	2.2	1.9	1.3	0.6	
DEPTH=	8.9	0.2	1.7	1.9	1.8	1.4	0.8	0.3	

FLOW DISTRIBUTION FOR SECNO= 4.82 CWSEL= 27.79

STA=	419.	800.	900.	950.	1103.	1158.	1236.	1550.	1922.
PER Q=	3.1	3.2	2.2	54.2	3.2	5.9	24.9	3.3	
AREA=	490.4	306.7	187.1	1619.8	234.9	401.9	1661.8	482.4	
VEL=	0.5	0.9	1.0	2.8	1.1	1.2	1.2	0.6	
DEPTH=	1.3	3.1	3.7	10.6	4.3	5.2	5.3	1.3	

FLOW DISTRIBUTION FOR SECNO= 4.90 CWSEL= 28.10

STA=	1404.	1900.	1933.	1953.	1973.	2000.	2023.	2067.	2100.	2200.	2300.	2370.	2502.
PER Q=	9.9	3.5	4.2	4.0	3.8	4.1	27.7	4.3	13.6	13.8	9.5	1.8	
AREA=	715.8	188.0	171.0	167.0	180.8	178.2	499.5	176.5	549.8	554.8	384.9	170.3	
VEL=	1.1	1.5	2.0	2.0	1.7	1.9	4.6	2.0	2.0	2.1	2.0	0.9	
DEPTH=	1.4	5.7	8.5	8.3	6.7	7.7	11.4	5.3	5.5	5.5	5.5	1.3	

FLOW DISTRIBUTION FOR SECNO= 5.55 CWSEL= 39.78

STA=	1094.	1570.	1610.	1650.	1670.	1700.	1720.	1735.	1760.	1830.	1900.	2020.	2070.
PER Q=	3.1	3.8	8.8	5.9	10.6	7.1	4.4	4.6	3.7	4.0	10.1	33.9	
AREA=	438.1	141.2	211.2	125.6	210.9	140.6	94.2	119.5	229.6	239.6	513.6	511.5	
VEL=	0.6	2.3	3.4	3.9	4.2	4.2	3.9	3.2	1.3	1.4	1.6	5.5	
DEPTH=	0.9	3.5	5.3	6.3	7.0	7.0	6.3	4.8	3.3	3.4	4.3	10.3	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 5.90 CWSEL= 43.21

STA=	1537.	1540.	1570.	1573.	1940.	1995.	2065.
PER Q=	0.2	7.5	0.2	0.1	6.6	85.5	
AREA=	6.2	126.5	6.2	2.9	149.4	644.6	
VEL=	1.1	2.6	1.1	0.9	2.0	5.9	
DEPTH=	2.1	4.2	2.1	0.0	2.7	9.5	

FLOW DISTRIBUTION FOR SECNO= 5.93 CWSEL= 43.70

STA=	1467.	1469.	1492.	1495.	1939.
PER Q=	0.2	8.7	0.2	90.9	
AREA=	7.0	120.1	7.0	699.4	
VEL=	1.2	3.2	1.2	5.8	
DEPTH=	2.6	5.2	2.6	8.0	

FLOW DISTRIBUTION FOR SECNO= 5.95 CWSEL= 44.29

STA=	1685.	1779.
PER Q=	100.0	
AREA=	830.6	
VEL=	5.4	
DEPTH=	8.9	

FLOW DISTRIBUTION FOR SECNO= 5.99 CWSEL= 44.98

STA=	1226.	1950.	2010.	2050.	2075.	2083.
PER Q=	22.4	67.4	6.5	3.4	0.3	
AREA=	1562.8	756.1	199.0	111.9	16.8	
VEL=	0.6	4.0	1.4	1.3	0.7	
DEPTH=	2.2	12.6	5.0	4.5	2.0	

FLOW DISTRIBUTION FOR SECNO= 6.12 CWSEL= 45.93

STA=	1642.	1765.	1832.	1897.	1933.	1965.	2001.	2059.
PER Q=	0.1	0.7	1.7	1.2	1.1	1.5	93.7	
AREA=	20.7	46.1	74.0	48.2	42.8	55.4	673.6	
VEL=	0.3	0.7	1.0	1.1	1.1	1.2	6.2	
DEPTH=	0.2	0.7	1.1	1.3	1.3	1.5	11.6	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 6.14 CWSEL= 46.75

STA=	1575.	1620.	1765.	1832.	1900.	1933.	1990.	2011.	2093.
PER Q=	0.1	2.9	2.4	1.4	0.1	0.9	0.9	91.3	
AREA=	16.9	181.2	117.2	85.0	16.5	59.8	42.0	916.3	
VEL=	0.3	0.7	0.9	0.7	0.4	0.6	1.0	4.4	
DEPTH=	0.4	1.2	1.7	1.2	0.5	1.0	2.0	11.2	

FLOW DISTRIBUTION FOR SECNO= 6.32 CWSEL= 47.45

STA=	1658.	1800.	1871.	1967.	2015.	2051.	2200.	2269.	2350.	2450.	2568.
PER Q=	3.4	4.1	5.3	1.2	63.8	4.3	3.5	5.4	6.1	2.8	
AREA=	154.9	138.2	182.4	54.7	542.0	194.6	130.5	178.2	210.0	136.7	
VEL=	1.0	1.3	1.3	1.0	5.2	1.0	1.2	1.3	1.3	0.9	
DEPTH=	1.1	1.9	1.9	1.1	15.1	1.3	1.9	2.2	2.1	1.2	

FLOW DISTRIBUTION FOR SECNO= 6.77 CWSEL= 49.08

STA=	1537.	1670.	1800.	1900.	2003.	2049.	2100.	2445.
PER Q=	3.6	14.7	14.2	18.3	44.2	3.3	1.6	
AREA=	210.3	517.2	457.9	538.5	550.4	133.7	203.7	
VEL=	0.8	1.3	1.4	1.5	3.6	1.1	0.4	
DEPTH=	1.6	4.0	4.6	5.2	12.0	2.6	0.6	

FLOW DISTRIBUTION FOR SECNO= 7.45 CWSEL= 54.19

STA=	1697.	1900.	1990.	2000.	2063.	2100.	2169.	2670.
PER Q=	4.2	5.0	1.9	78.4	5.7	3.7	1.2	
AREA=	215.1	188.8	45.0	670.9	144.2	138.6	261.2	
VEL=	0.9	1.2	1.9	5.2	1.8	1.2	0.2	
DEPTH=	1.1	2.1	4.5	10.6	3.9	2.0	0.5	

FLOW DISTRIBUTION FOR SECNO= 8.77 CWSEL= 62.29

STA=	2002.	2032.	2076.	2100.	2132.	2200.	2212.	2232.	2282.	2300.	2307.
PER Q=	81.1	0.1	1.0	2.3	8.0	1.5	1.8	3.6	0.4	0.0	
AREA=	342.0	5.2	22.7	43.1	122.2	22.8	30.9	67.4	12.6	0.7	
VEL=	9.8	0.8	1.8	2.2	2.7	2.8	2.4	2.2	1.4	0.4	
DEPTH=	11.4	0.1	0.9	1.3	1.8	1.9	1.5	1.3	0.7	0.1	

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

FLOW DISTRIBUTION FOR SECNO= 9.73 CWSEL= 77.87

STA=	1826.	1913.	1986.	2000.	2042.
PER Q=	3.1	4.4	0.6	92.0	
AREA=	80.7	96.7	15.0	321.1	
VEL=	1.5	1.8	1.5	11.3	
DEPTH=	0.9	1.3	1.1	7.6	

FLOW DISTRIBUTION FOR SECNO= 9.86 CWSEL= 82.58

STA=	1816.	1824.	1900.	2000.	2059.	2100.	2130.	2238.
PER Q=	0.1	5.1	12.7	66.1	8.4	3.8	3.8	
AREA=	5.3	139.0	267.9	406.6	146.8	80.4	134.0	
VEL=	0.7	1.5	1.9	6.4	2.3	1.9	1.1	
DEPTH=	0.7	1.8	2.7	6.9	3.6	2.7	1.2	

FLOW DISTRIBUTION FOR SECNO= 9.97 CWSEL= 86.53

STA=	1588.	1900.	1995.	2037.	2045.
PER Q=	4.4	7.8	87.7	0.1	
AREA=	238.0	135.2	345.1	4.3	
VEL=	0.5	1.6	7.0	0.8	
DEPTH=	0.8	1.4	8.2	0.5	

FLOW DISTRIBUTION FOR SECNO= 9.99 CWSEL= 87.90

STA=	1389.	1600.	1663.	1700.	1745.	1800.	1843.	1900.	2000.	2031.
PER Q=	6.2	5.4	3.3	4.2	4.7	8.0	8.9	5.3	53.9	
AREA=	215.2	132.3	79.6	99.0	115.5	86.0	102.6	90.1	235.0	
VEL=	1.1	1.6	1.6	1.6	1.6	3.5	3.3	2.2	8.7	
DEPTH=	1.0	2.1	2.2	2.2	2.1	2.0	1.8	0.9	8.4	

FLOW DISTRIBUTION FOR SECNO= 10.00 CWSEL= 88.78

STA=	1333.	1600.	1700.	1802.	1852.	1882.	1982.	1994.	2046.	2068.
PER Q=	3.5	4.1	7.4	4.0	4.5	20.9	2.5	51.4	1.8	
AREA=	352.0	302.8	308.9	160.2	141.8	572.8	68.7	524.9	74.3	
VEL=	0.4	0.5	0.9	0.9	1.2	1.4	1.4	3.7	0.9	
DEPTH=	1.3	3.0	3.0	3.2	4.7	5.7	5.7	10.1	3.3	

THIS RUN EXECUTED 18NOV97 13:51:00

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SCAPPOOSE CREEK 10-YEAR

SUMMARY PRINTOUT

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	WV
	4.110	18.10	0.00	3470.00	1346.50	1042.80	1080.69	0.52	1.50	0.48	5550.47	1.00	0.01
	4.110	19.35	0.00	5270.00	2165.20	1244.69	1860.11	0.61	1.60	0.57	7586.48	0.99	0.01
	4.110	19.80	0.00	6120.00	2545.31	1345.65	2229.04	0.66	1.67	0.61	8320.21	1.02	0.01
	4.110	20.99	0.00	8300.00	3528.14	1552.86	3219.00	0.74	1.76	0.69	10289.87	1.00	0.02
	4.130	18.11	0.00	3470.00	1328.23	1088.46	1053.32	0.54	1.59	0.50	5240.97	1.16	0.02
	4.130	19.36	0.00	5270.00	2151.89	1285.91	1832.20	0.64	1.68	0.59	7275.16	1.11	0.02
	4.130	19.81	0.00	6120.00	2533.06	1385.93	2201.01	0.68	1.75	0.63	8008.86	1.14	0.02
	4.130	21.00	0.00	8300.00	3518.86	1589.24	3191.90	0.76	1.83	0.71	9976.62	1.10	0.02
*	4.480	19.66	0.00	3470.00	1148.25	2321.75	0.00	1.79	4.28	0.00	1183.28	20.47	0.21
*	4.480	20.97	0.00	5270.00	2100.51	3169.48	0.00	2.31	4.93	0.00	1552.91	22.25	0.26
*	4.480	21.46	0.00	6120.00	2564.25	3555.75	0.00	2.52	5.22	0.00	1699.56	23.27	0.29
*	4.480	22.67	0.00	8300.00	3833.21	4466.79	0.00	2.75	5.75	0.00	2169.14	24.15	0.33
*	4.650	22.06	0.00	3470.00	0.00	3470.00	0.00	0.00	5.92	0.00	585.88	43.37	0.54
*	4.650	23.82	0.00	5270.00	0.00	5270.00	0.00	0.00	6.61	0.00	796.75	57.25	0.68
*	4.650	24.40	0.00	6120.00	0.00	6120.00	0.00	0.00	7.02	0.00	871.86	58.69	0.77
*	4.650	25.42	0.00	8300.00	0.00	7258.26	1041.74	0.00	7.22	1.35	1775.46	52.94	0.71
	4.660	22.38	0.00	3470.00	0.00	3470.00	0.00	0.00	5.55	0.00	624.77	43.50	0.48
	4.660	24.07	0.00	5270.00	0.00	5270.00	0.00	0.00	6.63	0.00	794.89	46.81	0.68
	4.660	24.67	0.00	6120.00	0.00	6120.00	0.00	0.00	7.16	0.00	854.97	50.21	0.80
	4.660	25.65	22.10	8300.00	0.00	7435.62	864.38	0.00	7.77	1.19	1684.71	55.99	0.84
	4.670	22.55	0.00	3470.00	0.00	3470.00	0.00	0.00	5.40	0.00	642.12	39.87	0.45
	4.670	24.26	0.00	5270.00	0.00	5270.00	0.00	0.00	6.47	0.00	813.94	43.45	0.65
	4.670	24.89	20.24	6120.00	0.00	6093.31	26.69	0.00	6.94	0.39	945.46	45.88	0.75
	4.670	26.51	0.00	8300.00	0.00	5752.60	2547.40	0.00	5.94	1.95	2275.16	68.50	0.40
	4.680	22.75	0.00	3470.00	0.00	3470.00	0.00	0.00	5.49	0.00	631.76	41.99	0.47
	4.680	24.48	0.00	5270.00	0.00	5270.00	0.00	0.00	6.54	0.00	805.60	44.88	0.66
	4.680	25.13	20.52	6120.00	0.00	6096.07	23.93	0.00	7.00	0.32	944.31	47.52	0.76
*	4.680	26.68	0.00	8300.00	0.00	6345.93	1954.07	0.00	6.13	1.33	2506.95	32.09	0.45

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	HV
*	4.820	24.30	0.00	3470.00	5.91	2887.50	576.58	0.25	2.66	0.76	1870.75	7.96	0.09
*	4.820	26.02	0.00	5270.00	148.55	3578.75	1542.70	0.56	2.65	1.00	3163.66	5.94	0.08
*	4.820	26.70	0.00	6120.00	297.28	3817.52	2005.20	0.61	2.63	1.02	3911.96	5.27	0.07
*	4.820	27.79	0.00	8300.00	713.22	4495.49	3091.29	0.72	2.78	1.11	5385.12	5.09	0.07
*	4.900	24.77	0.00	3470.00	856.81	1668.88	944.31	1.41	4.73	1.42	1623.89	23.84	0.18
*	4.900	26.39	0.00	5270.00	1444.79	1855.29	1969.93	1.39	4.37	1.68	2633.14	15.96	0.13
*	4.900	27.03	0.00	6120.00	1728.89	1955.22	2435.89	1.41	4.32	1.74	3076.22	14.32	0.12
*	4.900	28.10	0.00	8300.00	2438.98	2295.06	3565.95	1.52	4.59	1.94	3936.51	14.16	0.13
	4.940	25.23	0.00	3470.00	995.54	1960.90	513.56	1.66	5.58	0.79	1602.49	33.41	0.29
	4.940	26.72	0.00	5270.00	1773.54	2359.18	1137.28	1.79	5.66	1.02	2526.72	27.31	0.24
	4.940	27.33	0.00	6120.00	2158.63	2532.46	1428.91	1.85	5.71	1.08	2937.86	25.60	0.23
	4.940	28.40	0.00	8300.00	3129.95	3043.36	2126.69	2.08	6.20	1.22	3746.35	26.42	0.25
*	4.970	25.49	0.00	3470.00	92.15	3377.85	0.00	2.45	9.28	0.00	401.59	103.15	1.30
*	4.970	26.97	26.97	5270.00	648.49	4621.51	0.00	1.57	10.51	0.00	852.59	108.05	1.51
*	4.970	27.46	27.46	6120.00	1134.22	4985.78	0.00	1.86	10.72	0.00	1073.51	105.98	1.46
*	4.970	28.64	28.64	8300.00	2794.07	5505.93	0.00	2.14	10.43	0.00	1834.07	88.06	1.14
*	5.000	27.33	0.00	3470.00	1217.20	2252.80	0.00	1.11	3.60	0.00	1724.90	20.43	0.14
*	5.000	29.00	0.00	5270.00	2538.99	2731.01	0.00	1.30	3.56	0.00	2725.19	15.99	0.11
*	5.000	29.44	0.00	6120.00	3112.63	3007.37	0.00	1.38	3.73	0.00	3055.19	16.75	0.12
*	5.000	30.26	0.00	8300.00	4605.42	3694.58	0.00	1.60	4.21	0.00	3753.44	19.62	0.14
	5.210	29.66	0.00	3470.00	127.51	2737.01	605.48	0.92	4.12	2.19	1078.09	23.67	0.22
	5.210	30.98	0.00	5270.00	662.29	3686.72	920.98	0.90	4.57	2.53	1903.97	22.46	0.25
	5.210	31.44	0.00	6120.00	1022.82	4051.93	1045.25	0.93	4.73	2.64	2353.98	22.23	0.25
	5.210	32.40	0.00	8300.00	2065.93	4898.02	1336.05	1.04	5.11	2.90	3411.96	22.22	0.26
*	5.320	31.45	0.00	3470.00	0.00	3470.00	0.00	0.00	8.81	0.00	394.06	76.63	1.20
*	5.320	32.71	31.44	5270.00	21.59	5248.41	0.00	0.66	10.73	0.00	521.74	99.43	1.78
*	5.320	33.13	32.34	6120.00	133.46	5986.54	0.00	1.36	11.48	0.00	619.33	105.82	2.00
*	5.320	34.78	34.78	8300.00	1336.65	6963.35	0.00	2.09	10.60	0.00	1296.91	69.67	1.47
	5.380	34.13	0.00	3470.00	0.14	3469.85	0.00	0.22	6.96	0.00	499.22	55.79	0.75
*	5.380	36.00	0.00	5270.00	197.15	5072.85	0.00	1.46	7.09	0.00	850.40	45.15	0.75
*	5.380	36.59	0.00	6120.00	435.44	5684.56	0.00	1.41	7.22	0.00	1096.55	41.54	0.75
	5.380	37.31	0.00	8300.00	1122.97	7177.03	0.00	1.71	8.20	0.00	1533.20	47.10	0.91
*	5.430	35.25	0.00	3470.00	21.67	3404.04	44.29	0.71	5.21	1.46	714.66	16.62	0.41
*	5.430	36.94	0.00	5270.00	256.38	4933.24	80.38	1.27	6.00	1.69	1071.58	16.31	0.53
*	5.430	37.47	0.00	6120.00	416.39	5606.57	97.04	1.45	6.42	1.80	1213.50	17.19	0.59
*	5.430	38.26	0.00	8300.00	872.29	7290.24	137.47	1.86	7.65	2.15	1484.59	21.77	0.81
	5.550	36.36	0.00	3470.00	1373.24	2096.76	0.00	2.57	6.10	0.00	878.26	17.91	0.39
	5.550	38.09	0.00	5270.00	2940.97	2329.03	0.00	2.32	5.44	0.00	1695.04	11.13	0.25
	5.550	38.69	0.00	6120.00	3655.27	2464.73	0.00	2.32	5.39	0.00	2035.01	10.15	0.23
*	5.550	39.78	0.00	8300.00	5483.39	2816.61	0.00	2.23	5.51	0.00	2975.73	9.38	0.21

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	HV
*	5.630	37.10	0.00	1930.00	13.96	1899.24	16.80	0.77	5.83	0.47	379.51	21.69	0.52
*	5.630	38.52	0.00	2900.00	128.62	2483.32	288.06	1.24	6.04	1.07	783.68	17.08	0.49
*	5.630	39.07	0.00	3360.00	229.84	2688.08	442.08	1.30	6.06	1.23	980.24	15.52	0.46
*	5.630	40.13	0.00	4450.00	567.13	3092.56	790.31	1.41	6.09	1.47	1448.09	13.13	0.41
	5.830	39.12	0.00	1930.00	267.86	1662.14	0.00	0.96	4.83	0.00	622.77	13.53	0.31
	5.830	40.38	0.00	2900.00	726.15	2173.85	0.00	1.30	5.42	0.00	958.65	14.76	0.35
	5.830	40.83	0.00	3360.00	965.07	2394.93	0.00	1.44	5.67	0.00	1093.39	15.42	0.36
	5.830	41.79	0.00	4450.00	1622.35	2827.65	0.00	1.78	6.02	0.00	1380.45	17.54	0.38
	5.860	39.43	0.00	1930.00	35.23	1894.77	0.00	0.93	4.43	0.00	465.37	19.58	0.30
	5.860	40.67	0.00	2900.00	130.24	2769.52	0.24	1.67	5.42	0.43	589.10	25.84	0.44
	5.860	41.12	0.00	3360.00	182.20	3176.81	1.00	1.96	5.85	0.64	637.19	28.64	0.51
	5.860	42.06	0.00	4450.00	321.82	4122.46	5.72	2.46	6.73	1.07	748.26	34.19	0.66
*	5.890	39.84	0.00	1930.00	241.11	1688.88	0.00	1.94	6.22	0.00	395.59	55.39	0.53
	5.890	41.14	0.00	2900.00	604.40	2295.00	0.60	2.52	6.70	0.75	582.61	48.19	0.57
	5.890	41.62	0.00	3360.00	784.36	2574.10	1.54	2.74	6.97	0.94	656.84	47.19	0.61
	5.890	42.63	0.00	4450.00	1230.51	3213.94	5.55	3.17	7.57	1.28	816.54	46.15	0.69
*	5.900	40.49	0.00	1930.00	47.38	1882.62	0.00	1.02	4.02	0.00	514.82	18.45	0.25
*	5.900	41.71	0.00	2900.00	217.84	2682.15	0.00	1.42	4.92	0.00	699.08	24.05	0.35
	5.900	42.20	0.00	3360.00	330.61	3029.39	0.00	1.67	5.25	0.00	774.05	26.08	0.39
	5.900	43.21	0.00	4450.00	646.28	3803.72	0.00	2.22	5.90	0.00	935.75	29.76	0.47
	5.920	40.69	0.00	1930.00	76.64	1853.36	0.00	1.44	4.04	0.00	512.39	22.38	0.24
	5.920	41.97	0.00	2900.00	186.80	2713.20	0.00	2.17	4.88	0.00	641.77	28.40	0.35
	5.920	42.47	0.00	3360.00	245.07	3114.93	0.00	2.46	5.23	0.00	695.36	30.92	0.40
	5.920	43.52	0.00	4450.00	394.54	4055.46	0.00	3.06	5.93	0.00	813.17	35.88	0.51
	5.925	40.78	0.00	1930.00	80.15	1849.85	0.00	1.45	3.97	0.00	520.98	21.46	0.24
	5.925	42.09	0.00	2900.00	193.16	2706.84	0.00	2.16	4.79	0.00	655.00	26.93	0.34
	5.925	42.61	0.00	3360.00	252.82	3107.18	0.00	2.44	5.12	0.00	710.95	29.17	0.38
	5.925	43.70	0.00	4450.00	404.99	4045.01	0.00	3.02	5.78	0.00	833.49	33.60	0.48
	5.935	40.97	0.00	1930.00	0.00	1930.00	0.00	0.00	3.54	0.00	545.95	14.69	0.19
	5.935	42.30	0.00	2900.00	0.00	2900.00	0.00	0.00	4.45	0.00	651.77	20.35	0.31
	5.935	42.82	0.00	3360.00	0.00	3360.00	0.00	0.00	4.83	0.00	696.33	22.78	0.36
	5.935	43.92	0.00	4450.00	0.00	4450.00	0.00	0.00	5.59	0.00	795.86	28.93	0.49
	5.950	40.99	0.00	1930.00	0.00	1930.00	0.00	0.00	3.53	0.00	547.52	14.57	0.19
	5.950	42.33	0.00	2900.00	0.00	2900.00	0.00	0.00	4.43	0.00	655.21	20.06	0.30
	5.950	42.95	0.00	3360.00	0.00	3360.00	0.00	0.00	4.75	0.00	707.08	21.85	0.35
	5.950	44.29	0.00	4450.00	0.00	4450.00	0.00	0.00	5.36	0.00	830.58	25.35	0.45
*	5.960	41.29	0.00	1930.00	0.00	1930.00	0.00	0.00	3.38	0.00	570.84	12.99	0.18
*	5.960	42.73	0.00	2900.00	0.00	2900.00	0.00	0.00	4.21	0.00	688.84	17.48	0.28
*	5.960	43.45	0.00	3360.00	0.00	3360.00	0.00	0.00	4.47	0.00	752.27	19.64	0.31
*	5.960	44.39	0.00	4450.00	0.00	4450.00	0.00	0.00	5.30	0.00	839.84	24.50	0.44

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	MV
	5.990	41.50	0.00	1930.00	178.30	1701.84	49.86	0.40	3.11	0.58	1078.45	8.48	0.13
*	5.990	43.09	0.00	2900.00	475.97	2236.29	187.74	0.58	3.48	0.97	1649.83	8.57	0.15
*	5.990	43.86	0.00	3360.00	641.61	2446.29	272.11	0.64	3.55	1.10	1933.79	8.15	0.15
*	5.990	44.98	0.00	4450.00	998.75	3001.31	449.94	0.64	3.97	1.37	2646.66	8.99	0.17
*	6.020	41.68	0.00	1930.00	3.21	1711.06	215.73	0.64	4.12	0.86	672.47	17.73	0.23
	6.020	43.27	0.00	2900.00	19.30	2087.06	793.63	1.00	4.18	1.29	1133.91	14.31	0.20
	6.020	44.03	0.00	3360.00	33.46	2211.08	1115.46	0.82	4.10	1.41	1372.45	12.41	0.18
	6.020	45.17	0.00	4450.00	232.65	2508.66	1708.68	0.62	4.18	1.61	2036.76	11.21	0.17
*	6.090	42.15	0.00	1930.00	86.18	1528.26	315.56	0.65	1.90	0.81	1327.75	3.24	0.05
*	6.090	43.68	0.00	2900.00	177.79	2102.68	619.53	0.87	2.20	0.97	1797.34	3.57	0.06
*	6.090	44.39	0.00	3360.00	225.90	2350.16	783.94	0.95	2.28	1.03	2028.53	3.55	0.06
*	6.090	45.50	0.00	4450.00	332.34	2963.89	1153.77	1.14	2.60	1.19	2399.95	4.08	0.08
	6.110	42.19	0.00	1930.00	88.57	1772.58	68.85	0.42	2.50	0.30	1148.69	5.65	0.09
	6.110	43.71	0.00	2900.00	192.97	2517.21	189.83	0.59	3.02	0.35	1698.59	6.62	0.12
	6.110	44.43	0.00	3360.00	249.77	2847.73	262.50	0.65	3.19	0.38	1969.49	6.76	0.13
	6.110	45.54	0.00	4450.00	376.72	3647.21	426.07	0.80	3.71	0.45	2399.28	8.01	0.18
*	6.115	42.22	0.00	1930.00	0.00	1930.00	0.00	0.00	4.03	0.00	478.37	15.60	0.25
*	6.115	43.75	0.00	2900.00	0.00	2900.00	0.00	0.00	5.26	0.00	551.21	23.45	0.43
*	6.115	44.46	0.00	3360.00	0.00	3360.00	0.00	0.00	5.72	0.00	587.43	31.40	0.51
*	6.115	45.58	0.00	4450.00	163.01	4286.99	0.00	0.91	6.57	0.00	832.49	36.04	0.65
	6.120	42.24	0.00	1930.00	0.00	1930.00	0.00	0.00	4.02	0.00	480.07	15.45	0.25
	6.120	43.80	0.00	2900.00	0.00	2900.00	0.00	0.00	5.24	0.00	553.94	23.12	0.43
	6.120	44.52	0.00	3360.00	0.00	3360.00	0.00	0.00	5.68	0.00	591.55	30.68	0.50
	6.120	45.93	0.00	4450.00	280.74	4169.26	0.00	0.98	6.19	0.00	960.80	30.64	0.56
	6.130	42.42	0.00	1930.00	0.00	1930.00	0.00	0.00	3.42	0.00	563.88	13.10	0.18
	6.130	44.13	0.00	2900.00	0.00	2900.00	0.00	0.00	4.13	0.00	701.82	16.84	0.27
	6.130	44.94	0.00	3360.00	0.00	3360.00	0.00	0.00	4.38	0.00	767.78	17.07	0.30
	6.130	46.38	0.00	4450.00	250.99	4199.01	0.00	0.69	4.74	0.00	1250.91	16.67	0.33
	6.135	42.44	0.00	1930.00	0.00	1930.00	0.00	0.00	3.42	0.00	565.09	13.05	0.18
	6.135	44.16	0.00	2900.00	0.00	2900.00	0.00	0.00	4.12	0.00	703.73	16.70	0.26
	6.135	45.20	0.00	3360.00	0.00	3360.00	0.00	0.00	4.26	0.00	789.09	15.64	0.28
	6.135	46.75	0.00	4450.00	386.74	4063.26	0.00	0.75	4.43	0.00	1434.85	13.97	0.28
*	6.150	42.64	0.00	1930.00	0.00	1930.00	0.00	0.00	2.17	0.00	889.84	4.30	0.07
*	6.150	44.44	0.00	2900.00	0.00	2900.00	0.00	0.00	2.59	0.00	1120.23	5.09	0.10
*	6.150	45.50	0.00	3360.00	0.00	3360.00	0.00	0.00	2.67	0.00	1257.37	4.88	0.11
*	6.150	47.10	0.00	4450.00	936.38	3513.62	0.00	0.32	2.40	0.00	4430.81	3.38	0.07
	6.230	42.86	0.00	1930.00	400.50	1529.50	0.00	1.32	2.92	0.00	827.01	6.97	0.11
	6.230	44.71	0.00	2900.00	971.86	1914.48	13.66	0.89	3.07	0.19	1782.26	6.43	0.10
	6.230	45.77	0.00	3360.00	1480.69	1735.75	143.55	0.76	2.55	0.37	3009.02	3.94	0.06
	6.230	47.28	0.00	4450.00	2353.56	1641.64	454.80	0.73	2.15	0.48	4923.75	2.42	0.03

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	HV
*	6.300	43.31	0.00	1930.00	0.00	1930.00	0.00	0.00	4.68	0.00	412.73	23.43	0.34
*	6.300	45.14	0.00	2900.00	1.40	2727.32	171.28	0.28	5.37	1.08	670.82	26.82	0.42
*	6.300	46.06	0.00	3360.00	71.22	2823.57	465.21	0.54	5.06	1.00	1156.23	21.56	0.34
*	6.300	47.44	0.00	4450.00	650.55	2575.61	1223.83	0.86	4.06	1.04	2572.93	11.71	0.15
	6.310	43.41	0.00	1930.00	0.00	1930.00	0.00	0.00	4.87	0.00	396.69	25.49	0.37
	6.310	45.19	0.00	2900.00	0.00	2899.79	0.21	0.00	6.30	0.12	462.17	38.00	0.62
	6.310	46.04	38.82	3360.00	63.06	3153.82	143.12	0.66	6.42	0.73	781.50	37.61	0.60
	6.310	47.45	0.00	4450.00	623.77	2840.06	986.17	1.18	5.24	1.16	1921.84	22.92	0.28
	6.315	43.43	0.00	1930.00	0.00	1930.00	0.00	0.00	4.86	0.00	397.30	25.38	0.37
	6.315	45.34	0.00	2900.00	0.00	2896.51	3.49	0.00	6.21	0.25	480.38	36.64	0.60
	6.315	46.05	0.00	3360.00	64.46	3150.01	145.53	0.67	6.41	0.74	785.84	37.47	0.60
	6.315	47.45	0.00	4450.00	623.94	2839.65	986.41	1.18	5.24	1.16	1922.26	22.91	0.28
	6.320	43.64	0.00	1930.00	0.00	1902.10	27.90	0.00	3.98	0.40	547.52	13.91	0.24
*	6.320	45.91	0.00	2900.00	145.28	2205.50	549.22	0.58	3.76	0.85	1483.93	9.94	0.17
*	6.320	46.66	0.00	3360.00	327.77	2157.13	875.10	0.70	3.46	0.85	2122.83	7.79	0.12
*	6.320	47.70	0.00	4450.00	694.03	2258.76	1497.21	0.85	3.36	0.95	3069.32	6.61	0.10
*	6.500	44.34	0.00	1930.00	280.96	1046.84	602.19	0.65	2.11	1.16	1444.96	3.21	0.05
*	6.500	46.42	0.00	2900.00	681.97	1223.50	994.52	0.76	2.11	0.89	2588.60	2.61	0.04
*	6.500	47.08	0.00	3360.00	845.45	1283.29	1231.26	0.80	2.12	0.83	3144.47	2.48	0.03
*	6.500	48.08	0.00	4450.00	1193.18	1462.02	1794.79	0.90	2.26	0.87	4030.51	2.60	0.03
*	6.750	45.46	0.00	1930.00	328.31	1586.46	15.23	0.87	4.04	0.81	789.43	16.07	0.21
*	6.750	47.16	0.00	2900.00	1115.93	1729.40	54.66	1.14	3.67	0.95	1511.38	10.43	0.13
*	6.750	47.75	0.00	3360.00	1471.40	1809.24	79.36	1.20	3.63	1.01	1800.17	9.47	0.12
*	6.750	48.72	0.00	4450.00	2235.53	2027.81	186.66	1.35	3.73	0.68	2468.85	8.94	0.11
	6.760	45.54	0.00	1930.00	0.00	1930.00	0.00	0.00	4.86	0.00	396.84	23.05	0.37
	6.760	47.21	0.00	2900.00	1150.99	1749.01	0.00	1.15	3.69	0.00	1474.18	10.51	0.14
	6.760	47.80	0.00	3360.00	1518.34	1841.66	0.00	1.22	3.68	0.00	1740.11	9.70	0.13
	6.760	48.77	0.00	4450.00	2244.79	2008.90	196.31	1.34	3.68	0.67	2513.81	8.65	0.11
	6.770	45.59	0.00	1930.00	0.00	1930.00	0.00	0.00	4.95	0.00	389.82	24.46	0.38
	6.770	47.88	0.00	2900.00	1283.28	1616.72	0.00	1.07	3.26	0.00	1690.31	7.72	0.10
	6.770	48.34	0.00	3360.00	1618.38	1741.61	0.00	1.16	3.37	0.00	1907.80	7.80	0.10
	6.770	49.08	0.00	4450.00	2263.35	1968.44	218.21	1.31	3.58	0.65	2611.64	8.06	0.10
*	6.780	46.00	0.00	1930.00	425.15	1485.28	19.57	0.87	3.63	0.78	924.24	12.34	0.16
	6.780	47.93	0.00	2900.00	1264.60	1567.43	67.97	1.04	3.15	0.88	1788.74	7.16	0.09
	6.780	48.39	0.00	3360.00	1585.84	1682.95	91.21	1.12	3.25	0.93	2027.26	7.19	0.09
	6.780	49.12	0.00	4450.00	2270.01	1953.03	226.96	1.30	3.54	0.64	2649.53	7.84	0.10
	7.020	47.28	0.00	1930.00	212.06	1717.94	0.00	0.73	3.80	0.00	743.86	9.98	0.20
	7.020	48.81	0.00	2900.00	782.74	2075.05	42.20	1.14	4.01	0.37	1316.29	10.01	0.18
	7.020	49.26	0.00	3360.00	1022.52	2200.33	137.16	1.26	4.09	0.52	1614.59	10.12	0.18
	7.020	50.02	0.00	4450.00	1521.11	2458.39	470.50	1.46	4.29	0.74	2248.40	10.61	0.17

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	HV
	7.430	50.37	0.00	1930.00	7.71	1921.18	1.11	0.91	4.47	0.27	442.25	19.78	0.31
*	7.430	51.88	0.00	2900.00	31.87	2790.75	77.38	1.17	5.31	1.06	625.25	21.37	0.42
*	7.430	52.38	0.00	3360.00	59.29	3166.74	133.97	1.04	5.69	1.28	718.48	22.63	0.47
*	7.430	53.27	0.00	4450.00	230.63	3918.79	300.57	1.07	6.40	1.56	1020.34	25.23	0.56
	7.440	50.47	0.00	1930.00	0.00	1930.00	0.00	0.00	4.42	0.00	436.25	18.97	0.30
	7.440	51.98	0.00	2900.00	0.00	2900.00	0.00	0.00	5.46	0.00	531.48	22.17	0.46
	7.440	52.53	0.00	3360.00	68.74	3143.37	147.89	0.97	5.56	1.29	751.53	21.15	0.45
	7.440	53.48	0.00	4450.00	286.16	3832.25	331.59	1.08	6.13	1.42	1123.70	22.50	0.51
	7.450	50.50	0.00	1930.00	0.00	1930.00	0.00	0.00	4.41	0.00	438.13	18.70	0.30
	7.450	52.33	0.00	2900.00	50.11	2849.88	0.00	0.96	5.15	0.00	605.17	18.74	0.41
	7.450	53.03	0.00	3360.00	129.52	3031.14	199.34	0.81	5.07	1.25	915.69	16.42	0.36
	7.450	54.19	0.00	4450.00	489.55	3488.39	472.06	1.09	5.20	0.87	1663.78	14.76	0.33
	7.460	50.61	0.00	1930.00	0.00	1930.00	0.00	0.00	4.35	0.00	444.06	17.88	0.29
	7.460	52.52	0.00	2900.00	58.61	2714.72	126.67	0.84	4.80	1.11	748.71	15.84	0.34
	7.460	53.13	0.00	3360.00	146.86	3003.39	209.75	0.81	4.98	1.23	955.86	15.58	0.35
	7.460	54.29	0.00	4450.00	514.30	3442.29	493.41	1.09	5.09	0.82	1748.72	13.97	0.31
*	7.870	52.57	0.00	1795.00	10.33	1758.29	26.38	0.25	2.62	0.49	766.83	5.09	0.10
*	7.870	54.46	0.00	2690.00	207.04	2361.51	121.46	0.60	2.97	0.84	1283.73	5.25	0.12
*	7.870	55.07	0.00	3115.00	356.48	2588.50	170.02	0.71	3.10	0.95	1517.30	5.36	0.13
*	7.870	56.17	0.00	4125.00	750.20	3088.61	286.19	0.93	3.41	1.14	1960.53	5.82	0.14
*	8.580	57.02	0.00	1795.00	0.19	1735.62	59.20	0.14	4.45	1.12	444.46	19.19	0.30
*	8.580	58.64	0.00	2690.00	143.79	2308.62	237.59	0.93	4.96	1.45	784.42	18.89	0.33
*	8.580	59.18	0.00	3115.00	259.95	2519.66	335.39	1.13	5.14	1.60	928.84	18.93	0.34
*	8.580	60.22	0.00	4125.00	583.18	2965.43	576.39	1.47	5.51	1.91	1236.16	19.24	0.35
	8.750	58.75	0.00	1795.00	26.91	1768.09	0.00	1.24	4.20	0.00	442.76	16.92	0.27
	8.750	60.32	0.00	2690.00	55.10	2358.20	276.70	1.47	4.66	1.11	792.22	16.33	0.30
	8.750	60.86	0.00	3115.00	70.14	2606.88	437.97	1.58	4.87	1.25	929.85	16.59	0.31
	8.750	61.90	0.00	4125.00	115.11	3113.38	896.51	1.67	5.27	1.48	1266.16	16.94	0.33
*	8.760	59.14	0.00	1795.00	0.00	1795.00	0.00	0.00	7.25	0.00	247.55	71.96	0.82
*	8.760	60.79	0.00	2690.00	0.00	2667.93	22.07	0.00	8.99	0.86	322.29	95.69	1.24
*	8.760	61.17	57.75	3115.00	0.00	3012.01	102.99	0.00	9.77	1.26	390.26	109.78	1.43
*	8.760	62.23	62.09	4125.00	0.00	3388.96	736.03	0.00	9.97	2.37	651.20	106.14	1.28
	8.770	59.14	0.00	1795.00	0.00	1795.00	0.00	0.00	7.25	0.00	247.59	71.92	0.82
	8.770	60.79	0.00	2690.00	0.00	2667.18	22.82	0.00	8.98	0.87	323.30	95.41	1.24
	8.770	61.19	0.00	3115.00	0.00	3001.68	113.32	0.00	9.71	1.28	397.53	108.06	1.41
	8.770	62.29	0.00	4125.00	0.00	3346.10	778.89	0.00	9.78	2.38	669.66	101.83	1.22
*	8.780	60.23	0.00	1795.00	36.24	1585.63	173.13	0.99	3.17	0.74	769.85	7.64	0.14
*	8.780	62.54	0.00	2690.00	88.85	1906.90	694.26	0.90	3.05	0.93	1470.68	5.25	0.11
*	8.780	63.20	0.00	3115.00	123.69	2055.74	935.57	0.90	3.11	1.00	1733.73	5.08	0.10
*	8.780	63.99	0.00	4125.00	199.90	2503.65	1421.45	1.04	3.56	1.22	2064.19	6.12	0.13

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	HV
	8.880	60.70	0.00	1730.00	1.99	1727.53	0.48	0.21	2.94	0.20	600.15	7.92	0.13
	8.880	62.87	0.00	2585.00	190.57	2353.12	41.31	0.75	3.15	0.68	1061.86	6.64	0.14
	8.880	63.52	0.00	2990.00	302.76	2616.81	70.43	0.88	3.30	0.83	1222.83	6.69	0.15
	8.880	64.36	0.00	3960.00	538.20	3290.82	130.98	1.14	3.85	1.11	1445.25	8.25	0.19
*	9.230	64.53	0.00	1730.00	326.88	1385.33	17.79	1.02	5.26	1.56	595.17	40.60	0.35
*	9.230	65.50	0.00	2585.00	1035.10	1521.94	27.96	1.39	4.92	1.53	1071.63	28.50	0.23
*	9.230	65.89	0.00	2990.00	1373.44	1583.79	32.77	1.49	4.82	1.53	1271.31	25.39	0.21
*	9.230	66.62	0.00	3960.00	2144.81	1770.67	44.52	1.69	4.87	1.58	1658.78	22.63	0.19
	9.500	69.69	0.00	1730.00	643.26	800.88	285.86	2.21	4.27	1.20	716.86	36.97	0.16
	9.500	70.13	0.00	2585.00	934.10	1071.10	579.80	2.74	5.19	1.61	906.65	47.91	0.22
	9.500	70.32	0.00	2990.00	1063.59	1180.27	746.14	2.92	5.49	1.78	999.38	50.80	0.24
*	9.500	70.91	0.00	3960.00	1349.42	1374.74	1235.84	3.07	5.72	2.06	1278.54	47.71	0.25
*	9.600	72.68	72.68	1730.00	434.76	1295.24	0.00	1.50	7.26	0.00	468.10	83.56	0.62
	9.600	73.30	0.00	2585.00	1035.51	1549.49	0.00	1.88	7.47	0.00	757.82	79.92	0.54
	9.600	73.55	0.00	2990.00	1343.61	1646.39	0.00	1.97	7.48	0.02	901.65	76.34	0.50
	9.600	73.98	0.00	3960.00	2077.74	1879.37	2.89	2.05	7.78	0.62	1259.04	72.96	0.48
	9.620	73.64	0.00	1730.00	634.24	1095.76	0.00	1.32	5.48	0.00	681.82	44.16	0.31
	9.620	74.17	0.00	2585.00	1216.10	1368.76	0.15	1.58	6.06	0.25	995.93	48.39	0.32
	9.620	74.37	0.00	2990.00	1516.46	1472.32	1.22	1.63	6.23	0.43	1168.93	48.20	0.32
	9.620	74.76	0.00	3960.00	2242.70	1709.19	8.11	1.81	6.68	0.69	1504.91	49.98	0.33
	9.710	75.87	0.00	1730.00	12.39	1717.61	0.00	0.62	6.33	0.00	291.38	52.98	0.62
	9.710	76.78	0.00	2585.00	213.12	2371.82	0.05	1.50	7.68	0.31	451.25	72.72	0.84
	9.710	77.04	0.00	2990.00	342.84	2646.50	0.66	1.83	8.28	0.60	507.84	80.52	0.95
	9.710	77.59	77.16	3960.00	732.54	3220.37	7.09	2.43	9.39	1.27	649.77	94.36	1.13
	9.720	76.14	0.00	1730.00	0.00	1730.00	0.00	0.00	6.50	0.00	266.23	56.69	0.66
	9.720	77.15	0.00	2585.00	166.00	2419.00	0.00	1.21	7.87	0.00	445.12	76.63	0.90
	9.720	77.44	0.00	2990.00	282.80	2707.20	0.00	1.50	8.46	0.00	508.15	84.02	1.01
	9.720	78.06	77.93	3960.00	643.85	3316.15	0.00	1.97	9.58	0.00	672.88	97.21	1.20
	9.730	76.19	0.00	1730.00	0.00	1730.00	0.00	0.00	6.86	0.00	252.36	34.95	0.73
	9.730	77.21	74.65	2585.00	0.00	2585.00	0.00	0.00	9.52	0.00	271.62	140.36	1.41
*	9.730	78.09	0.00	2990.00	298.63	2691.37	0.00	1.28	8.15	0.00	563.01	39.51	0.93
*	9.730	77.87	77.87	3960.00	316.88	3643.12	0.00	1.65	11.34	0.00	513.54	79.61	1.84
	9.740	76.36	0.00	1730.00	0.00	1730.00	0.00	0.00	7.09	0.00	243.93	38.54	0.78
*	9.740	78.56	0.00	2585.00	273.61	2309.83	1.56	1.12	6.93	0.48	581.81	28.30	0.67
	9.740	78.29	0.00	2990.00	243.98	2745.43	0.58	1.25	8.53	0.43	518.84	44.85	1.04
	9.740	78.27	78.15	3960.00	316.13	3643.17	0.69	1.65	11.35	0.56	514.35	79.68	1.84
	9.860	79.76	0.00	1730.00	1.72	1688.88	39.41	0.39	7.02	1.25	276.54	73.69	0.75
	9.860	80.97	0.00	2585.00	156.87	2209.49	218.64	1.23	7.07	1.67	570.61	52.85	0.67
	9.860	81.48	0.00	2990.00	303.05	2356.56	330.39	1.42	6.89	1.73	746.64	44.49	0.59
*	9.860	82.58	0.00	3960.00	707.40	2618.95	633.65	1.72	6.44	1.75	1180.01	30.81	0.44

	SECNO	CWSEL	CRIWS	Q	QLOB	QCH	QROB	VLOB	VCH	VROB	AREA	10*KS	HV
	9.930	82.80	82.44	1730.00	0.00	1644.81	85.19	0.00	8.09	1.30	268.71	111.29	0.97
*	9.930	83.50	83.43	2585.00	0.00	2231.19	353.81	0.00	9.22	2.11	409.67	122.34	1.15
*	9.930	83.83	83.83	2990.00	0.00	2453.51	536.49	0.00	9.41	2.39	485.64	118.60	1.14
*	9.930	84.32	84.32	3960.00	8.47	3009.40	942.13	0.79	10.37	2.88	627.45	127.17	1.30
	9.970	84.67	0.00	1600.00	0.21	1599.79	0.00	0.23	5.99	0.00	268.13	49.74	0.56
	9.970	85.55	0.00	2000.00	35.48	1964.52	0.00	0.63	6.46	0.01	360.70	50.88	0.64
	9.970	85.84	82.11	2210.00	87.76	2122.06	0.18	0.68	6.71	0.39	446.26	52.13	0.67
	9.970	86.53	0.00	2750.00	333.90	2412.69	3.41	0.89	6.99	0.79	722.72	50.38	0.67
	9.980	85.11	0.00	1600.00	0.00	1600.00	0.00	0.00	7.67	0.00	208.61	44.77	0.91
	9.980	86.00	82.82	2000.00	118.14	1881.86	0.00	0.78	8.08	0.00	383.54	44.53	0.95
	9.980	86.29	83.22	2210.00	247.88	1962.12	0.00	0.97	8.14	0.00	496.18	43.75	0.91
	9.980	86.96	0.00	2750.00	703.57	2046.43	0.00	1.29	7.89	0.00	806.84	38.29	0.73
	9.990	85.21	0.00	1660.00	0.00	1660.00	0.00	0.00	8.05	0.00	206.17	79.91	1.01
*	9.990	86.09	86.03	2480.00	38.18	2441.82	0.00	0.49	10.64	0.00	307.19	180.96	1.73
*	9.990	87.17	87.17	2870.00	766.54	2103.46	0.00	1.49	9.03	0.00	748.21	175.24	0.94
*	9.990	87.90	87.90	3800.00	1750.66	2049.34	0.00	1.90	8.72	0.00	1155.39	162.77	0.66
*	10.000	86.64	0.00	1660.00	487.67	1150.47	21.86	0.65	2.78	0.64	1194.34	4.70	0.09
*	10.000	88.63	0.00	2480.00	1137.40	1297.79	44.81	0.63	2.51	0.63	2400.96	2.84	0.05
*	10.000	88.50	0.00	2870.00	1291.28	1527.66	51.07	0.75	2.99	0.75	2307.88	4.11	0.08
*	10.000	88.78	0.00	3800.00	1778.05	1952.17	69.77	0.93	3.72	0.94	2506.46	6.12	0.12

SCAPPOOSE CREEK 10-YEAR

SUMMARY PRINTOUT

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	4.110	0.00	3470.00	18.10	18.12	0.00	0.00	4.90	1629.54	83.94	825.00	890.00	1713.48
	4.110	0.00	5270.00	19.35	19.36	0.00	0.00	4.90	1637.96	81.31	825.00	890.00	1719.26
	4.110	0.00	6120.00	19.80	19.81	0.00	0.00	4.90	1640.98	80.36	825.00	890.00	1721.34
	4.110	0.00	8300.00	20.99	21.01	0.00	0.00	4.90	1649.20	77.83	825.00	890.00	1727.03
	4.130	100.00	3470.00	18.11	18.13	0.00	0.00	5.10	1628.25	84.34	825.00	890.00	1712.59
	4.130	100.00	5270.00	19.36	19.37	0.00	0.00	5.10	1636.67	81.71	825.00	890.00	1718.38
	4.130	100.00	6120.00	19.81	19.82	0.00	0.00	5.10	1639.70	80.76	825.00	890.00	1720.46
	4.130	100.00	8300.00	21.00	21.02	0.00	0.00	5.10	1647.79	78.23	825.00	890.00	1726.02
*	4.480	1850.00	3470.00	19.66	19.87	0.00	0.00	9.60	280.52	1786.21	1990.00	2069.00	2066.73
*	4.480	1850.00	5270.00	20.97	21.23	0.00	0.00	9.60	287.73	1780.16	1990.00	2069.00	2067.89
*	4.480	1850.00	6120.00	21.46	21.75	0.00	0.00	9.60	302.25	1766.09	1990.00	2069.00	2068.34
*	4.480	1850.00	8300.00	22.67	23.00	0.00	0.00	9.60	586.71	1482.29	1990.00	2069.00	2069.00
*	4.650	850.00	3470.00	22.06	22.61	0.00	0.00	9.30	88.53	1997.26	1990.00	2124.00	2085.80
*	4.650	850.00	5270.00	23.82	24.49	0.00	0.00	9.30	127.41	1990.68	1990.00	2124.00	2118.09
*	4.650	850.00	6120.00	24.40	25.17	0.00	0.00	9.30	129.92	1990.00	1990.00	2124.00	2119.92
*	4.650	850.00	8300.00	25.42	26.13	0.00	0.00	9.30	1011.60	1990.00	1990.00	2124.00	3017.20
	4.660	50.00	3470.00	22.38	22.86	0.00	0.00	9.30	100.48	2006.76	2000.00	2114.00	2107.24
	4.660	50.00	5270.00	24.07	24.76	0.00	0.00	9.30	100.54	2006.73	2000.00	2114.00	2107.27
	4.660	50.00	6120.00	24.67	25.47	0.00	0.00	9.30	100.56	2006.72	2000.00	2114.00	2107.28
	4.660	50.00	8300.00	25.65	26.49	0.00	0.00	9.30	1066.98	2006.70	2000.00	2114.00	3074.02
	4.670	31.00	3470.00	22.55	23.00	24.70	25.70	9.30	100.49	2006.75	2000.00	2114.00	2107.24
	4.670	31.00	5270.00	24.26	24.91	24.70	25.70	9.30	100.55	2006.72	2000.00	2114.00	2107.27
	4.670	31.00	6120.00	24.89	25.64	24.70	25.70	9.30	719.36	2006.71	2000.00	2114.00	2731.50
	4.670	31.00	8300.00	26.51	26.91	24.70	25.70	9.30	1247.02	2004.82	2000.00	2114.00	3251.84
	4.680	50.00	3470.00	22.75	23.22	0.00	0.00	9.60	100.49	2006.76	2000.00	2114.00	2107.24
	4.680	50.00	5270.00	24.48	25.14	0.00	0.00	9.60	100.55	2006.73	2000.00	2114.00	2107.27
	4.680	50.00	6120.00	25.13	25.88	0.00	0.00	9.60	683.11	2006.72	2000.00	2114.00	2695.70
*	4.680	50.00	8300.00	26.68	27.13	0.00	0.00	9.60	1214.94	2005.14	2000.00	2114.00	3220.08
*	4.820	850.00	3470.00	24.30	24.39	0.00	0.00	15.00	649.00	872.96	950.00	1103.00	1556.01
*	4.820	850.00	5270.00	26.02	26.10	0.00	0.00	15.00	978.56	666.67	950.00	1103.00	1645.23
*	4.820	850.00	6120.00	26.70	26.77	0.00	0.00	15.00	1206.03	571.30	950.00	1103.00	1777.33
*	4.820	850.00	8300.00	27.79	27.86	0.00	0.00	15.00	1503.27	419.06	950.00	1103.00	1922.33
*	4.900	400.00	3470.00	24.77	24.95	0.00	0.00	15.50	601.78	1774.70	2023.00	2067.00	2376.47
*	4.900	400.00	5270.00	26.39	26.52	0.00	0.00	15.50	665.83	1737.20	2023.00	2067.00	2403.03
*	4.900	400.00	6120.00	27.03	27.15	0.00	0.00	15.50	725.29	1715.97	2023.00	2067.00	2441.26
*	4.900	400.00	8300.00	28.10	28.23	0.00	0.00	15.50	1098.32	1404.13	2023.00	2067.00	2502.45

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	4.940	200.00	3470.00	25.23	25.52	0.00	0.00	16.00	600.96	1775.41	2023.00	2067.00	2376.37
	4.940	200.00	5270.00	26.72	26.97	0.00	0.00	16.00	650.74	1742.59	2023.00	2067.00	2393.33
	4.940	200.00	6120.00	27.33	27.56	0.00	0.00	16.00	707.26	1722.41	2023.00	2067.00	2429.67
	4.940	200.00	8300.00	28.40	28.65	0.00	0.00	16.00	801.76	1692.06	2023.00	2067.00	2493.82
*	4.970	150.00	3470.00	25.49	26.79	0.00	0.00	16.50	64.21	2011.28	2025.00	2080.00	2075.49
*	4.970	150.00	5270.00	26.97	28.48	0.00	0.00	16.50	446.04	1630.93	2025.00	2080.00	2076.97
*	4.970	150.00	6120.00	27.46	28.92	0.00	0.00	16.50	461.14	1616.32	2025.00	2080.00	2077.46
*	4.970	150.00	8300.00	28.64	29.78	0.00	0.00	16.50	797.87	1280.77	2025.00	2080.00	2078.64
*	5.000	130.00	3470.00	27.33	27.47	0.00	0.00	17.20	538.73	1570.14	2025.00	2120.00	2108.88
*	5.000	130.00	5270.00	29.00	29.12	0.00	0.00	17.20	715.72	1395.11	2025.00	2120.00	2110.83
*	5.000	130.00	6120.00	29.44	29.56	0.00	0.00	17.20	788.62	1322.72	2025.00	2120.00	2111.34
*	5.000	130.00	8300.00	30.26	30.40	0.00	0.00	17.20	909.34	1203.17	2025.00	2120.00	2112.51
	5.210	1100.00	3470.00	29.66	29.89	0.00	0.00	22.30	329.35	1847.61	2003.00	2111.00	2176.96
	5.210	1100.00	5270.00	30.98	31.23	0.00	0.00	22.30	935.07	803.75	2003.00	2111.00	2178.51
	5.210	1100.00	6120.00	31.44	31.69	0.00	0.00	22.30	1021.73	764.32	2003.00	2111.00	2179.05
	5.210	1100.00	8300.00	32.40	32.67	0.00	0.00	22.30	1181.54	695.85	2003.00	2111.00	2180.18
*	5.320	560.00	3470.00	31.45	32.66	0.00	0.00	23.30	71.04	2006.38	2000.00	2085.00	2077.42
*	5.320	560.00	5270.00	32.71	34.50	0.00	0.00	23.30	235.24	1844.28	2000.00	2085.00	2079.52
*	5.320	560.00	6120.00	33.13	35.13	0.00	0.00	23.30	246.72	1833.48	2000.00	2085.00	2080.20
*	5.320	560.00	8300.00	34.78	36.26	0.00	0.00	23.30	628.45	1430.47	2000.00	2085.00	2082.97
	5.380	330.00	3470.00	34.13	34.88	0.00	0.00	24.50	111.90	1926.17	1980.00	2105.00	2099.13
*	5.380	330.00	5270.00	36.00	36.75	0.00	0.00	24.50	230.95	1870.05	1980.00	2105.00	2101.00
*	5.380	330.00	6120.00	36.59	37.35	0.00	0.00	24.50	508.32	1432.94	1980.00	2105.00	2101.59
	5.380	330.00	8300.00	37.31	38.22	0.00	0.00	24.50	673.03	1370.68	1980.00	2105.00	2102.31
*	5.430	280.00	3470.00	35.25	35.66	0.00	0.00	25.40	164.47	1946.64	2003.00	2102.00	2111.11
*	5.430	280.00	5270.00	36.94	37.46	0.00	0.00	25.40	256.98	1856.46	2003.00	2102.00	2113.43
*	5.430	280.00	6120.00	37.47	38.06	0.00	0.00	25.40	285.55	1828.60	2003.00	2102.00	2114.15
*	5.430	280.00	8300.00	38.26	39.06	0.00	0.00	25.40	524.56	1590.68	2003.00	2102.00	2115.25
	5.550	640.00	3470.00	36.36	36.75	0.00	0.00	25.50	380.23	1586.36	2020.00	2070.00	2068.35
	5.550	640.00	5270.00	38.09	38.34	0.00	0.00	25.50	502.86	1566.28	2020.00	2070.00	2069.13
	5.550	640.00	6120.00	38.69	38.92	0.00	0.00	25.50	726.16	1343.25	2020.00	2070.00	2069.40
*	5.550	640.00	8300.00	39.78	39.99	0.00	0.00	25.50	975.96	1093.94	2020.00	2070.00	2069.90
*	5.630	410.00	1930.00	37.10	37.62	0.00	0.00	26.00	253.41	967.08	1000.00	1060.00	1220.49
*	5.630	410.00	2900.00	38.52	39.01	0.00	0.00	26.00	335.64	890.66	1000.00	1060.00	1226.30
*	5.630	410.00	3360.00	39.07	39.53	0.00	0.00	26.00	388.57	839.09	1000.00	1060.00	1227.66
*	5.630	410.00	4450.00	40.13	40.54	0.00	0.00	26.00	490.30	740.01	1000.00	1060.00	1230.31
	5.830	1060.00	1930.00	39.12	39.43	0.00	0.00	27.40	237.49	1761.61	2004.00	2060.00	2048.29
	5.830	1060.00	2900.00	40.38	40.72	0.00	0.00	27.40	292.02	1754.55	2004.00	2060.00	2050.43
	5.830	1060.00	3360.00	40.83	41.20	0.00	0.00	27.40	297.19	1754.02	2004.00	2060.00	2051.21
	5.830	1060.00	4450.00	41.79	42.17	0.00	0.00	27.40	304.73	1752.88	2004.00	2060.00	2057.62

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	5.860	180.00	1930.00	39.43	39.73	0.00	0.00	27.50	95.91	1539.19	1930.00	2005.00	2003.93
	5.860	180.00	2900.00	40.67	41.11	0.00	0.00	27.50	104.89	1538.38	1930.00	2005.00	2006.66
	5.860	180.00	3360.00	41.12	41.63	0.00	0.00	27.50	108.30	1538.08	1930.00	2005.00	2007.79
	5.860	180.00	4450.00	42.06	42.72	0.00	0.00	27.50	196.65	1537.46	1930.00	2005.00	2010.31
*	5.890	150.00	1930.00	39.84	40.38	0.00	0.00	31.00	130.50	1538.92	1975.00	2030.00	2029.71
	5.890	150.00	2900.00	41.14	41.71	0.00	0.00	31.00	150.96	1538.07	1975.00	2030.00	2031.42
	5.890	150.00	3360.00	41.62	42.23	0.00	0.00	31.00	154.63	1537.75	1975.00	2030.00	2032.03
	5.890	150.00	4450.00	42.63	43.32	0.00	0.00	31.00	162.26	1537.09	1975.00	2030.00	2033.29
*	5.900	80.00	1930.00	40.49	40.74	0.00	0.00	28.60	93.29	1538.96	1995.00	2065.00	2056.23
*	5.900	80.00	2900.00	41.71	42.06	0.00	0.00	28.60	154.00	1538.11	1995.00	2065.00	2059.29
	5.900	80.00	3360.00	42.20	42.59	0.00	0.00	28.60	156.25	1537.78	1995.00	2065.00	2060.49
	5.900	80.00	4450.00	43.21	43.69	0.00	0.00	28.60	161.01	1537.07	1995.00	2065.00	2063.04
	5.920	100.00	1930.00	40.69	40.94	0.00	0.00	28.90	98.04	1468.17	1830.43	1939.00	1916.50
	5.920	100.00	2900.00	41.97	42.32	0.00	0.00	28.90	105.53	1467.51	1830.43	1939.00	1920.42
	5.920	100.00	3360.00	42.47	42.87	0.00	0.00	28.90	108.48	1467.25	1830.43	1939.00	1921.96
	5.920	100.00	4450.00	43.52	44.03	0.00	0.00	28.90	114.70	1466.70	1830.43	1939.00	1925.21
	5.925	20.00	1930.00	40.78	41.02	53.40	50.70	28.90	98.56	1468.12	1830.43	1939.00	1916.77
	5.925	20.00	2900.00	42.09	42.43	53.40	50.70	28.90	106.27	1467.44	1830.43	1939.00	1920.80
	5.925	20.00	3360.00	42.61	42.99	53.40	50.70	28.90	109.32	1467.18	1830.43	1939.00	1922.40
	5.925	20.00	4450.00	43.70	44.18	53.40	50.70	28.90	115.74	1466.61	1830.43	1939.00	1925.75
	5.935	70.00	1930.00	40.97	41.16	0.00	0.00	28.90	76.99	1693.36	1685.15	1778.87	1770.35
	5.935	70.00	2900.00	42.30	42.60	0.00	0.00	28.90	82.97	1690.33	1685.15	1778.87	1773.30
	5.935	70.00	3360.00	42.82	43.18	0.00	0.00	28.90	85.36	1689.11	1685.15	1778.87	1774.47
	5.935	70.00	4450.00	43.92	44.40	0.00	0.00	28.90	92.76	1685.60	1685.15	1778.87	1778.36
	5.950	120.00	1930.00	40.99	41.18	44.50	43.20	28.90	77.08	1693.32	1685.15	1778.87	1770.40
	5.950	120.00	2900.00	42.33	42.64	44.50	43.20	28.90	83.16	1690.23	1685.15	1778.87	1773.39
	5.950	120.00	3360.00	42.95	43.30	44.50	43.20	28.90	85.93	1688.82	1685.15	1778.87	1774.75
	5.950	120.00	4450.00	44.29	44.73	44.50	43.20	28.90	92.98	1685.49	1685.15	1778.87	1778.47
*	5.960	1.00	1930.00	41.29	41.47	0.00	0.00	28.90	78.44	1692.63	1685.15	1778.87	1771.07
*	5.960	1.00	2900.00	42.73	43.01	0.00	0.00	28.90	84.96	1689.31	1685.15	1778.87	1774.28
*	5.960	1.00	3360.00	43.45	43.76	0.00	0.00	28.90	92.50	1685.73	1685.15	1778.87	1778.23
*	5.960	1.00	4450.00	44.39	44.83	0.00	0.00	28.90	93.03	1685.47	1685.15	1778.87	1778.50
	5.990	140.00	1930.00	41.50	41.63	0.00	0.00	29.50	353.57	1722.50	1950.00	2010.00	2076.06
*	5.990	140.00	2900.00	43.09	43.23	0.00	0.00	29.50	366.70	1712.75	1950.00	2010.00	2079.44
*	5.990	140.00	3360.00	43.86	44.00	0.00	0.00	29.50	373.44	1707.63	1950.00	2010.00	2081.08
*	5.990	140.00	4450.00	44.98	45.15	0.00	0.00	29.50	852.95	1225.59	1950.00	2010.00	2083.46
*	6.020	200.00	1930.00	41.68	41.92	0.00	0.00	29.50	279.30	1971.08	1977.00	2030.00	2250.73
	6.020	200.00	2900.00	43.27	43.47	0.00	0.00	29.50	297.83	1964.71	1977.00	2030.00	2262.54
	6.020	200.00	3360.00	44.03	44.21	0.00	0.00	29.50	399.66	1642.95	1977.00	2030.00	2264.06
	6.020	200.00	4450.00	45.17	45.34	0.00	0.00	29.50	716.50	1549.84	1977.00	2030.00	2266.34

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
*	6.090	360.00	1930.00	42.15	42.20	0.00	0.00	30.00	297.17	1904.81	1950.00	2051.00	2201.98
*	6.090	360.00	2900.00	43.68	43.73	0.00	0.00	30.00	318.89	1902.90	1950.00	2051.00	2221.80
*	6.090	360.00	3360.00	44.39	44.45	0.00	0.00	30.00	329.06	1902.01	1950.00	2051.00	2231.07
*	6.090	360.00	4450.00	45.50	45.58	0.00	0.00	30.00	344.77	1900.63	1950.00	2051.00	2245.41
	6.110	90.00	1930.00	42.19	42.28	0.00	0.00	28.50	310.69	1905.45	1980.00	2062.00	2216.14
	6.110	90.00	2900.00	43.71	43.84	0.00	0.00	28.50	377.99	1903.27	1980.00	2062.00	2281.25
	6.110	90.00	3360.00	44.43	44.56	0.00	0.00	28.50	381.86	1902.25	1980.00	2062.00	2284.11
	6.110	90.00	4450.00	45.54	45.72	0.00	0.00	28.50	410.95	1785.34	1980.00	2062.00	2288.57
*	6.115	50.00	1930.00	42.22	42.47	0.00	0.00	27.70	47.35	2006.29	2001.00	2059.00	2053.64
*	6.115	50.00	2900.00	43.75	44.17	0.00	0.00	27.70	47.84	2006.06	2001.00	2059.00	2053.89
*	6.115	50.00	3360.00	44.46	44.97	0.00	0.00	27.70	58.00	2001.00	2001.00	2059.00	2059.00
*	6.115	50.00	4450.00	45.58	46.23	0.00	0.00	27.70	291.33	1767.67	2001.00	2059.00	2059.00
	6.120	14.00	1930.00	42.24	42.50	45.60	46.50	27.70	47.36	2006.29	2001.00	2059.00	2053.65
	6.120	14.00	2900.00	43.80	44.22	45.60	46.50	27.70	47.85	2006.05	2001.00	2059.00	2053.90
	6.120	14.00	3360.00	44.52	45.02	45.60	46.50	27.70	58.00	2001.00	2001.00	2059.00	2059.00
	6.120	14.00	4450.00	45.93	46.49	45.60	46.50	27.70	416.58	1642.42	2001.00	2059.00	2059.00
	6.130	50.00	1930.00	42.42	42.60	0.00	0.00	28.90	73.95	2011.00	2011.00	2093.00	2084.95
	6.130	50.00	2900.00	44.13	44.40	0.00	0.00	28.90	82.00	2011.00	2011.00	2093.00	2093.00
	6.130	50.00	3360.00	44.94	45.24	0.00	0.00	28.90	82.00	2011.00	2011.00	2093.00	2093.00
	6.130	50.00	4450.00	46.38	46.71	0.00	0.00	28.90	484.51	1596.86	2011.00	2093.00	2093.00
	6.135	26.00	1930.00	42.44	42.62	45.00	45.60	28.90	74.14	2011.00	2011.00	2093.00	2085.14
	6.135	26.00	2900.00	44.16	44.42	45.00	45.60	28.90	82.00	2011.00	2011.00	2093.00	2093.00
	6.135	26.00	3360.00	45.20	45.48	45.00	45.60	28.90	82.00	2011.00	2011.00	2093.00	2093.00
	6.135	26.00	4450.00	46.75	47.03	45.00	45.60	28.90	517.98	1575.02	2011.00	2093.00	2093.00
*	6.150	60.00	1930.00	42.64	42.71	0.00	0.00	30.00	123.18	1966.82	1960.00	2090.00	2090.00
*	6.150	60.00	2900.00	44.44	44.55	0.00	0.00	30.00	130.00	1960.00	1960.00	2090.00	2090.00
*	6.150	60.00	3360.00	45.50	45.61	0.00	0.00	30.00	130.00	1960.00	1960.00	2090.00	2090.00
*	6.150	60.00	4450.00	47.10	47.17	0.00	0.00	30.00	820.95	1269.05	1960.00	2090.00	2090.00
	6.230	430.00	1930.00	42.86	42.97	0.00	0.00	27.40	159.87	1902.31	2010.00	2064.00	2062.18
	6.230	430.00	2900.00	44.71	44.81	0.00	0.00	27.40	1102.71	1214.16	2010.00	2064.00	2316.87
	6.230	430.00	3360.00	45.77	45.83	0.00	0.00	27.40	1214.85	1186.71	2010.00	2064.00	2401.57
	6.230	430.00	4450.00	47.28	47.31	0.00	0.00	27.40	1299.94	1155.98	2010.00	2064.00	2455.92
*	6.300	390.00	1930.00	43.31	43.65	0.00	0.00	31.60	49.26	2006.70	2004.00	2059.00	2055.96
*	6.300	390.00	2900.00	45.14	45.56	0.00	0.00	31.60	242.57	1896.21	2004.00	2059.00	2312.00
*	6.300	390.00	3360.00	46.06	46.40	0.00	0.00	31.60	955.01	1568.54	2004.00	2059.00	2566.02
*	6.300	390.00	4450.00	47.44	47.60	0.00	0.00	31.60	1056.31	1533.94	2004.00	2059.00	2590.24
	6.310	50.00	1930.00	43.41	43.78	0.00	0.00	31.60	35.98	2015.01	2015.00	2051.00	2050.99
	6.310	50.00	2900.00	45.19	45.80	0.00	0.00	31.60	76.05	2015.00	2015.00	2051.00	2367.04
	6.310	50.00	3360.00	46.04	46.64	0.00	0.00	31.60	632.51	1751.59	2015.00	2051.00	2490.21
	6.310	50.00	4450.00	47.45	47.73	0.00	0.00	31.60	910.32	1657.53	2015.00	2051.00	2567.84

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	6.315	22.00	1930.00	43.43	43.80	45.10	44.60	31.60	35.98	2015.01	2015.00	2051.00	2050.99
	6.315	22.00	2900.00	45.34	45.94	45.10	44.60	31.60	151.32	2015.00	2015.00	2051.00	2399.07
	6.315	22.00	3360.00	46.05	46.64	45.10	44.60	31.60	634.86	1750.62	2015.00	2051.00	2490.83
	6.315	22.00	4450.00	47.45	47.73	45.10	44.60	31.60	910.35	1657.50	2015.00	2051.00	2567.86
	6.320	33.00	1930.00	43.64	43.88	0.00	0.00	29.30	224.62	2006.47	2005.00	2053.00	2231.09
*	6.320	33.00	2900.00	45.91	46.08	0.00	0.00	29.30	796.84	1742.62	2005.00	2053.00	2539.46
*	6.320	33.00	3360.00	46.66	46.78	0.00	0.00	29.30	876.58	1696.73	2005.00	2053.00	2573.32
*	6.320	33.00	4450.00	47.70	47.80	0.00	0.00	29.30	952.63	1633.69	2005.00	2053.00	2586.32
*	6.500	960.00	1930.00	44.34	44.39	0.00	0.00	29.00	359.81	1827.62	2016.00	2056.00	2187.43
*	6.500	960.00	2900.00	46.42	46.46	0.00	0.00	29.00	831.13	1771.55	2016.00	2056.00	2602.68
*	6.500	960.00	3360.00	47.08	47.11	0.00	0.00	29.00	863.93	1758.43	2016.00	2056.00	2622.36
*	6.500	960.00	4450.00	48.08	48.11	0.00	0.00	29.00	912.64	1738.49	2016.00	2056.00	2651.13
*	6.750	1350.00	1930.00	45.46	45.67	0.00	0.00	34.30	383.01	1682.75	2003.00	2049.00	2065.75
*	6.750	1350.00	2900.00	47.16	47.30	0.00	0.00	34.30	469.43	1608.82	2003.00	2049.00	2078.25
*	6.750	1350.00	3360.00	47.75	47.87	0.00	0.00	34.30	508.36	1582.24	2003.00	2049.00	2090.60
*	6.750	1350.00	4450.00	48.72	48.83	0.00	0.00	34.30	898.03	1543.18	2003.00	2049.00	2441.21
	6.760	50.00	1930.00	45.54	45.91	0.00	0.00	34.30	46.00	2003.00	2003.00	2049.00	2049.00
	6.760	50.00	2900.00	47.21	47.35	0.00	0.00	34.30	442.23	1606.77	2003.00	2049.00	2049.00
	6.760	50.00	3360.00	47.80	47.92	0.00	0.00	34.30	468.51	1580.49	2003.00	2049.00	2049.00
	6.760	50.00	4450.00	48.77	48.88	0.00	0.00	34.30	901.36	1541.18	2003.00	2049.00	2442.55
	6.770	20.00	1930.00	45.59	45.97	46.00	46.70	34.50	46.00	2003.00	2003.00	2049.00	2049.00
	6.770	20.00	2900.00	47.88	47.98	46.00	46.70	34.50	463.70	1585.30	2003.00	2049.00	2049.00
	6.770	20.00	3360.00	48.34	48.44	46.00	46.70	34.50	482.67	1566.33	2003.00	2049.00	2049.00
	6.770	20.00	4450.00	49.08	49.18	46.00	46.70	34.50	908.57	1536.86	2003.00	2049.00	2445.43
*	6.780	50.00	1930.00	46.00	46.16	0.00	0.00	34.50	398.35	1669.77	2003.00	2049.00	2068.12
	6.780	50.00	2900.00	47.93	48.02	0.00	0.00	34.50	506.88	1583.25	2003.00	2049.00	2090.13
	6.780	50.00	3360.00	48.39	48.49	0.00	0.00	34.50	535.11	1564.58	2003.00	2049.00	2099.70
	6.780	50.00	4450.00	49.12	49.22	0.00	0.00	34.50	911.35	1535.19	2003.00	2049.00	2446.54
	7.020	1250.00	1930.00	47.28	47.48	0.00	0.00	31.40	281.34	1775.99	2016.00	2063.00	2057.33
	7.020	1250.00	2900.00	48.81	48.99	0.00	0.00	31.40	590.30	1739.83	2016.00	2063.00	2790.23
	7.020	1250.00	3360.00	49.26	49.44	0.00	0.00	31.40	719.76	1728.50	2016.00	2063.00	2805.33
	7.020	1250.00	4450.00	50.02	50.20	0.00	0.00	31.40	925.02	1708.14	2016.00	2063.00	2830.25
	7.430	2150.00	1930.00	50.37	50.68	0.00	0.00	37.70	92.50	1993.15	2000.00	2063.00	2085.65
*	7.430	2150.00	2900.00	51.88	52.30	0.00	0.00	37.70	160.85	1961.25	2000.00	2063.00	2122.10
*	7.430	2150.00	3360.00	52.38	52.86	0.00	0.00	37.70	217.74	1796.86	2000.00	2063.00	2130.78
*	7.430	2150.00	4450.00	53.27	53.83	0.00	0.00	37.70	469.85	1765.09	2000.00	2063.00	2563.48
	7.440	50.00	1930.00	50.47	50.78	0.00	0.00	37.70	63.00	2000.00	2000.00	2063.00	2063.00
	7.440	50.00	2900.00	51.98	52.45	0.00	0.00	37.70	63.00	2000.00	2000.00	2063.00	2063.00
	7.440	50.00	3360.00	52.53	52.98	0.00	0.00	37.70	252.27	1791.79	2000.00	2063.00	2137.95
	7.440	50.00	4450.00	53.48	53.98	0.00	0.00	37.70	531.17	1757.66	2000.00	2063.00	2573.81

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	7.450	26.00	1930.00	50.50	50.80	52.30	51.40	37.70	63.00	2000.00	2000.00	2063.00	2063.00
	7.450	26.00	2900.00	52.33	52.73	52.30	51.40	37.70	138.39	1799.00	2000.00	2063.00	2063.00
	7.450	26.00	3360.00	53.03	53.39	52.30	51.40	37.70	397.52	1773.77	2000.00	2063.00	2551.42
	7.450	26.00	4450.00	54.19	54.53	52.30	51.40	37.70	942.39	1697.04	2000.00	2063.00	2669.53
	7.460	50.00	1930.00	50.61	50.90	0.00	0.00	37.70	63.00	2000.00	2000.00	2063.00	2063.00
	7.460	50.00	2900.00	52.52	52.85	0.00	0.00	37.70	249.46	1792.20	2000.00	2063.00	2137.34
	7.460	50.00	3360.00	53.13	53.48	0.00	0.00	37.70	427.15	1770.27	2000.00	2063.00	2556.29
	7.460	50.00	4450.00	54.29	54.61	0.00	0.00	37.70	951.47	1695.69	2000.00	2063.00	2672.04
*	7.870	2200.00	1795.00	52.57	52.68	0.00	0.00	34.60	198.52	1841.42	2005.00	2070.00	2112.07
*	7.870	2200.00	2690.00	54.46	54.58	0.00	0.00	34.60	362.70	1740.38	2005.00	2070.00	2124.62
*	7.870	2200.00	3115.00	55.07	55.20	0.00	0.00	34.60	396.50	1734.25	2005.00	2070.00	2130.75
*	7.870	2200.00	4125.00	56.17	56.31	0.00	0.00	34.60	417.04	1723.78	2005.00	2070.00	2140.82
*	8.580	3800.00	1795.00	57.02	57.31	0.00	0.00	43.90	100.70	1985.58	2004.00	2050.00	2100.35
*	8.580	3800.00	2690.00	58.64	58.97	0.00	0.00	43.90	259.30	1872.90	2004.00	2050.00	2132.20
*	8.580	3800.00	3115.00	59.18	59.52	0.00	0.00	43.90	278.05	1857.54	2004.00	2050.00	2135.58
*	8.580	3800.00	4125.00	60.22	60.57	0.00	0.00	43.90	314.24	1827.89	2004.00	2050.00	2142.12
	8.750	950.00	1795.00	58.75	59.02	0.00	0.00	49.30	62.74	1979.26	1988.00	2042.00	2042.00
	8.750	950.00	2690.00	60.32	60.62	0.00	0.00	49.30	238.54	1976.49	1988.00	2042.00	2215.03
	8.750	950.00	3115.00	60.86	61.17	0.00	0.00	49.30	278.80	1972.27	1988.00	2042.00	2251.06
	8.750	950.00	4125.00	61.90	62.23	0.00	0.00	49.30	368.45	1953.11	1988.00	2042.00	2321.56
*	8.760	100.00	1795.00	59.14	59.96	0.00	0.00	49.90	29.70	2002.15	2002.00	2032.00	2031.85
*	8.760	100.00	2690.00	60.79	62.03	0.00	0.00	49.90	118.09	2002.00	2002.00	2032.00	2229.61
*	8.760	100.00	3115.00	61.17	62.61	0.00	0.00	49.90	219.16	2002.00	2002.00	2032.00	2283.28
*	8.760	100.00	4125.00	62.23	63.51	0.00	0.00	49.90	274.49	2002.00	2002.00	2032.00	2304.93
	8.770	20.00	1795.00	59.14	59.96	60.10	60.50	49.90	29.70	2002.15	2002.00	2032.00	2031.85
	8.770	20.00	2690.00	60.79	62.03	60.10	60.50	49.90	120.50	2002.00	2002.00	2032.00	2231.30
	8.770	20.00	3115.00	61.19	62.61	60.10	60.50	49.90	220.88	2002.00	2002.00	2032.00	2283.88
	8.770	20.00	4125.00	62.29	63.51	60.10	60.50	49.90	278.97	2002.00	2002.00	2032.00	2307.45
*	8.780	50.00	1795.00	60.23	60.37	0.00	0.00	49.30	229.75	1976.66	1988.00	2042.00	2206.41
*	8.780	50.00	2690.00	62.54	62.65	0.00	0.00	49.30	382.96	1933.83	1988.00	2042.00	2316.79
*	8.780	50.00	3115.00	63.20	63.31	0.00	0.00	49.30	411.43	1923.95	1988.00	2042.00	2335.39
*	8.780	50.00	4125.00	63.99	64.12	0.00	0.00	49.30	428.60	1912.15	1988.00	2042.00	2340.75
	8.880	600.00	1730.00	60.70	60.83	0.00	0.00	49.40	135.35	1950.08	2003.00	2076.00	2085.44
	8.880	600.00	2585.00	62.87	63.01	0.00	0.00	49.40	242.93	1869.46	2003.00	2076.00	2112.38
	8.880	600.00	2990.00	63.52	63.66	0.00	0.00	49.40	255.26	1858.90	2003.00	2076.00	2114.16
	8.880	600.00	3960.00	64.36	64.55	0.00	0.00	49.40	271.38	1845.09	2003.00	2076.00	2116.47
*	9.230	1700.00	1730.00	64.53	64.88	0.00	0.00	58.60	477.18	1583.09	2006.00	2054.00	2060.26
*	9.230	1700.00	2585.00	65.50	65.74	0.00	0.00	58.60	507.10	1554.83	2006.00	2054.00	2061.93
*	9.230	1700.00	2990.00	65.89	66.09	0.00	0.00	58.60	519.13	1543.47	2006.00	2054.00	2062.60
*	9.230	1700.00	3960.00	66.62	66.81	0.00	0.00	58.60	541.71	1522.15	2006.00	2054.00	2063.86

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	9.500	1350.00	1730.00	69.69	69.85	0.00	0.00	63.60	389.97	1900.05	2006.00	2049.00	2290.02
	9.500	1350.00	2585.00	70.13	70.35	0.00	0.00	63.60	461.55	1889.68	2006.00	2049.00	2351.23
	9.500	1350.00	2990.00	70.32	70.57	0.00	0.00	63.60	468.41	1884.82	2006.00	2049.00	2353.23
*	9.500	1350.00	3960.00	70.91	71.16	0.00	0.00	63.60	488.47	1870.59	2006.00	2049.00	2359.06
*	9.600	530.00	1730.00	72.68	73.30	0.00	0.00	65.00	450.24	554.10	1000.00	1050.00	1047.66
	9.600	530.00	2585.00	73.30	73.84	0.00	0.00	65.00	487.75	551.01	1000.00	1050.00	1049.42
	9.600	530.00	2990.00	73.55	74.06	0.00	0.00	65.00	806.60	98.63	1000.00	1050.00	1052.20
	9.600	530.00	3960.00	73.98	74.46	0.00	0.00	65.00	858.12	87.89	1000.00	1050.00	1069.37
	9.620	100.00	1730.00	73.64	73.94	0.00	0.00	65.50	478.19	551.80	1000.00	1050.00	1048.97
	9.620	100.00	2585.00	74.17	74.49	0.00	0.00	65.50	820.50	95.73	1000.00	1050.00	1056.83
	9.620	100.00	2990.00	74.37	74.69	0.00	0.00	65.50	845.42	90.54	1000.00	1050.00	1065.14
	9.620	100.00	3960.00	74.76	75.09	0.00	0.00	65.50	891.84	80.87	1000.00	1050.00	1080.61
	9.710	520.00	1730.00	75.87	76.49	0.00	0.00	66.20	111.37	1870.34	2000.00	2042.00	2041.87
	9.710	520.00	2585.00	76.78	77.62	0.00	0.00	66.20	209.94	1834.05	2000.00	2042.00	2043.99
	9.710	520.00	2990.00	77.04	77.99	0.00	0.00	66.20	220.26	1826.74	2000.00	2042.00	2047.00
	9.710	520.00	3960.00	77.59	78.72	0.00	0.00	66.20	378.21	1383.98	2000.00	2042.00	2053.20
	9.720	50.00	1730.00	76.14	76.80	0.00	0.00	66.60	38.70	2003.15	2000.00	2042.00	2041.85
	9.720	50.00	2585.00	77.15	78.05	0.00	0.00	66.60	207.15	1834.85	2000.00	2042.00	2042.00
	9.720	50.00	2990.00	77.44	78.45	0.00	0.00	66.60	215.44	1826.56	2000.00	2042.00	2042.00
	9.720	50.00	3960.00	78.06	79.27	0.00	0.00	66.60	438.95	1371.41	2000.00	2042.00	2042.00
	9.730	11.00	1730.00	76.19	76.91	78.00	77.70	67.00	38.29	2003.51	2000.00	2042.00	2041.79
	9.730	11.00	2585.00	77.21	78.62	78.00	77.70	67.00	193.28	1843.86	2000.00	2042.00	2041.97
*	9.730	11.00	2990.00	78.09	79.02	78.00	77.70	67.00	232.82	1809.18	2000.00	2042.00	2042.00
*	9.730	11.00	3960.00	77.87	79.71	78.00	77.70	67.00	216.13	1825.87	2000.00	2042.00	2042.00
	9.740	50.00	1730.00	76.36	77.14	0.00	0.00	67.40	38.03	2003.72	2000.00	2042.00	2041.75
*	9.740	50.00	2585.00	78.56	79.23	0.00	0.00	67.40	246.93	1803.68	2000.00	2042.00	2050.61
	9.740	50.00	2990.00	78.29	79.33	0.00	0.00	67.40	222.21	1825.36	2000.00	2042.00	2047.57
	9.740	50.00	3960.00	78.27	80.11	0.00	0.00	67.40	221.41	1825.92	2000.00	2042.00	2047.33
	9.860	600.00	1730.00	79.76	80.51	0.00	0.00	72.00	138.06	1966.84	2000.00	2059.00	2104.90
	9.860	600.00	2585.00	80.97	81.64	0.00	0.00	72.00	325.92	1842.48	2000.00	2059.00	2168.41
	9.860	600.00	2990.00	81.48	82.07	0.00	0.00	72.00	367.79	1822.44	2000.00	2059.00	2190.22
*	9.860	600.00	3960.00	82.58	83.02	0.00	0.00	72.00	421.74	1816.34	2000.00	2059.00	2238.08
	9.930	350.00	1730.00	82.80	83.77	0.00	0.00	74.00	175.69	1004.78	1000.00	1059.00	1180.47
*	9.930	350.00	2585.00	83.50	84.65	0.00	0.00	74.00	222.98	1002.00	1000.00	1059.00	1224.98
*	9.930	350.00	2990.00	83.83	84.97	0.00	0.00	74.00	240.68	1000.69	1000.00	1059.00	1241.37
*	9.930	350.00	3960.00	84.32	85.62	0.00	0.00	74.00	344.45	954.10	1000.00	1059.00	1298.56
	9.970	200.00	1600.00	84.67	85.23	0.00	0.00	74.80	51.99	1983.67	1995.00	2037.00	2035.66
	9.970	200.00	2000.00	85.55	86.19	0.00	0.00	74.80	247.78	1727.03	1995.00	2037.00	2037.44
	9.970	200.00	2210.00	85.84	86.51	0.00	0.00	74.80	346.82	1682.47	1995.00	2037.00	2039.78
	9.970	200.00	2750.00	86.53	87.19	0.00	0.00	74.80	457.37	1587.99	1995.00	2037.00	2045.36

	SECNO	XLCH	Q	CWSEL	EG	ELTRD	ELLC	ELMIN	TOPWID	SSTA	STCHL	STCHR	ENDST
	9.980	100.00	1600.00	85.11	86.02	0.00	0.00	75.60	27.16	2003.84	2003.00	2031.00	2031.00
	9.980	100.00	2000.00	86.00	86.95	0.00	0.00	75.60	350.14	1562.84	2003.00	2031.00	2031.00
	9.980	100.00	2210.00	86.29	87.21	0.00	0.00	75.60	416.12	1535.44	2003.00	2031.00	2031.00
	9.980	100.00	2750.00	86.96	87.68	0.00	0.00	75.60	520.39	1467.59	2003.00	2031.00	2031.00
	9.990	19.00	1660.00	85.21	86.22	85.70	86.20	75.80	27.13	2003.87	2003.00	2031.00	2031.00
*	9.990	19.00	2480.00	86.09	87.82	85.70	86.20	75.80	323.61	1573.32	2003.00	2031.00	2031.00
*	9.990	19.00	2870.00	87.17	88.11	85.70	86.20	75.80	522.34	1466.30	2003.00	2031.00	2031.00
*	9.990	19.00	3800.00	87.90	88.56	85.70	86.20	75.80	644.45	1388.55	2003.00	2031.00	2033.00
*	10.000	50.00	1660.00	86.64	86.73	0.00	0.00	76.20	539.63	1521.51	1994.00	2046.00	2061.14
*	10.000	50.00	2480.00	88.63	88.69	0.00	0.00	76.20	712.62	1355.15	1994.00	2046.00	2067.77
*	10.000	50.00	2870.00	88.50	88.58	0.00	0.00	76.20	692.30	1375.03	1994.00	2046.00	2067.33
*	10.000	50.00	3800.00	88.78	88.89	0.00	0.00	76.20	734.97	1333.29	1994.00	2046.00	2068.26

SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO=      4.480  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.480  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.480  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.480  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.650  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.650  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.650  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.650  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.680  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.820  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.820  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.820  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.820  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.900  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.900  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.900  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.900  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.970  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=      4.970  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      4.970  PROFILE=  2  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      4.970  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      4.970  PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      4.970  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      4.970  PROFILE=  4  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      5.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.000  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.320  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.320  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.320  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=      5.320  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      5.320  PROFILE=  4  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      5.380  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.380  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.430  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.430  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.430  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      5.430  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.550  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.630  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.630  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.630  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.630  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.890  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.900  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.900  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

NOTE    SECNO=      5.960  PROFILE=  1  WSEL BASED ON X5 CARD
NOTE    SECNO=      5.960  PROFILE=  2  WSEL BASED ON X5 CARD
NOTE    SECNO=      5.960  PROFILE=  3  WSEL BASED ON X5 CARD
NOTE    SECNO=      5.960  PROFILE=  4  WSEL BASED ON X5 CARD

WARNING SECNO=      5.990  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.990  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.990  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.020  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.090  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.090  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.090  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.090  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.115  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.115  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.115  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.115  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.150  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.150  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.150  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.150  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.300  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.300  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.300  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.300  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.320  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.320  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.320  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.500  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      6.500  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.500  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.750  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.750  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.750  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      6.750  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.780  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      7.430  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      7.430  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      7.430  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      7.870  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      7.870  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      7.870  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      7.870  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      8.580  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.580  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.580  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      8.760  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.760  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.760  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.760  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      8.780  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.780  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.780  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      8.780  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      9.230  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      9.230  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      9.230  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      9.230  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      9.500  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      9.600  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.600  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      9.730  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=      9.730  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.730  PROFILE=  4  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      9.740  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      9.860  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      9.930  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=      9.930  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.930  PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      9.930  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.930  PROFILE=  4  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      9.990  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=      9.990  PROFILE=  3  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.990  PROFILE=  3  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      9.990  PROFILE=  3  BRIDGE DECK DEFINITION ERROR
CAUTION SECNO=      9.990  PROFILE=  4  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.990  PROFILE=  4  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      9.990  PROFILE=  4  BRIDGE DECK DEFINITION ERROR

WARNING SECNO=     10.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     10.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     10.000  PROFILE=  3  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     10.000  PROFILE=  4  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

Appendix F

STORM DRAINAGE SYSTEM INVENTORY AND MAINTENANCE BUDGET

Scappoose Storm Drain System Master Plan

City of Scappoose

Maintenance Inventory for Storm Drainage

Location/Description	Date	Catch Basins	Std Inlets	SD COs	Area Drains	Man-Holes	PC MHs	Dry-Wells	Detention Pond	Detention Tank/Pipe	Pipe Outfall	Lineal Feet of Pipe TOTAL	8	10	12	14	15	18	21	24	27	30	36	42	48	54	60	72	84	96
Holiday Orchard	Nov-96	2									1	193		84	109															
Leslie Acres	Jul-81		2			1					1	330			330															
Creekview Place Ext	Oct-89	2									1	202	30		172															
Sunrise Estates No.2		2						1				40		40																
Green Meadows	Apr-78	11				3		2			1	945			945															
Mobile Garden	Sep-82	2	1			3					1	656			451			205												
Dons Subdivision	Apr-73	17			PRIVATE			8				390	114	276																
Springlake Park	Feb-86	6										392	392																	
Westcliff	Feb-73	8				3						1,242			1,242															
Bella Vista	Apr-73	5										607			607															
Steinke's Addition	Apr-78	3				1						380		60	320															
Scappoose Heights No.:	May-96	9									1	484		424	60															
Keys Landing	Jul-91	4						1			1	340	32	238				70												
Seely Lane	Mar-96								1			1,113		345	595		173													
Crown Park	Dec-96	4		PRIVATE				2				76			76															
Sixth Street	Sep-95	8				5					1	1,194			213			981												
Sunset Estates	Oct-93	4						3				48		48																
Kingsbrook LID	Jul-80	5				2					1	841		116					236	489										
Heller Orchards	Jan-97	1				1				1	1	130			130															
Meersburg		12				12				2		1,208			805		95	110					20					178		
Rolling Hills	Oct-95	2				4						707		72	635															
Willows Park	Aug-95	2	1			1			1			228				228														
Fred Meyer On-Site		18	8			14				1		2,604	202		565		480	328		518										511
Scappoose Retail Cente	Aug-96	4	2			7				1		835			481			50					12							292
Fred Meyer Off-Site	Jul-95	16			2	8						1,164		48	223		893													
Meadowbrook	Jun-95	16				10				1	1	1,862			985			277					220				380			
US Hwy 30 Improvmnt	Aug-96	3										0																		
Heron Meadows	Aug-97	16	1	1		12	2				2	1,926			806			635		485										
Scappoose Sr. Ctr.	Apr-96					1						286							286											
Norfolk	Sep-95	9				4				1		635			111		124						400							
Springlake Park #2	Oct-93	12		14							6	994	125	340	528															
Seven Oaks (1&2)	Nov-95	36				14			1		2	2,760			1,579		1,035	18		128										
Kingfisher Glen	Jun-98	1				2						446			446															
Old Portland Road LID	Apr-97	23				15						1,996			1,723		273													
Columbia Avenue	Jun-93	14				4		2				1,034			260		774													
Civic Center	Jul-96	2						1				195		195																
Snyder Court	Aug-96	2										0																		
Kingsbrook III	Feb-95	18				12						2,195			1,851		344													
West First Street	Jul-92	6				3						258	258																	
Sunset Estates Drainage	Nov-97																													
Other Existing System								20				0																		
N.E. 2nd						*		1				0																		
TOTAL		305	15	15	2	142	2	40	3	7	21	30,936	1,153	2,286	16,248	228	4,191	2,674	522	1,620	0	0	652	0	0	0	380	178	0	803

City of Scappoose

Stormwater Maintenance

Storm Drain System Maintenance Worksheet

[* Key Water Quality Elements]

Item No.	Maintenance Category	Units to be Maintained	Recommended Frequency	Performance Standard	Labor Requirements (Maint. Worker / Other)	Annual Man-Days (Maint. Worker / Other)	Worker: $185/day	Equip. Cost (City Rate)	Cost Totals	% of Program	Annual F.T.E. Reqmt.
1 *	Clean Catch Basins w/Sumps	250 EA	2.00 /YR	15 EA/DA	2	67	$12,333	$2,500	$14,833	36.6%	0.3
2 *	Manhole Cleaning	100 EA	1.00 /YR	15 EA/DA	2	13	$2,467	$500	$2,967	7.3%	0.1
3 *	Dry Well Cleaning	50 EA	1.00 /YR	15 EA/DA	2	7	$1,233	$250	$1,483	3.7%	0.0
4 *	Clean Detention Basins e	10 EA	2.00 /YR	2 EA/DA	2	20	$3,700	$450	$4,150	10.2%	0.1
5	Roadside Ditches - Veg. e	0 LF	1.00 /YR	2,640 LF/DA	2	0	$0	$0	$0	0.0%	0.0
6	Roadside Ditches - Reshape e	0 LF	0.33 /YR	1,320 LF/DA	2	0	$0	$0	$0	0.0%	0.0
7	Open Channels - Veg. e	0 LF	2.00 /YR	2,640 LF/DA	2	0	$0	$0	$0	0.0%	0.0
8	Open Channels - Reshape e	0 LF	1.00 /YR	1,500 LF/DA	2	0	$0	$0	$0	0.0%	0.0
9	Clean/Flush Culverts	2,500 LF	1.00 /YR	500 LF/DA	2	10	$1,850	$375	$2,225	5.5%	0.0
10	Clean Pipe	25,000 LF	0.50 /YR	1,500 LF/DA	2	17	$3,083	$625	$3,708	9.1%	0.1
11	Inspection with T.V.	25,000 LF	0.50 /YR	2,500 LF/DA	2	10	$1,850	$500	$2,350	5.8%	0.0
12	Rehab Catch Basin e	10 EA	1.00 /YR	2 EA/DA	2	10	$1,850	$300	$2,150	5.3%	0.0
13	Install Sedimentation Sumps	10 EA	1.00 /YR	1 EA/DA	2	20	$3,700	$600	$4,300	10.6%	0.1
14 *	Street Sweeping	0 MI	12.00 /YR	10 MI/DA	1	0	$0	$0	$0	0.0%	0.0
15	Non-Scheduled Maintenance	(+ 7.5% of Items 1 - 13)				13	$2,405	$0	$2,405	5.9%	0.1
SUB-TOTAL: ALL MAINTENANCE CATEGORIES >>>>>						186	$34,472	$6,100	$40,572	100.0%	0.8
OTHER ACTIVITIES:											
	Administration/Supervision	+ 10.0%							$4,057		
	Emergency Response	+ 5.0%							$2,029		
	Hazard Mitigation	+ 5.0%							$2,029		
TOTAL: ALL MAINTENANCE CATEGORIES >>>>>>>>>>>>>>>>>>>>>>>>>>>>									$48,686		
TOTAL STORMWATER MAINTENANCE REVENUE NEEDS>>>>>>>>>>>>>>>>>									$48,686		

e = preliminary estimate

Appendix G

METRO TITLE 3 MODEL ORDINANCE

Scappoose Storm Drain System Master Plan

Title 3 Model Ordinance

Growth Management Committee
May 28, 1998

METRO

Table of Contents

EXHIBIT C

Metro Water Quality and Flood Management Area Model Ordinance

Introduction

Attached is the model ordinance required by Title 3, Section 6 of Metro's *Urban Growth Management Functional Plan.*

The purpose of this model ordinance is to provide a specific example of provisions approved by the Metro Council that can be used by a city or county to comply with the performance standards for *Title 3: Water Quality, Flood Management, and Fish and Wildlife Conservation* described in the *Metro Urban Growth Management Functional Plan.* Title 3 describes specific performance standards and practices for floodplain and water quality protection. It also requires that Metro adopt a Water Quality and Flood Management Model Ordinance and map for use by local jurisdictions to comply with Title 3. This model ordinance fulfills the Title 3 requirement. It is also consistent with Metro's policies in the 1995 *Future Vision Report*, in the 1995 *Regional Urban Growth Goals and Objectives* (RUGGOs) in the 1992 *Greenspaces Master Plan,* and in the 1997 *Regional Framework Plan.*

The purpose of Title 3 is to protect water quality and floodplain areas. Floodplains protect the region's health and public safety by reducing flood and landslide hazards and pollution of the region's waterways. This Model Ordinance and Map address that purpose. Another purpose of Title 3 is to protect fish and wildlife habitat. Statewide land use Goal 5 measures, which include fish and wildlife habitat protection, will be addressed in a Metro study that will be conducted within the next 18 months. Title 3 will apply to development in Fish and Wildlife Habitat Conservation Areas when Metro's Section 5 analysis and mapping are completed. As additional issues are addressed, further regulations may be imposed on areas contained within or outside of the Water Quality Resource Area and Flood Management Area Overlay Zones addressed in this Model Ordinance.

The Metro *Future Vision, Greenspaces Master Plan, Regional Urban Growth Goals and Objectives* (RUGGOs), *and Regional Framework Plan* identify water quality protection, floodplain management, fish and wildlife habitat protection, development of recreational trails, acquisition of open space and maintenance of biodiversity as critical elements of maintaining healthy, livable communities.

This Model Ordinance, however, only provides specific examples of local ordinance provisions for a portion of the issues identified in Title 3: protection of the region's floodplains, water quality and reduction of flood hazards and the implementation of erosion control practices throughout the Portland metropolitan region. Other issues

including fish and wildlife habitat, watershed-wide stormwater management, steep slopes, landslide hazards and biodiversity are addressed in the December 1997 Metro *Regional Framework Plan*.

The approach in Sections 2, 3 and 4 of Title 3 is to implement Oregon Statewide Goal 6 and Goal 7. *Goal 6: Air, Water and Land Resources Quality* and *Goal 7: Areas Subject to Natural Disasters and Hazards* are addressed by protecting streams, rivers, wetlands, and areas adjacent to streams and floodplains within the Water Quality Resource and Flood Management Areas.

Cities and counties are required to amend their plans and implementing ordinances, if necessary, to ensure that they comply with Title 3 in one of the following ways:

Adopt the applicable provisions of the Metro Water Quality and Flood Management Area model ordinance and map, which is entitled the Metro Water Quality and Flood Management Area Map.

Local jurisdictions have two options with regard to their adoption of code language and a map (either the Metro Water Quality and Flood Management Area Map or a city or county field verified map that substantially complies with the Metro map):

The code language that describes the affected area prevails and the map is a reference; or the field verified map prevails and the descriptive code language is used to correct map errors when they are discovered and for delineating and marking the overlay zone boundary in the field. This map must be reviewed concurrently with local periodic review.

The advantage of the first approach above is that the final boundary is determined at the time of the development application, based on a detailed survey of the site. If a large scale, precise boundary can be mapped, the official map should prevail. This method allows for a more efficient permit process and more certainty for the property owner. In this case, the language is used to correct mapping errors when they are discovered. A map, however, should only be used if it has a level of detail and clarity equal to or better than 1" = 300 feet, and has been field-checked for accuracy.

Adopt plans and implementing ordinances and maps that substantially comply with the performance standards of Title 3.

Any combination of the above that substantially complies with all performance standards in Title 3, Section 4 (see Title 3, Section 3).

The purpose of the map adopted by Metro is to provide the performance standard for the location of Water Quality Resource and Flood Management Areas. Therefore, the map is the basis for evaluation of substantial compliance of local maps for those jurisdictions that choose to develop their own field verified map of Water Quality Resource and Flood Management Areas. "Substantial compliance" means that the city and county

comprehensive plans and implementing ordinances, on the whole, conform with the purposes of the performance standards in the functional plan and any failure to meet individual performance standard requirements is technical or minor in nature.

Water Quality and Flood Management Area Model Ordinance

Section 1. Intent

The purpose of this ordinance is to comply with Sections 1-4 of Title 3 of Metro's Urban Growth Management Functional Plan.

A. To protect and improve water quality, to support the designated beneficial water uses and to protect the functions and values of existing and newly established Water Quality Resource Areas, which include, but are not limited to:

1. Provide a vegetated corridor to separate Protected Water Features from development;

2. Maintain or reduce stream temperatures;

3. Maintain natural stream corridors;

4. Minimize erosion, nutrient and pollutant loading into water;

5. Provide filtration, infiltration and natural water purification;

6. Stabilize slopes to prevent landslides contributing to sedimentation of water features.

B. To protect Flood Management Areas, which provide the following functions:

1. Protect life and property from dangers associated with flooding;

2. Flood storage, reduction of flood velocities, reduction of flood peak flows and reduction of wind and wave impacts;

3. Maintain water quality by reducing and sorting sediment loads, processing chemical and organic wastes and reducing nutrients;

4. Recharge, store and discharge groundwater;

5. Provide plant and animal habitat, and support riparian ecosystems.

C. To establish two overlay zones for Water Quality Resource Areas and Flood Management Areas, which operate contemporaneously with the base zone and implement the performance standards of Title 3 of the Urban Growth Management Functional Plan.

Section 2. Applicability

A. This ordinance applies to:

1. Development in the Water Quality Resource Area and Flood Management Area Overlay Zones. The overlay zones restrict the uses that are allowed in the base zone by right, with limitations, or as conditional uses.

2. Development that may cause visible or measurable erosion on any property within the Metro Boundary.

B. This ordinance does not apply to work necessary to protect, repair, maintain, or replace existing structures, utility facilities, roadways, driveways, accessory uses and exterior improvements in response to emergencies provided that after the emergency has passed, adverse impacts are mitigated in accordance with Table 2 standards for restoring marginal existing vegetated corridors.

Section 3. Administration

A. Title 3 of the Urban Growth Management Functional Plan allows for two methods for applying the provisions of this ordinance to applications to allow development in the Water Quality Resource Areas and Flood Management Areas Overlay Zones. The purpose of this section is to show how this ordinance is applied under each method.

Alternative 1 requires the text of this ordinance, including definitions, to describe and regulate the protected areas shown on the city/county Water Quality and Flood Management Areas map using the map as a reference.

Alternative 2 requires the city/county Water Quality and Flood Management Areas map to describe and regulate the areas shown on the map after the city or county has field verified the protected areas on Metro's map and identified or delineated those areas, and other Protected Water Features, Water Quality Resource Areas and Flood Management Areas the city/county may identify, on the city/county map.

B. Map as Reference (Alternative 1)

1. The text provisions of this ordinance shall be used to determine whether applications to allow development in the Water Quality Resource Area and Flood Management Area Overlay Zones are subject to the requirements of this ordinance.

2. The Water Quality and Flood Management Areas map shall be a reference for identifying areas subject to the Water Quality Resource Area or Flood Management Area Overlay Zones.

3. Applicants are required to provide the city/county with a delineation of the Water Quality Resource Areas and Flood Management Areas on the subject property as part of their application. An application shall not be complete until this delineation is submitted to the city/county.

4. Wetlands which meet the criteria in Section 10.D.2 shall be subject to the standards which apply to the Water Quality Resource Areas and Flood Management Areas Overlay Zones.

C. Field Verified Map (Alternative 2)

1. A field verified Water Quality and Flood Management Areas map shall be used to determine whether applications to allow development in the Water Quality Resource Areas and Flood Management Areas Overlay Zones are subject to the requirements of this ordinance.

2. The city/county shall identify and delineate the areas shown on the Metro Water Quality and Flood Management Areas map by:

   a. Conducting a site visit, with the owner's permission, of the property where a Water Quality Resource Area or Flood Management Area is shown on Metro's map to delineate the resource area; and

   b. Gathering and reviewing other information such as wetland inventory maps, aerial photographs and other significant evidence submitted by citizens; and

   c. Mapping the specific boundaries of the Water Quality Resource Areas and Flood Management Areas on the city/county Water Quality and Flood Management Areas map.

3. The city/county Water Quality and Flood Management Areas map shall be amended to add wetlands which meet the requirements of Section 10.D.2 and to correct the locations of Protected Water Features, Water Quality Resource Areas and Flood Management Areas in accordance with Section 10.B.

D. The city/county shall review the Water Quality and Flood Management Areas Map during periodic review as required by ORS 197.633 (1997).

Section 4. Water Quality Resource Areas

A. The purpose of this section is to protect and improve the beneficial water uses and functions and values of Water Quality Resource Areas.

B. This ordinance establishes a Water Quality Resource Area Overlay Zone, which is delineated on the Water Quality and Flood Management Area map attached and incorporated by reference as part of this ordinance.

(Note: If it has been determined during local public review that the code language is to prevail, adoption of these standards as written is appropriate. If a map is to prevail, this section should be used for map correction and interpretation, and the definition of areas should be by adopting an official map by reference.)

C. The Water Quality Resource Area is the vegetated corridor and the Protected Water Feature. The width of the vegetated corridor is specified in the Table One. At least three slope measurements along the water feature, at no more than 100-foot increments, shall be made for each property for which development is proposed. Depending on the width of the property, the width of the vegetated corridor will vary.

Table 1

Protected Water Feature Type (see definitions)	Slope Adjacent to Protected Water Feature	Starting Point for Measurements from Water Feature	Width of Vegetated Corridor
Primary Protected Water Features[1]	< 25%	• Edge of bankful flow or 2-year storm level; • Delineated edge of Title 3 wetland	50 feet
Primary Protected Water Features[1]	≥ 25% for 150 feet or more[5]	• Edge of bankful flow or 2-year storm level; • Delineated edge of Title 3 wetland	200 feet
Primary Protected Water Features[1]	≥ 25% for less than 150 feet[5]	• Edge of bankful flow or 2-year storm level; • Delineated edge of Title 3 wetland	Distance from starting point of measurement to top of ravine (break in ≥25% slope)[3], plus 50 feet.[4]
Secondary Protected Water Features[2]	< 25%	• Edge of bankful flow or 2-year storm level; • Delineated edge of Title 3 wetland	15 feet
Secondary Protected Water Features[2]	≥ 25%[5]	• Edge of bankful flow or 2-year storm level; • Delineated edge of Title 3 wetland	50 feet

[1] **Primary Protected Water Features** include: all perennial streams and streams draining greater than 100 acres, Title 3 wetlands, natural lakes and springs

[2] **Secondary Protected Water Features** include intermittent streams draining 50-100 acres.

[3] Where the Protected Water Feature is confined by a ravine or gully, the top of ravine is the break in the ≥ 25% slope (see slope measurement in Appendix).

[4] A maximum reduction of 25 feet may be permitted in the width of vegetated corridor beyond the slope break if a geotechnical report demonstrates that slope is stable. To establish the width of the vegetated corridor, slope should be measured in 25-foot increments away from the water feature until slope is less than 25% (top of ravine).

[5] Vegetated corridors in excess of 50-feet for primary protected features, or in excess of 15-feet for secondary protected features, apply on steep slopes only in the *uphill* direction from the protected water feature.

(Note: The following methodology is an alternative for the purposes of substantial compliance: a jurisdiction can meet the performance standards in Title 3 by applying the following method to the water quality resource area: for areas with zero slope (as measured parallel to the ground) the buffer will be 50 feet from top of waterway bank, but for every one percent (1%) slope after that point, add six (6) feet.)

D. Uses Permitted Outright

1. Stream, wetland, riparian and upland enhancement or restoration projects; and farming practices as defined in ORS 30.930 and farm uses, excluding buildings and structures, as defined in ORS 215.203.

2. Placement of structures that do not require a grading or building permit.

(Note: City and Counties have the option of choosing to apply the Water Quality and Flood Management Area performance standards of Table 1 to all structures.)

3. Routine repair and maintenance of existing structures, roadways, driveways, utility facilities, accessory uses and other development.

(Note: Local jurisdictions may choose to place this subsection – D3 – in subsection E as item 3, Uses under Prescribed Conditions, and prescribe those conditions.)

E. Uses Under Prescribed Conditions

1. Repair, replacement or improvement of utility facilities where:

   a. The disturbed portion of the Water Quality Resource Area is restored; and

   b. Non-native vegetation is removed from the Water Quality Resource Area and replaced with vegetation from the Metro Native Plant List.

2. Additions, alterations, rehabilitation, or replacement of existing structures that do not increase existing structural footprint in the Water Quality Resource Area where the disturbed portion of the Water Quality Resource Area is restored using native vegetative cover.

F. Conditional Uses

The following uses are allowed in the Water Quality Resource Area Overlay Zone subject to compliance with the Application Requirements and Development Standards of subsections H and I:

1. Any use allowed in the base zone, other than those listed in subsection D and E above.

2. Measures to remove or abate nuisances, or any other violation of State statute, administrative agency rule or city or county ordinance.

3. Roads to provide access to Protected Water Features or necessary ingress and egress across Water Quality Resource Areas.

4. New public or private utility facility construction.

5. Walkways and bike paths. (Subsection I.5).

6. New stormwater pre-treatment facilities (Subsection I.6).

7. Widening an existing road adjacent to or running parallel to a Water Quality Resource Area.

8. Additions, alterations, rehabilitation or replacement of existing structures, roadways, accessory uses and development that increase the structural footprint within the Water Quality Resource Area consistent with Subsection I.7.

G. Prohibited Uses

1. Any new structures, development, other than those listed in subsection D, E and F, construction activities, gardens, lawns, dumping of any materials of any kind.

2. Uncontained areas of hazardous materials as defined by the Department of Environmental Quality.

H. Application Requirements

Applications for Conditional Uses in the Water Quality Resource Area Overlay Zone must provide the following information in addition to the information required for the base zone:

1. A topographic map of the site at contour intervals of five feet or less showing a delineation of the Water Quality Resource Area, which includes areas shown on the city/county Water Quality and Flood Management Area map, and that meets the definition of Water Quality Resource Areas in Table 1.

2. The location of all existing natural features including, but not limit to, all trees of a caliper greater than six (6) inches diameter at breast height (DBH), natural drainages on the site, springs, seeps and outcroppings of rocks, or boulders within the Water Quality Resource Area.

3. Location of Title 3 wetlands. Where Title 3 wetlands are identified, the applicant shall follow the Division of State Lands recommended wetlands

delineation process. The delineation shall be prepared by a professional wetlands specialist.

4. An inventory and location of existing debris and noxious materials.

5. An assessment of the existing condition of the Water Quality Resource Area in accordance with Table 2.

6. An inventory of vegetation, including percentage ground and canopy coverage.

7. Alternatives analysis demonstrating that:

   a. No practicable alternatives to the requested development exist that will not disturb the Water Quality Resource Area; and

   b. Development in the Water Quality Resource Area has been limited to the area necessary to allow for the proposed use; and

   c. The Water Quality Resource Area can be restored to an equal or better condition in accordance with Table 2; and

   d. It will be consistent with a Water Quality Resource Area Mitigation Plan.

   e. An explanation of the rationale behind choosing the alternative selected, including how adverse impacts to resource areas will be avoided and/or minimized.

   f. For applications seeking an alteration, addition, rehabilitation or replacement of existing structures:

      1. Demonstrate that no reasonably practicable alternative design or method of development exists that would have a lesser impact on the Water Quality Resource Area than the one proposed; and

      2. If no such reasonably practicable alternative design or method of development exists, the project should be conditioned to limit its disturbance and impact on the Water Quality Resource to the minimum extent necessary to achieve the proposed addition, alteration, restoration, replacement or rehabilitation; and

3. Provide mitigation to ensure that impacts to the functions and values of the Water Quality Resource Area will be mitigated or restored to the extent practicable.

8. A Water Quality Resource Area Mitigation Plan shall contain the following information:

   a. A description of adverse impacts that will be caused as a result of development.

   b. An explanation of how adverse impacts to resource areas will be avoided, minimized, and/or mitigated in accordance with, but not limited to, Table 2.

   c. A list of all responsible parties including, but not limited to, the owner, applicant, contractor or other persons responsible for work on the development site.

   d. A map showing where the specific mitigation activities will occur.

   e. An implementation schedule, including timeline for construction, mitigation, mitigation maintenance, monitoring, reporting and a contingency plan. All in-stream work in fish-bearing streams shall be done in accordance with the Oregon Department of Fish and Wildlife in-stream timing schedule.

I. Development Standards

Applications for Conditional Uses in the Water Quality Resource Area Overlay Zone shall satisfy the following standards:

1. The Water Quality Resource Area shall be restored and maintained in accordance with the mitigation plan and the specifications in Table 2.

2. To the extent practicable, existing vegetation shall be protected and left in place. Work areas shall be carefully located and marked to reduce potential damage to the Water Quality Resource Area. Trees in the Water Quality Resource Area shall not be used as anchors for stabilizing construction equipment.

3. Where existing vegetation has been removed, or the original land contours disturbed, the site shall be revegetated, and the vegetation shall be established as soon as practicable. Nuisance plants, as identified in the Metro Native Plant List, may be removed at any time. Interim erosion control measures such as mulching shall be used to avoid erosion on bare

areas. Nuisance plants shall be replaced with non-nuisance plants by the next growing season.

4. Prior to construction, the Water Quality Resource Area shall be flagged, fenced or otherwise marked and shall remain undisturbed except as allowed in Subsection F. Such markings shall be maintained until construction is complete.

5. Walkways and bike paths:

   a. A gravel walkway or bike path shall not be constructed closer than 10 feet from the boundary of the Protected Water Feature. Walkways and bike paths shall be constructed so as to minimize disturbance to existing vegetation. Where practicable, a maximum of 10 percent of the trail may be within 30 feet of the Protected Water Feature.

   b. A paved walkway or bike path shall not be constructed closer than 10 feet from the boundary of the Protected Water Feature. For any paved walkway or bike path, the width of the Water Quality Resource Area must be increased by a distance equal to the width of the path. Walkways and bike paths shall be constructed so as to minimize disturbance to existing vegetation. Where practicable, a maximum of 10 percent of the trail may be within 30 feet of the Protected Water Feature; and

   c. A walkway or bike path shall not exceed 10 feet in width.

6. Stormwater pre-treatment facilities:

   a. The stormwater pre-treatment facility may only encroach a maximum of 25 feet into the outside boundary of the Water Quality Resource Area of a primary water feature; and

   b. The area of encroachment must be replaced by adding an equal area to the Water Quality Resource Area on the subject property.

7. Additions, alterations, rehabilitation and replacement of lawful structures.

   a. For existing structures, roadways, driveways, accessory uses and development which are nonconforming, this ordinance shall apply in addition to the nonconforming use regulations of the city/county zoning ordinance.

b. Additions, alterations, rehabilitation or replacement of existing structures, roadways, driveways, accessory uses and development shall not encroach closer to the Protected Water Feature than the existing structures, roadways, driveways, accessory uses and development

8. Off-site Mitigation:

a. Where the alternatives analysis demonstrates that there are no practicable alternatives for mitigation on site, off-site mitigation shall be located as follows:

1. As close to the development as is practicable above the confluence of the next downstream tributary, or if this is not practicable;

2. Within the watershed where the development will take place or as otherwise specified by the city or county in an approved Wetland Mitigation Bank.

b. In order to ensure that the mitigation area will be protected in perpetuity, proof that a deed restriction has been placed on the property where the mitigation is to occur is required.

Table 2

WATER QUALITY RESOURCE AREA REQUIREMENTS

EXISTING CONDITION OF WATER QUALITY RESOURCE AREA	REQUIREMENTS IF WATER QUALITY RESOURCE AREA REMAINS UNDISTURBED DURING CONSTRUCTION	REQUIREMENTS IF WATER QUALITY RESOURCE AREA IS DISTURBED DURING CONSTRUCTION
Good Existing Corridor: Combination of trees, shrubs and groundcover are 80% present, and there is more than 50% tree canopy coverage in the vegetated corridor.	*Provide certification by registered professional engineer, landscape architect, or biologist or other person trained or certified in riparian or wetland delineation that vegetated corridor meets the standards of this ordinance.* *Inventory and remove debris and noxious materials.*	Prior to construction, a biologist or landscape architect shall prepare and submit an inventory of vegetation in areas proposed to be disturbed and a plan for mitigating water quality impacts related to the development, including: sediments, temperature and nutrients sediment control temperature control or addressing any other condition that may have caused the Protected Water Feature to be listed on DEQ's 303 (d) list. Inventory and remove debris and noxious materials.

Note: The middle column, being italicized, indicates that it is an option for consideration in the development review process.

EXISTING CONDITION OF WATER QUALITY RESOURCE AREA	REQUIREMENTS IF WATER QUALITY RESOURCE AREA REMAINS UNDISTURBED DURING CONSTRUCTION	REQUIREMENTS IF WATER QUALITY RESOURCE AREA IS DISTURBED DURING CONSTRUCTION
Marginal Existing Vegetated Corridor: Combination of trees, shrubs and groundcover are 80% present, and 25-50 percent canopy coverage in the vegetated corridor.	*Provide certification by registered professional engineer, landscape architect, or biologist or other person trained or certified in riparian or wetland delineation that vegetated corridor meets the standards of this ordinance.* *Inventory and remove debris and noxious materials.*	Vegetate disturbed and bare areas with, non-nuisance plantings from Native Plants List. Inventory and remove debris and noxious materials. Revegetate with native species using a City/County approved plan developed to represent the vegetative composition that would naturally occur on the site. Seeding may be required prior to establishing plants for site stabilization. Revegetation must occur during the next planting season following site disturbance. Annual replacement of plants that do not survive is required until vegetation representative of natural conditions is established on the site. Restore and mitigate according to approved plan using non-nuisance plantings from Native Plants List. Inventory and remove debris and noxious materials.

Note: The middle column, being italicized, indicates that it is an option for consideration in the development review process.

EXISTING CONDITION OF WATER QUALITY RESOURCE AREA	REQUIREMENTS IF WATER QUALITY RESOURCE AREA REMAINS UNDISTURBED DURING CONSTRUCTION	REQUIREMENTS IF WATER QUALITY RESOURCE AREA IS DISTURBED DURING CONSTRUCTION
Degraded Existing Vegetated Corridor: Less vegetation and canopy coverage than Marginal Vegetated Corridors, and/or greater than 10% surface coverage of any non-native species.	*Vegetate bare areas with plantings from approved Native Plant List.* *Remove non-native species and revegetate with plantings from approved Native Plants List.* *Inventory and remove debris and noxious materials.*	Vegetate disturbed and bare areas with appropriate plants from Native Plants List. Remove non-native species and revegetate with non-nuisance plantings from Native Plants List. Plant and seed to provide 100 percent surface coverage. Restore and mitigate according to approved plan using non-nuisance plantings from Native Plants List. Inventory and remove debris and noxious materials.

Note: The middle column, being italicized, indicates that it is an option for consideration in the development review process.

Section 5. Flood Management

A. The purpose of these standards is to reduce the risk of flooding, prevent or reduce risk to human life and property, and maintain the functions and values of floodplains, such as allowing for the storage and conveyance of stream flows through existing and natural flood conveyance systems.

B. This ordinance establishes a Flood Management Area Overlay Zone, which is delineated on the Water Quality and Flood Management Area Map attached and incorporated by reference as a part of this ordinance.

C. The Flood Management Areas mapped include:

1. Land contained within the 100-year floodplain, flood area and floodway as shown on the Federal Emergency Management Agency Flood Insurance maps and the area of inundation for the February 1996 flood; and

2. Lands that have physical or documented evidence of flooding within recorded history. Jurisdictions shall use the most recent and technically accurate information available to determine the historical flood area, such as the aerial photographs of the 1996 flooding and digitized flood elevation maps.

3. The standards that apply to the Flood Management Areas apply in addition to local, state or federal restrictions governing floodplains or flood hazard areas.

D. Uses Permitted Outright:

1. Excavation and fill required to plant any new trees or vegetation.

2. Restoration or enhancement of floodplains, riparian areas, wetland, upland and streams that meet federal and state standards.

E. Conditional Uses:

All uses allowed in the base zone or existing flood hazard overlay zone are allowed in the Flood Management Overlay Zone subject to compliance with the Development Standards of subsection H.

F. Prohibited Uses:

1. Any use prohibited in the base zone or existing flood hazard overlay zone.

2. Uncontained areas of hazardous materials as defined by the Department of Environmental Quality.

G. Development Standards

All development, excavation and fill in the floodplain shall conform to the following balanced cut and fill standards:

1. No net fill in any floodplain is allowed. All fill placed in a floodplain shall be balanced with at least an equal amount of soil material removal.

2. Excavation areas shall not exceed fill areas by more than 50 percent of the square footage.

3. Any excavation below bankful stage shall not count toward compensating for fill.

   (Note: These areas would be full of water in the winter and not available to hold stormwater.)

4. Excavation to balance a fill shall be located on the same parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill will not increase flood impacts for surrounding properties as determined through hydrologic and hydraulic analysis.

5. For excavated areas identified by the city or county to remain dry in the summer, such as parks or mowed areas, the lowest elevation of the excavated area shall be at least 6 inches above the winter "low water" elevation, and sloped at a minimum of two percent towards the Protected Water Feature. One percent slopes will be allowed in smaller areas.

6. For excavated areas identified by the city or county to remain wet in the summer, such as a constructed wetland, the grade shall be designed not to drain into the Protected Water Feature.

7. Minimum finished floor elevations must be at least one foot above the design flood height or highest flood of record, whichever is higher, for new habitable structures in the Flood Area.

8. Short-term parking in the floodplain may be located at an elevation of no more than one foot below the ten-year floodplain so long as the parking facilities do not occur in a Water Quality Resource Area. Long-term parking in the floodplain may be located at an elevation of no more than one foot below the 100-year floodplain so long as the parking facilities do not occur in a Water Quality Resource Area.

9. Temporary fills permitted during construction shall be removed.

10. New culverts, stream crossings and transportation projects shall be designed as balanced cut and fill projects or designed not to significantly raise the design flood elevation. Such projects shall be designed to minimize the area of fill in Flood Management Areas and to minimize erosive velocities. Stream crossings shall be as close to perpendicular to the stream as practicable. Bridges shall be used instead of culverts wherever practicable.

11. Excavation and fill required for the construction of detention facilities or structures, and other facilities, such as levees, specifically shall be designed to reduce or mitigate flood impacts and improve water quality. Levees shall not be used to create vacant buildable lands.

Section 6. Subdivisions and Partitions *(optional)*

A. The purpose of this section is to amend the city/county regulations governing land divisions to require that new subdivision and partition plats delineate and show the Water Quality Resource Area as a separate tract.

B. The standards for land divisions in Water Quality Resource Areas Overlay Zone shall apply in addition to the requirements of the city/county land division ordinance and zoning ordinance.

C. Prior to preliminary plat approval, the Water Quality Resource Area shall be shown as a separate tract, which shall not be a part of any parcel used for construction of a dwelling unit.

D. Prior to final plat approval, ownership of the Water Quality Resource Area tract shall be identified to distinguish it from lots intended for sale. The tract may be identified as any one of the following:

1. Private open space held by the owner or homeowners association; or

2. For residential land divisions, private open space subject to an easement conveying storm and surface water management rights to the city/county and preventing the owner of the tract from activities and uses inconsistent with the purpose of this ordinance; or

3. At the owner's option, public open space where the tract has been dedicated to the city/county or other governmental unit; or

4. Any other ownership proposed by the owner and approved by the Director.

E. Where the Water Quality Resource Area tract is dedicated to the city/county or other governmental unit, development shall be subject to a minimum 3-foot setback from the Water Quality Resource Area.

Section 7. Density Transfers

A. The purpose of this section is to allow density accruing to portions of a property within the Water Quality Resource Area and Flood Management Area Overlay Zones to be transferred outside the overlay zones.

B. Development applications that request a density transfer must provide the following information:

1. A map showing the net buildable area to which the density will be transferred.

2. Calculations justifying the requested density increase.

C. Density transfers shall be allowed if the applicant demonstrates compliance with the following standards:

1. The density proposed for the lot receiving the density is not increased to more than two (2) times the permitted density of the base zone. Fractional units shall be rounded down to the next whole number.

(Note: This is one way of restricting density.)

2. Minimum density standards will not increase due to the density transfers.

D. The area of land contained in a Water Quality Resource Area may be excluded from the calculations for determining compliance with minimum density requirements of the zoning code.

E. All standards of the base zone other than density requirements continue to apply.

F. Density transfers shall be recorded on the title of the lot in the Water Quality Resource Area and on the title of the transfer lot.

G. Once density is transferred from a lot in the Water Quality Resource Area, the density increase allocated to the transfer lot may not be transferred to any other lot.

Section 8. Erosion Prevention and Sediment Control

A. The purpose of this section is to require erosion prevention measures and sediment control practices for all development inside and outside the Water Quality Resource Area and Flood Management Area Overlay Zones during construction to prevent and restrict the discharge of sediments, and to require final permanent erosion prevention measures, which may include landscaping, after development is completed. Erosion prevention techniques shall be designed to protect soil particles from the force of water and wind so that they will not be transported from the site. Sediment control measures shall be designed to capture soil particles after they have become dislodged by erosion and attempt to retain the soil particles on site.

B. Prior to, or contemporaneous with, approval of an application that may cause visible or measurable erosion, the applicant must obtain an Erosion and Sediment Control Permit.

C. An application for an Erosion and Sediment Control Permit shall include an Erosion and Sediment Control Plan, which contains methods and interim measures to be used during and following construction to prevent or control erosion. The plan shall demonstrate the following:

1. The Erosion and Sediment Control Plan meets the requirements of the *Erosion Prevention and Sediment Control Plans, Technical Guidance Handbook (Handbook)* attached and incorporated by reference as part of this ordinance;

2. The Erosion and Sediment Control Plan will:

   a. Prevent erosion by employing prevention practices such as non-disturbance, construction schedules, erosion blankets and mulch covers; or

   b. Ensure that where erosion cannot be completely avoided, the sediment control measures will be adequate to prevent erosion from entering the public stormwater system, surface water system, and Water Quality Resource Areas; and

   c. Allow no more than a ten percent cumulative increase in natural stream turbidities, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate

activities, and that cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied.

3. The applicant will actively manage and maintain erosion control measures and utilize techniques described in the Permit to prevent or control erosion during and following development. Erosion and sediment control measures required by the Permit shall remain in place until disturbed soil areas are permanently stabilized by landscaping, grass, approved mulch or other permanent soil stabilizing measures;

4. No mud, dirt, rock or other debris will be deposited upon a public street or any part of the public stormwater system, surface water system, Water Quality Resource Area, or any part of a private stormwater system or surface water system that drains or connects to the public stormwater or surface water system.

D. The Erosion and Sediment Control Plan shall be reviewed in conjunction with the requested development approval. If the development does not require review under Sections 3 and 4 of this ordinance, the Director may approve or deny the permit with notice of the decision to the applicant.

E. The city or county may inspect the development site to determine compliance with the Erosion and Sediment Control Plan and Permit.

F. Erosion that occurs on a development site that does not have an Erosion and Sediment Control Permit, or that results from a failure to comply with the terms of such a Permit, constitutes a violation of this ordinance.

G. If the Director finds that the facilities and techniques approved in an Erosion and Sediment Control Plan and Permit are not sufficient to prevent erosion, the Director shall notify the permittee. Upon receiving notice, the permittee shall immediately install interim erosion and sediment control measures as specified in the *Handbook*. Within three days from the date of notice, the permittee shall submit a revised Erosion and Sediment Control Plan to the city or county. Upon approval of the revised plan and issuance of an amended Permit, the permittee shall immediately implement the revised plan.

Section 9. Variances

A. The purpose of this Section is to ensure that compliance with this ordinance does not cause unreasonable hardship. To avoid such instances, the requirements of this ordinance may be varied. Variances are also allowed when strict application of this ordinance would deprive an owner of all economically viable use of land.

B. This Section applies in addition to the standards governing proposals to vary the requirements of the base zone.

C. The Director shall provide the following notice of variance applications:

1. Upon receiving an application to vary the requirements of this ordinance, the Director shall provide notice of the request to all property owners within (100) feet inside the urban growth boundary, (250) feet outside the urban growth boundary and Metro.

2. Within (7) days of a decision on the variance, the Director shall provide notice of the decision to all property owners within (100) feet inside the urban growth boundary, (250) feet outside the urban growth boundary and Metro.

D. Development may occur on lots located completely within the Water Quality Resource Overlay Zone that are recorded with the county assessor's office on or before the date this ordinance is adopted. Development shall not disturb more than 5,000 square feet of the vegetated corridor, including access roads and driveways, subject to the erosion and sediment control standards of this ordinance.

E. Hardship Variance

Variances to avoid unreasonable hardship caused by the strict application of this ordinance are permitted subject to the criteria set forth in this section. To vary from the requirements of this ordiinance, the applicant must demonstrate the following:

1. The variance is the minimum necessary to allow the proposed use or activity;

2. The variance does not increase danger to life and property due to flooding or erosion;

3. The impact of the increase in flood hazard, which will result from the variance, will not prevent the city or county from meeting the requirements of this ordinance. In support of this criteria the applicant shall have a qualified professional engineer document the expected height, velocity and duration of flood waters, and estimate the rate of increase in sediment transport of the flood waters expected both downstream and upstream as a result of the variance;

4. The variance will not increase the cost of providing and maintaining public services during and after flood conditions so as to unduly burden public agencies and taxpayers;

5. Unless the proposed variance is from Section 4.H.8 (mitigation) or Section 8 (erosion control), the proposed use will comply with those standards; and

6. The proposed use complies with the standards of the base zone.

F. Buildable Lot Variance

A variance to avoid the loss of all economically viable use of a lot that is partially inside the Water Quality Resource Overlay Zone is permitted. Development on such lots shall not disturb more than 5,000 square feet of the vegetated corridor, including access roads and driveways, subject to the erosion and sediment control standards in Section 8 of this ordinance. Applicants must demonstrate the following:

1. Without the proposed variance, the applicant would be denied economically viable use of the subject property. To meet this criterion, the applicant must show that:

   a. The proposed use cannot meet the standards in Section 9.E (hardship variance); and

   b. No other application could result in permission for an economically viable use of the subject property. Evidence to meet this criterion shall include a list of uses allowed on the subject property.

2. The proposed variance is the minimum necessary to allow for the requested use;

3. The proposed variance will comply with Section 4.H.8 (mitigation) and Section 8 (erosion control); and

4. The proposed use complies with the standards of the base zone.

G. Variance Conditions

The Director may impose such conditions as are deemed necessary to limit any adverse impacts that may result from granting relief. If a variance is granted pursuant to subsections E. 1-6, the variance shall be subject to the following conditions:

1. The minimum width of the vegetated corridor shall be 15 feet on each side of a Primary Protected Water Feature, except as allowed in Section 4F;

2. No more than 25 percent of the length of the Water Quality Resource Area for a Primary Protected Water Feature within a development site can be less than 30 feet in width on each side of the water feature; and

3. In either case, the average width of the Water Quality Resource Area shall be a minimum of 15 feet on each side for Secondary Protected Water Features, a minimum of 50 feet on each side for Primary Protected Water Features; or up to 200 feet on each side in areas with slopes greater than 25 percent. The stream shall be allowed to meander within this area, but in no case shall the stream be less than 10 feet from the outer boundary of the Water Quality Resource Area.

Section 10. Map Administration

A. The purpose of this section is to provide a process for amending the Water Quality and Flood Management Areas map to add wetlands and correct the location of Protected Water Features and the Water Quality Resource Areas and Flood Management Area Overlay Zones.

B. Map Corrections

1. Within 90 days of receiving information establishing a possible error in the existence or location of a Protected Water Feature, Water Quality Resource Area Overlay Zone or Flood Management Area Overlay Zone, the city/county shall provide notice to interested parties of a public hearing at which the city/county will review the information.

2 The city/county shall amend the Water Quality and Flood Management Areas map if the information demonstrates:

a. That a Primary or Secondary Protected Water Feature no longer exists because the area has been legally filled, culverted or developed prior to the adoption of this ordinance; or

b. The boundaries of the Water Quality Resource Area Overlay Zone or Flood Management Area Overlay Zone have changed since adoption of the Water Quality and Flood Management Areas map.

C. Modification of the Water Quality Resource Area

To modify the Water Quality Resource Area Overlay Zone, the applicant shall demonstrate that the modification will offer the same or better

protection of the Protected Water Feature, Water Quality Resource Area and Flood Management Area by:

1. Preserving a vegetated corridor that will separate the Protected Water Feature from proposed development; and

2. Preserving existing vegetated cover or enhancing the Water Quality Resource Area sufficient to assist in maintaining or reducing water temperatures in the adjacent Protected Water Feature; and

3. Enhancing the Water Quality Resource Area sufficient to minimize erosion, nutrient and pollutant loading into the adjacent Protected Water Feature; and

4. Protecting the vegetated corridor sufficient to provide filtration, infiltration and natural water purification for the adjacent Protected Water Feature; and

5. Stabilizing slopes adjacent to the Protected Water Feature.

D. Adding Title 3 Wetlands

1. Within 90 days of receiving evidence that wetland meets any of one of the criteria in D.2., the city/county shall provide notice to interested parties of a public hearing at which the city/county will review the evidence.

2. A wetland shall be protected by the standards set forth in this ordinance if the wetland meets any one of the following criteria:

   a. The wetland is fed by surface flows, sheet flows or precipitation, and has evidence of flooding during the growing season, and has 60 percent or greater vegetated cover, and is over one-half acre in size;

      or the wetland qualifies as having "intact water quality function" under the 1996 Oregon Freshwater Wetland Assessment Methodology; or

   b. The wetland is in the Flood Management Area, and has evidence of flooding during the growing season, and is five acres or more in size, and has a restricted outlet or no outlet;

      or the wetland qualifies as having "intact hydrologic control function" under the 1996 Oregon Freshwater Wetland Assessment Methodology; or

c. The wetland or a portion of the wetland is within a horizontal distance of less than one-fourth mile from a water body which meets the Department of Environmental Quality definition of "water quality limited water body" in OAR Chapter 340, Division 41 (1996).

Section 11. Consistency

Where the provisions of this ordinance are less restrictive or conflict with comparable provisions of the zoning ordinance, regional, state or federal law, the provisions that are more restrictive shall govern. Where this ordinance imposes restrictions that are more stringent than regional, state and federal law, the provisions of this ordinance shall govern.

Section 12. Warning and Disclaimer of Liability

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damage. This ordinance shall not create liability on the part of the City or County, any officer or employee thereof, or the Federal Insurance Administration, for any damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

Section 13. Severability

The provisions of this ordinance are severable. If any section, clause or phrase of this ordinance is adjudged to be invalid by a court of competent jurisdiction, the decision of that court shall not affect the validity of the remaining portions of this ordinance.

Section 14. Enforcement

A. No person shall engage in or cause to occur any development, use or activity that fails to meet the standards and requirements of this ordinance. Development, uses or activities that are not specifically allowed within the Water Quality Resource Area are prohibited. All activities that may cause visible or measurable erosion are prohibited prior to the applicant obtaining an Erosion and Sediment Control Permit.

B. In addition to other powers the city or county may exercise to enforce this ordinance, the city or county may:

1. Establish a cooperative agreement between the (enforcement authority) and the applicant (or responsible party) to remedy the violation.

2. Issue a stop work order.

3. Impose a civil penalty of not more than $___ for each violation upon the permittee, contractor or person responsible for carrying out the development work. Each day of violation shall constitute a separate offense.

4. Cause an action to be instituted in a court of competent jurisdiction.

5. Authorize summary abatement and subsequent recovery of costs incurred by the city or county.

C. Upon notification by the city or county of any violation of this ordinance the applicant, permittee, contractor or person responsible for carrying out development work may be required to immediately install emergency erosion and sediment control measures that comply with Section 8.

Section 15. Definitions

Definitions. Unless specifically defined below, words or phrases used in this section shall be interpreted to give them the same meaning as they have in common usage and to give this classification its most reasonable application.

Architect - An architect licensed by the State of Oregon.

Bankful Stage - Defined in OAR 141-85-010 (definitions for Removal/Fill Permits) as the stage or elevation at which water overflows the natural banks of a stream or other waters of the state and begin to inundate upland areas. In the absence of physical evidence, the two-year recurrent flood elevation may be used to approximate the bankful stage.

Created Wetlands - Those wetlands developed in an area previously identified as a non-wetland to replace, or mitigate wetland destruction or displacement. A created wetland shall be regulated and managed the same as an existing wetland.

Constructed Wetlands - Those wetlands developed as a water quality or quantity facility, subject to change and maintenance as such. These areas must be clearly defined and/or separated from naturally occurring or created wetlands.

Debris - discarded man-made objects that would not occur in an undeveloped stream corridor or wetland. Debris includes, but is not limited to, tires, vehicles, litter, scrap metal, construction waste, lumber, plastic or styrofoam. Debris does not include objects necessary to a use allowed by this ordinance, or ornamental and recreational structures. Debris does not include existing natural plant materials or natural plant materials which are left after flooding, downed or standing dead trees or trees which have fallen into protected water features.

Department of Environmental Quality (DEQ) Water Quality Standards - The numerical criteria or narrative condition needed in order to protect an identified beneficial use.

Design Flood Elevation -the elevation of the 100-year storm as defined in FEMA Flood Insurance Studies or, in areas without FEMA floodplains, the elevation of the 25-year storm, or the edge of mapped flood prone soils or similar methodologies.

Development - any man-made change defined as buildings or other structures, mining, dredging, paving, filling, or grading in amounts greater than ten (10) cubic yards on any lot or excavation. In addition, any other activity that results in the removal of more than 10 percent of the vegetation in the Water Quality Resource Area on the lot is defined as development, for the purpose of Title 3 except that more than 10 percent removal of vegetation on a lot must comply with Section 4C - Erosion and Sediment Control. Development does not include the following: a) Stream enhancement or restoration projects approved by cities and counties; b) Farming practices as defined in ORS 30.930

and farm use as defined in ORS 215.203, except that buildings associated with farm practices and farm uses are subject to the requirements of Title 3; and c) Construction on lots in subdivisions meeting the criteria of ORS 92.040(2) (1995).

Disturb - man-made changes to the existing physical status of the land, which are made in connection with development. The following uses are excluded from the definition:

enhancement or restoration of the Water Quality Resource Area;

planting native cover identified in the Metro Native Plant List.

Division of State Lands Wetland Determinations - As defined in OAR 141-86-200 (1997) (definitions for Local Wetland Inventory Standards and Guidelines), "wetland determination" means identifying an area as wetland or non-wetland.

Emergency - any man-made or natural event or circumstance causing or threatening loss of life, injury to person or property, and includes, but is not limited to, fire, explosion, flood, severe weather, drought earthquake, volcanic activity, spills or releases of oil or hazardous material, contamination, utility or transportation disruptions, and disease.

Engineer - A registered professional engineer licensed by the State of Oregon.

Enhancement - the process of improving upon the natural functions and/or values of an area or feature which has been degraded by human activity. Enhancement activities may or may not return the site to a pre-disturbance condition, but create/recreate processes and features that occur naturally.

Engineering Geologist - A registered professional engineering geologist licensed by the State of Oregon.

Erosion - Erosion is the movement of soil particles resulting from actions of water or wind.

Fill - any material such as, but not limited to, sand, gravel, soil, rock or gravel that is placed in a Title 3 wetland or floodplain for the purposes of development or redevelopment.

Floodway Fringe - The area of the floodplain, lying outside the floodway, which does not contribute appreciably to the passage of flood water, but serves as a retention area.

Floodplain - The land area identified and designated by the United States Army Corps of Engineers, the Oregon Division of State Lands, FEMA, or (identify name) county/city that has been or may be covered temporarily by water as a result of a storm event of identified frequency. It is usually the flat area of land adjacent to a stream or river formed by floods.

Floodway - The portion of a watercourse required for the passage or conveyance of a given storm event as identified and designated by the (identify name) city/county pursuant to this Ordinance. The floodway shall include the channel of the watercourse and the adjacent floodplain that must be reserved in an unobstructed condition in order to discharge the base flood without flood levels by more than one foot.

Flood Management Areas - all lands contained within the 100-year floodplain, flood area and floodway as shown on the Federal Emergency Management Agency Flood Insurance Maps and the area of inundation for the February 1996 flood. In addition, all lands which have documented evidence of flooding.

Invasive Non-native or Noxious Vegetation - plant species that have been introduced and due to aggressive growth patterns and lack of natural enemies in the area where introduced, spread rapidly into native plant communities, or which are not listed on the Metro Native Plant List as adopted by Metro Council resolution.

Lot - Lot means a single unit of land that is created by a subdivision of land. (ORS 92.010(3)).

Mitigation - the reduction of adverse effects of a proposed project by considering, in the order: a) avoiding the impact all together by not taking a certain action or parts of an action; b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; c) rectifying the impact by repairing, rehabilitating or restoring the effected environment; d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action by monitoring and taking appropriate measures; and e) compensating for the impact by replacing or providing comparable substitute water quality resource areas.

Native Vegetation - any vegetation native to the Portland metropolitan area or listed on the Metro Native Plant list as adopted by Metro Council resolution.

ODFW Construction Standards - Oregon Department of Fish and Wildlife construction guidelines for building roads, bridges and culverts or any transportation structure within a waterway.

Open Space - Land that is undeveloped and that is planned to remain so indefinitely. The term encompasses parks, forests and farm land. It may also refer only to land zoned as being available to the public, including playgrounds, watershed preserves and parks.

Ordinary Mean High Water Line - As defined in OAR 141-82-005 as the line on the bank or shore to which water ordinarily rises in season; synonymous with Mean High Water (ORS 274.005).

Ordinary Mean Low Water Line - As defined in OAR 141-82-005 as the line on the on the bank or shore to which water ordinarily recedes in season; synonymous with Mean Low Water (ORS 274.005).

Owner or Property Owner - The person who is the legal record owner of the land, or where there is a recorded land sale contract, the purchaser thereunder.

Parcel - Parcel means a single unit of land that is created by a partitioning of land. (ORS 92.010(7)).

Perennial Streams - means all primary and secondary perennial water ways mapped by the U.S. Geological Survey.

Plans - The drawings and designs that specify construction details as prepared by the Engineer.

Post-Construction Erosion Control - Consists of re-establishing groundcover or landscaping prior to the removal of temporary erosion control measures.

Practicable - means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose.

Protected Water Features

Primary Protected Water Features shall include:

a. Title 3 wetlands; and

b. rivers, streams, and drainages downstream from the point at which 100 acres or more are drained to that water feature (regardless of whether it carries year-round flow); and

c. streams carrying year-round flow; and

d. springs which feed streams and wetlands and have year-round flow and

e. natural lakes.

Secondary Protected Water Features shall include intermittent streams and seeps downstream of the point at which 50 acres are drained and upstream of the point at which 100 acres are drained to that water feature.

Restoration - the process of returning a disturbed or altered area or feature to a previously existing natural condition. Restoration activities reestablish the structure, function, and/or diversity to that which occurred prior to impacts caused by human activity.

"Resource" versus "Facility" - The distinction being made is between a "resource," a functioning natural system such as a wetland or stream; and a "facility" which refers to a created or constructed structure or drainage way that is designed, constructed and maintained to collect and filter, retain, or detain surface water run-off during and after a storm event for the purpose of water quality improvement.

Riparian - Those areas associated with streams, lakes and wetlands where vegetation communities are predominately influenced by their association with water.

Routine Repair and Maintenance - activities directed at preserving an existing allowed use or facility, without expanding the development footprint or site use.

Set-back Adjustment - The placement of a building a specified distance away from a road, property line or protected resource.

Significant Negative Impact - an impact that affects the natural environment, considered individually or cumulatively with other impacts on the Water Quality Resource Area, to the point where existing water quality functions and values are degraded.

Statewide Planning Goal 5 - Oregon's statewide planning goal that addresses open space, scenic and historic areas, and natural resources. The purpose of the goal is to conserve open space and protect natural and scenic resources.

Statewide Planning Goal 6 - Oregon's statewide planning goal that addresses air, water and land resources quality to "maintain and improve the quality of the air, water and land resources of the state" as implemented by the Land Conservation and Development Commission (LCDC).

Statewide Planning Goal 7 - Oregon's statewide planning goal that addresses areas subject to natural disasters and hazards to "protect life and property from natural disasters and hazards" as implemented by the Land Conservation and Development Commission (LCDC).

Steep slopes - Steep slopes are those slopes that are equal to or greater than 25%. Steep slopes have been removed from the "buildable lands" inventory and have not been used in calculations to determine the number of acres within the urban growth boundary which are available for development.

Stormwater Pre-treatment Facility – any structure or drainage way that is designed, constructed, and maintained to collect and filter, retain, or detain surface water run-off during and after a storm event for the purpose of water quality improvement.

Stream - a body of running water moving over the earth's surface in a channel or bed, such as a creek, rivulet or river. It flows at least part of the year, including perennial and

intermittent streams. Streams are dynamic in nature and their structure is maintained through build-up and loss of sediment.

Structure - A building or other major improvement that is built, constructed or installed, not including minor improvements, such as fences, utility poles, flagpoles or irrigation system components, that are not customarily regulated through zoning codes.

Substantial Compliance - city and county comprehensive plans and implementing ordinances, on the whole, conform with the purposes of the performance standards in the functional plan and any failure to meet individual performance standard requirements is technical or minor in nature.

Title 3 Wetlands - wetlands of metropolitan concern as shown on the Metro Water Quality and Flood Management Area Map and other wetlands added to city or county adopted Water Quality and Flood Management Area maps consistent with the criteria in Title 3, Section 7.C. Title 3 wetlands do not include artificially constructed and managed stormwater and water quality treatment facilities.

Top of Bank - The same as "bankful stage" defined in OAR 141-85-010(2).

Utility Facilities - buildings, structures or any constructed portion of a system which provides for the production, transmission, conveyance, delivery or furnishing of services including, but not limited to, heat, light, water, power, natural gas, sanitary sewer, stormwater, telephone and cable television. Utility facilities do not include stormwater pre-treatment facilities.

Variance - means a discretionary decision to permit modification of the terms of an implementing ordinance based on a demonstration of unusual hardship or exceptional circumstances unique to a specific property.

Vegetated Corridor – the area of setback between the top of bank of a Protected Water Feature and the delineated edge of the Water Quality Resource Area as defined in Table 1.

Visible or Measurable Erosion - Visible or measurable erosion includes, but is not limited to:

Deposits of mud, dirt sediment or similar material exceeding one-half cubic foot in volume on public or private streets, adjacent property, or onto the storm and surface water system, either by direct deposit, dropping discharge, or as a result of the action of erosion.

Evidence of concentrated flows of water over bare soils; turbid or sediment-laden flows; or evidence of on-site erosion such as rivulets on bare soil slopes, where the flow of water is not filtered or captured on the site.

Earth slides, mudflows, earth sloughing, or other earth movement that leaves the property.

Water Quality Resource Areas - vegetated corridors and the adjacent water feature as established in Title 3.

Water Quality and Floodplain Management Area - The area that identifies where the Water Quality Resource Area and Floodplain Management Area Overlay Zone is applied.

Water Quality Facility - Any structure or drainage way that is designed, constructed and maintained to collect and filter, retain, or detain surface water run-off during and after a storm event for the purpose of water quality improvement. It may also include, but is not limited to, existing features such as constructed wetlands, water quality swales, and ponds that are maintained as stormwater quality control facilities.

Watershed - A watershed is a geographic unit defined by the flows of rainwater or snowmelt. All land in a watershed drains to a common outlet, such as a stream, lake or wetland.

Wetlands - Wetlands are those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. Wetlands are those areas identified and delineated by a qualified wetland specialist as set forth in the 1987 Corps of Engineers Wetland Delineation Manual.

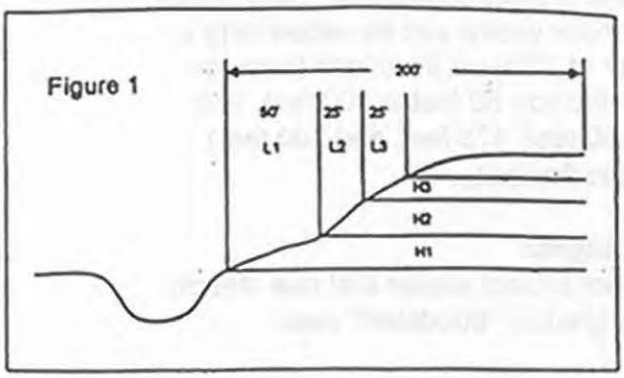
APPENDIX

EXHIBIT C

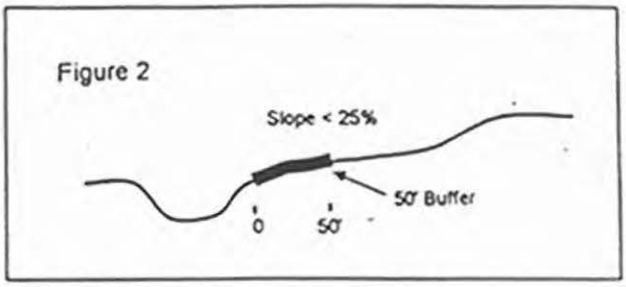
Proposed Method for Determining Vegetated Corridors Next to Primary Protected Water Features

How measure slope *(Figure 1)*

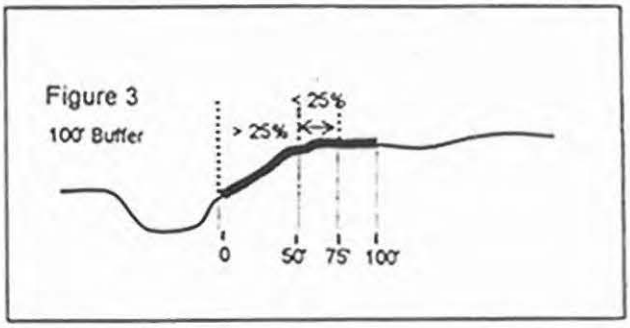
Measure 50 feet horizontally (L1) from the stream (top of bank) and determine the slope (H1/L1 - the difference in elevation divided by the difference in horizontal distance multiplied by 100).



If the slope in this 50-foot area is less than 25%, the corridor width is 50 feet from the top of bank *(see Figure 2)*.



If the slope in the 50-foot area is 25% or greater, measure another 25 feet horizontally. If the slope in this incremental 25-foot area is now *less than* 25% (H2/L2 < 25%), the vegetated corridor width would be 100 feet (50 feet for the horizontal distance from the top of bank with slope greater than 25% ***PLUS*** an additional 50 feet). *(See Figure 3.)*

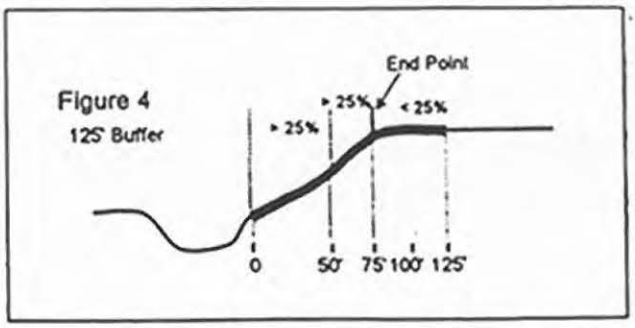


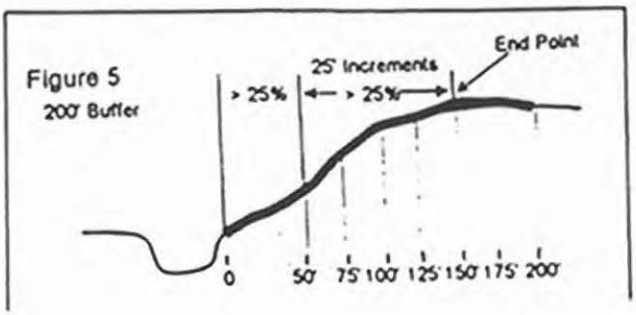
If the slope is greater than 25% in this incremental 25-foot area, continue measuring the slope every 25 feet (H/L) until you either:

(a) find a slope less than 25% *(see Figure 4)*, **or**

(When you find a slope less than 25%, the vegetated corridor equals the distance from the stream's top of bank to the ***end point*** of the last surveyed 25-foot increment with a slope greater than 25% ***PLUS*** an additional 50 feet).

(b) reach 200 feet (the maximum corridor width). *(See Figure 5.)*





Advantages:

- Provides protection for most steep slopes, yet corridor widths can be varied to fit a number of different situations (corridor widths include 50 feet to 100 feet, 125 feet, 150 feet, 175 feet, and 200 feet)
- Provides flexibility.

Disadvantages:

- Does not protect slopes that rise steeply after a gradual "floodplain" area.

Appendix H

EQUIVALENT SERVICE UNIT (ESU) BASIS, EXISTING AND FUTURE

Scappoose Storm Drain System Master Plan

City of Scappoose

Equivalent Residential Unit

Impervious Coverage

No.	Location Description			Land Use Zone	Imperv. Area sq ft
	East / West of Hwy 30	Street	Between		
1	EAST	NE Laurel	3rd & 4th	R-4	2137.0
2	EAST	Sawyer	NE Prairie/Williams	R-4	2144.0
4	EAST	Sawyer	NE Prairie/Williams	R-4	3204.0
5	EAST	SE Myrtle	3rd & 4th	R-4	2927.0
6	EAST	SE Maple	3rd & 4th	R-4	2490.0
7	EAST	SE Ironwood Ct	n/a	R-1	3475.0
8	EAST	SE Oak	east of 4th	R-4	2566.0
9	EAST	SE Santosh	SE 3rd & SE 4th	R-4	2937.0
11	WEST	SW Day	West of SW 4th	R-4	2530.0
12	WEST	SW 3rd	SW Maple & JP West Road	R-4	2758.0
13	WEST	Julie Court	West of SW 4th	R-4	2088.0
14	WEST	JP West Road	SW 2nd & SW 4th	R-4	2764.0
15	EAST	Woodmere Court		R-4	3010.0
16	WEST	SW Creekview Place	SW Park & SW Meadow Dr	R-4	2948.0
17	WEST	SW Meadow Drive	SW Creekview Pl & SW 4th	R-4	2601.0
18	WEST	SW 4th Street	SW Park & SW Meadow	R-4	2932.0
19	WEST	Sunset Drive	NW 11th & NW 14th	R-1	2010.0
20	WEST	NW Bella Vista	NW 11th & NW Smith	R-1	3628.0
21	WEST	Ridge Drive	Cliff Road & Cose	R-1	2380.0
22	WEST	Cose Street	South of Ridge	R-1	2758.0
23	WEST	Cliff Road		R-1	2450.0
24	WEST	Peak Road	Five Peak Terr & View Terr.	R-1	3048.0
25	EAST	6th Street	North of Vine	R-4	3087.0
	average				2733.6
	max				3628.0
	min				2010.0
	std dev				428.2
	median				2758.0
	low				2519.5
	average				2733.6
	high				2947.6

City of Scappoose

Existing Stormwater Equivalent Service Unit(ESU) Inventory

	Population	Dwelling Units	Dwelling Units/ Acre	Zoned Acreage	Developed	Undeveloped	C-value	Impervious Area Acreage	Impervious Area Sq Ft	ESUs 2750
SF Residential	3630	1318	6							1,318.0
MF Residential	970	388	15		25.9		0.50	12.9	563,376	204.9
Commercial				100	65	35	0.65	42.3	1,840,410	669.2
Industrial				231	126	105	0.80	100.8	4,390,848	1,596.7
Parks/Schools										100.0
Other										20.0
										3,908.8
									$2.00	$93,811
Computed:	2.70	People per dwelling - composite							$3.00	$140,716
Computed:		22.7%	MF Dwellings of Total						$4.00	$187,621
									$5.00	$234,527
Comm+Indust				331	191	140		143.1	6,231,258	2,265.9

City of Scappoose

Buildout Stormwater Equivalent Service Unit(ESU) Inventory

	Population	Dwelling Units	Dwelling Units/ Acre	Zoned Acreage	Developed	Undeveloped	C-value	Impervious Area Acreage	Impervious Area Sq Ft	ESUs 2750
SF Residential	8000	2909	6							2,909.1
MF Residential	2000	800	15		53.3		0.50	26.7	1,161,600	422.4
Commercial				100	65	35	0.65	65.0	2,831,400	1,029.6
Industrial				231	126	105	0.80	184.8	8,049,888	2,927.2
Parks/Schools										150.0
Other										40.0
										7,478.3
									$2.00	$179,480
Remaining ESUs		*3,569.5*							$3.00	$269,220
									$4.00	$358,959
									$5.00	$448,699
Comm+Indust				331	191	140		249.8	10,881,288	3,956.8
Computed:	2.70	People per dwelling - composite								
Computed:		21.6%	MF Dwellings of Total							

Appendix I

STORM DRAINAGE UTILITY ORDINANCE AND RESOLUTION

Scappoose Storm Drain System Master Plan

ORDINANCE NO. ____

AN ORDINANCE OF THE CITY OF SCAPPOOSE, OREGON, RELATING TO UTILITIES AND STORMWATER MANAGEMENT; AMENDING THE SCAPPOOSE MUNICIPAL CODE TO ADD A NEW CHAPTER ESTABLISHING A STORMWATER MANAGEMENT UTILITY; ADOPTING A SYSTEM AND PLAN FOR THAT UTILITY.

WHEREAS, the City Council of the City of Scappoose (the "City") has determined that the City's physical growth and urban development has and will continue to increase the volume of stormwater runoff collected in and routed through the City's man-made and natural stormwater facilities and system ("stormwater system"); and

WHEREAS, the City Council finds that stormwater runoff causes property damage and erosion; carries concentrations of nutrients, heavy metals, oil and toxic materials into receiving waters and ground water; degrades the integrity of City streets and the transportation system; and reduces citizen access to emergency services and poses hazards to both lives and property; and

WHEREAS, the City Council has determined that stormwater runoff must be managed in a manner that protects the public health, safety and welfare; and

WHEREAS, based on recommendations from the City's stormwater management consultant team, the City Council finds that stormwater quality and quantity problems cannot be allowed to escalate as a result of inadequate design criteria, regulation, maintenance, improvement, public awareness or code enforcement; and

WHEREAS, the City Council finds that the City's stormwater system must be funded in a manner enabling comprehensive maintenance, operation, regulation and improvement of the system; and

WHEREAS, the City Council finds that all impervious surface within the City's boundaries, contributes runoff to the City's stormwater system; that all utility customers having impervious surface areas make use of or benefit from the City's maintenance, operation and improvement of the stormwater system; and that all such stormwater customers should contribute to the funding of the City's program for maintenance, operation and improvement of the stormwater system; and

WHEREAS, professional financial and engineering consultants and the City's Public Works Director have worked cooperatively in evaluating methods for stormwater management and options for funding the program. Based on these assessments, recommendations from the Committee to the City Council were made and accepted;

THE CITY OF SCAPPOOSE DOES ORDAIN AS FOLLOWS:

Section 1. **Purpose.** The City finds and declares that absent effective maintenance, operation, regulation and control, existing stormwater drainage conditions in all drainage basins and subbasins within the City constitute a potential hazard to the health, safety and general welfare of the City. The City Council further finds that natural and man-made stormwater facilities and conveyances together constitute a stormwater system and that effective regulation and control of stormwater through formation, by the City, of a Stormwater Utility requires the transfer to the Utility of all stormwater facilities and conveyances and related rights belonging to the City.

Section 2. **Incurred charge imposed.** All customers of the City's Water Utility and those persons otherwise responsible for impervious surfaces within the City which contribute runoff to the common stormwater problem or who otherwise use or benefit from the Stormwater Utility of the City will be responsible for paying the Stormwater Utility fee as structured and applied through the Stormwater Utility Rate Resolution.

Section 3. **Stormwater Management Utility created.** There is hereby created and established pursuant to Oregon Revised Statute and Article XI, section 11b of the Oregon Constitution, a Stormwater Utility and incurred charge rate structure. All references to "the Utility" in this chapter refer to the Stormwater Management Utility. The Utility will have regulatory authority and responsibility for planning, design, construction, maintenance, administration and operation of all City stormwater conveyances and facilities.

Section 4. **Property transferred to Utility.** Title and all other incidents of ownership of the following assets are hereby transferred to and vested in the Stormwater Management Utility: all properties, interests and physical and intangible rights of every nature owned or held by the City, however acquired, insofar as they relate to or concern stormwater, further including, without limitation, all properties, interests, and rights acquired by adverse possession or by prescription, directly or through another, in and to the drainage or storage, or both, of stormwater, through, under, into or over lands, watercourses, drywells, pipes, channels, detention/retention facilities, sloughs, streams, ponds, lakes, and swamps, all beginning in each instance at a point where stormwater first enter the system of the City and ending in each instance at a point where the stormwater exits from the system of the City, and in width to the full extent of inundation caused by storm or flood conditions.

Section 5. **Utility administered by the City's Public Works Director.** The Stormwater Management Utility shall be administered by the City's Public Works Director.

Section 6. **Annual report to Stormwater Utility customers.** The City's Public Works Department shall cause to be completed an annual report on the Stormwater Management Utility which shall be approved by the City Council. This report shall summarize the financial activities of the Utility and the major areas of expenditure, field activities, accomplishments and the upcoming year's priorities.

Section 7. **Severability.** If any section, sentence, clause or phrase of this ordinance should be held to be invalid or unconstitutional by a court of competent jurisdiction, such invalidity or unconstitutionality shall not affect the validity or constitutionality of any other section, sentence, clause or phrase of this ordinance.

Section 8. **Effective date.** This ordinance shall take effect and be in force five (5) days after its passage, approval and publication as provided by law.

Read for the first time _____, 1998, and moved to second reading by _____ vote of the City Council.

Read the second time and adopted by the City Council _____, 1998.

Signed by the Mayor _____, 1998.

_____
Mayor

ATTEST:

_____
City Recorder

_____
City Attorney

RESOLUTION NO. _____

A RESOLUTION OF THE CITY OF SCAPPOOSE PERTAINING TO A SYSTEM AND STRUCTURE FOR STORMWATER RATES; CLASSIFYING THE FEES IMPOSED BY THIS RESOLUTION AS NOT SUBJECT TO ARTICLE XI, SECTION 11B OF THE OREGON CONSTITUTION.

Whereas, the Scappoose Municipal Code Chapter ___ provides that fees for stormwater management services be established by resolution of the City Council; and

Whereas, the City Council established a Stormwater Management Utility as provided by Scappoose Municipal Code Chapter _____;

Whereas, City Council finds that stormwater runoff within the basins and subbasins of Scappoose has caused property damage and erosion; carries concentrations of nutrients, heavy metals, oil, toxic materials into receiving waters and groundwater; degrades the integrity of City streets and the transportation system; reduces citizen access to emergency services and poses hazards to both lives and property;

Whereas, current and pending state and federal regulations mandate the control of pollution contained within stormwater runoff and that these regulations require comprehensive stormwater plans including provisions for the long term regulation of nonpoint source pollution management measures;

Whereas, future rates and charges may be fixed with consideration for the difference in cost of service to the various customers based on such factors as: the location of the various customers within the City; the intensity of development of an area; the types of surfaces; the difference in cost of maintenance, operation, repair, and improvement of the various parts of the Utility; the different character of the service furnished various customers; the quantity and quality of the runoff generated; and other matters which present a reasonable basis for distinction;

Whereas, the City Council finds that all Water Utility customers and other persons having responsibility for impervious surface area cause, by virtue of their impervious area, a change in the quantity, quality and timing of the stormwater leaving such area and reaching the stormwater system owned, operated and maintained by the Stormwater Management Utility;

WHEREAS, the City's Engineering Consultants has prepared and delivered to the City Council a "Storm Drain System Master Plan" recommending a funding structure for the City's Stormwater Management Utility;

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Scappoose that:

Section 1. EFFECTIVE DATE: To be effective commencing with the billings prepared on or after _____ 1998.

Section 2. DEFINITIONS: The terms used in this resolution shall be defined as follows:

a. "City". The City of Scappoose, a municipality, and its authorized employees.

b. "City Council". The city council of Scappoose.

c. "Customer". A person in whose name service is rendered as evidenced by the signature on the application/contract for stormwater, sanitary sewer or water service or, in the absence of a signed instrument, by the receipt and payment of bills regularly issued in his/her/its name.

d. "Equivalent Service Unit (ESU)". A configuration of development or impervious surface estimated to contribute an amount of runoff to the City's stormwater system which is approximately equal to that created by the average developed single family residence within Scappoose. One ESU is equal to 2,750 square feet of impervious surface area.

e. "Impervious Surface". That hard surface area which either prevents or retards the entry of water into the soil mantle and/or causes water to runoff the surface in greater quantities or at an increased rate of flow from that present under natural conditions. Impervious surfaces may include, but are not limited to, rooftops, concrete or asphalt paving, walkways, patios, driveways, parking lots or storage areas, and oiled, macadam or other surfaces which similarly impede the natural infiltration or runoff of stormwater.

f. "Developed". An area which has been altered by grading or filling of the ground surface, or by construction of any improvement or other impervious surface area, which affects the hydraulic properties of the location.

g. "Single Family Residential". An area which is improved with a dwelling unit for occupancy by a single family or a similar group of people. A single family residence also may be an individual dwelling, mobile home, flat or unit in a multi-family building or portion thereof for occupancy as the home, residence or sleeping place for one or more persons, provided each such dwelling, mobile home, flat or unit has a separate billing identified within the City's utility billing system.

h. "Undeveloped". Any area which has not been altered by grading or filling of the ground surface, or by construction of any improvements or other impervious surface area, which affects the hydraulic properties of the location.

Section 3. SYSTEM OF FEES. There is hereby imposed a system of fees on customers within the City served by or to which is available for service the Utility established by this chapter.

The charges are found to be reasonable and necessary as a means for funding of stormwater management within the City. This program will fund the administration, planning, design, construction, water quality programming, operation, maintenance and repair of stormwater system, facilities, drywells, conveyances and program; provided, however, that the City reserves the right to fix, alter, regulate and control the charges. The following charges are hereby established for all customers in the City:

a. Single Family Residential: The single family residential charge shall be $_.__ per month for each residential dwelling. This uniform rate is based on each single family residence being equal to one equivalent service unit (ESU).

b. Undeveloped: Undeveloped areas shall not be charged under this structure of charges.

c. Other Customers: The charge for all other customers shall be based upon the total amount of measured impervious surface divided by one ESU, and rounded to the nearest whole number. The actual total monthly service charge shall be computed by multiplying the measured ESU's for the area by the monthly rate of $_.__ per ESU.

d. On-site Mitigation Reduction Factor: The Utility Administrator shall determine the appropriate on-site mitigation credit factor for those eligible customers who apply for such credit consideration and provided that such mitigation is done in a manner consistent with the design criteria adopted by the City and administrative procedure adopted by the Utility.

e. Certain Areas Exempted: The Utility shall apply its charge to all publicly owned impervious surfaces excepting streets within the public right of way as these areas are designed as part of the City's stormwater conveyance system.

f. Special Programs: Rate adjustments for special programs may be determined on a case by case basis. These adjustments will be executed through individual contracts that delineate the in kind contribution of the customer to the City's stormwater management program. Special Program adjustments will be approved by the Utility Administrator.

g. Low Income Fees: A reduced stormwater service charge of _____ per ESU shall be charged for individual stormwater system users qualifying under Chapter ____ of the Scappoose Municipal Code.

Section 4. BILLING AND COLLECTION: Stormwater Utility charges for each Utility customer within the City shall be computed on at least a bi-monthly basis. The amount to be billed shall be included on the existing utilities bill as a separate line item. A "stormwater only" billing will be sent to those customers who are not currently receiving a Utility billing upon receipt of written request for stormwater service. The City shall bill the occupier of the location being served by the Utility to the extent such billing is consistent with the City's water Utility billing system.

Section 5. PENALTIES FOR NONPAYMENT OF CHARGES: In the event that any person, firm or corporation shall tender as payment of water, sewer, or stormwater services an amount insufficient to pay in full all of the charges so billed, credit shall be given first to the stormwater charge, second to the charges for sanitary sewer service and lastly to the charges for water service. In the event that any Utility account shall become delinquent, water service may be terminated by the City and discontinued until all delinquent fees for the use of the stormwater system, sanitary sewer service and water service shall have been paid in full. The provisions for collection provided herein shall be in addition to any rights or remedies which the City may have under the laws of the State of Oregon. However, under no conditions, shall the Stormwater Management Utility fee become a lien against the customer's property.

Section 6. STORMWATER UTILITY ACCOUNT: All money collected through Stormwater Utility charges shall be deposited in the Stormwater Utility Account as established and maintained by the City's Finance Director.

Section 7. APPEAL OF CHARGES: Any customer making a timely payment of the City's total utilities bill who considers the City's stormwater water charge, as applied to their impervious surface area or who otherwise disagrees with the Utility's rate determination, may apply to the Utility Administrator, or his/her designee, for a service charge adjustment, stating in writing the grounds for such an adjustment. The Utility Administrator will review the case file and determine whether an adjustment to the charge is necessary to provide for reasonable and equitable application of the Utility service charge.

Appeals of decisions made by the Utility Administrator may be brought before the Citizen's Utility Advisory Committee who may direct the reevaluation of the appeal by the Utility Administrator. Any appeal under this chapter shall be filed with the Utility Administrator no later than twenty (20) days after initial billing. Any subsequent appeal to the City Council shall be filed with the City within twenty (20) days of the recorded decision of the Utility Administrator.

Section 8. CLASSIFICATION: The City Council determines that the fees imposed by this resolution are not taxes subject to the property tax limitations of Article XI, Section 11(b) of the Oregon Constitution.

Introduced and adopted by the City Council of Scappoose on _____.

_____
Mayor

ATTEST:

_____
City Recorder

APPROVED AS TO FORM:

_____
City Attorney

Appendix J

STORM DRAINAGE SYSTEM DEVELOPMENT CHARGE ORDINANCE AND RESOLUTION

Scappoose Storm Drain System Master Plan

SYSTEM DEVELOPMENT CHARGE ORDINANCE LANGUAGE

Section 1. Purpose. The purpose of this ordinance is to provide authorization for system development charges for capital improvements pursuant to ORS 223.297 - 223.314 for the purpose of creating a source of funding for existing system capacity and/or the installation, construction and extension of future capital improvements. These charges shall be collected either at the time of increased usage or at the time of permitting development of properties which increase the use of capital improvements and generate a need for those facilities.

Section 2. Scope. The system development charges imposed herein are separate from and in addition to any applicable tax, assessment, charge, or fee otherwise provided by law or imposed as a condition of development.

Definitions. For purposes of ordinance, the following definitions shall apply:

Capital Improvements. Facilities or assets used for:

(a) Water supply, treatment and distribution;
(b) Sewage and wastewater collection, transmission, treatment and disposal.
(c) Drainage and flood control;
(d) Transportation; or
(e) Parks and recreation.

Development. Conducting a building or mining operation, making a physical change in the use or appearance of a structure or land, or creating or terminating a right of access.

Improvement fee. A fee for costs associated with capital improvements to be constructed after the date the fee is adopted pursuant to the provisions of this ordinance.

Land area. The area of a parcel of land as measured by projection of the parcel boundaries upon a horizontal plane with the exception of a portion of the parcel within a recorded right-of-way or easement subject to a servitude for a public street or scenic or preservation purpose.

Owner. The Owner(s) of record title or the purchaser(s) under a recorded sales agreement, and other persons having an interest of record in the described real property.

Parcel of land. A lot, parcel, block or other tract of land that is occupied or may be occupied by a structure or structures or other use, and includes the yards and other open spaces required under the zoning, subdivision, or other development ordinances.

Permittee. The person to whom a Building Permit, Development Permit, or Right-of-Way Access Permit is issued.

Qualified public improvement. A capital improvement that is:

(a) Required as a condition of development approval;

(b) Identified in the System Development Charge Fund Project Plan; and

(c) Not located on or continuous to a parcel of land that is the subject of the development approval.

Reimbursement fee. A fee for costs associated with capital improvements constructed or under construction on the date the fee is adopted pursuant to the provisions of this ordinance.

System development charge. A reimbursement fee, an improvement fee or a combination thereof assessed or collected at the time of increased usage of a capital improvement, at the time of issuance of a development permit or building permit, or at the time of connection to the capital improvement. "System development charge" does not include fees assessed or collected as part of a local improvement district or a charge in lieu of a local improvement district assessment, or the cost of complying with requirements or conditions imposed by a land use decision.

Section 3. System Development Charge Imposed; Method for Establishment Created.

(a) Unless exempted pursuant to Section 8 herein, a systems development charge is hereby imposed upon all development within the city of Scappoose.

(b) Systems development charges shall be established and may be revised by resolution of the Scappoose City Council. The resolution shall set the amount of the charge, the type of permit to which the charge applies, and, if the charge applies to a geographic area smaller than the entire City, the geographic area subject to the charge.

Section 4. Methodology.

(a) The methodology used to establish the reimbursement fee shall consider the cost of the then-existing facilities, prior contributions by then-existing system users, the value of unused capacity, rate-making principles employed to finance publicity owned capital improvements, and other relevant factors identified by the City Council. The methodology shall promote the objective that future systems users shall contribute not more than an equitable share of the cost of then-existing facilities.

(b) The methodology used to establish the improvement fee shall consider the cost of projected capital improvements needed to increase the capacity of the systems to which the fee is related and other relevant factors identified by the City Council.

(c) The methodology used to establish the improvement fee or the reimbursement fee, or both, shall be adopted by resolution.

Section 5. Authorized Expenditure.

(a) Reimbursement fees shall be applied only to capital improvements associated with the systems for which the fees are assessed, including expenditures relating to repayment of indebtedness.

(b) (1) Improvement fees shall be spent only on capacity increasing capital improvements, including expenditures relating to repayment of debt for such improvements. An increase in system capacity occurs if a capital improvement increases the level of performance or service provided by existing facilities or provides new facilities. The portion of the improvements funded by improvement fees must be related to demands created by projected development.

(2) A capital improvement being funded wholly or in part from revenues derived from the improvement fee shall be included in the Systems Development Charge Fund Project Plan adopted by the City.

(c) System development charge revenues may be expended on the direct costs of complying with the provisions of this ordinance, including the costs of developing system development charge methodologies and providing an annual accounting of system development charge funds.

Section 6. Project Plan.

(a) The City Council shall adopt by resolution the Systems Development Charge Fund Project Plan. This Plan:

(1) Defines the amount of current or under construction capacity available for new development and the cost of the facilities comprising this capacity;
(2) Lists the capital improvements that may be funded with improvement fee revenues; and
(3) Lists the estimated cost and estimated time of construction of each improvement.

(b) In adopting this plan, the City Coucil may incorporate by reference all or a portion of any public facilities plan, master plan, capital improvements plan or similar plan that contains the information required by this section. The City Council may modify this project plan at any time through the adoption of an appropriate resolution.

Section 7. Collection of Charge.

(a) The systems development charge is payable upon issuance of:

(1) A building permit;
(2) A development permit for development not requiring the issuance of a building permit;
(3) Approval to connect or increase the usage of the system or systems provided by the City; or
(4) A right-of-way access permit.

(b) The resolution which sets the amount of the charge shall designate the permit or systems to which the charge applies.

(c) If development is commenced or connection is made to the systems provided by the City without an appropriate permit, the system development charge is immediately payable upon the earliest date that a permit was required.

(d) The City Manager or his/her designee shall collect the applicable system development charge from the permittee or system user.

(e) The City Manager or his/her designee shall not issue such permit or allow connection or increased usage of the system(s) until the charge has been paid in full, unless an exemption is granted pursuant to Section 8.

(f) All moneys collected through the system development charge shall be retained in a separate fund and segregated by type of system development charge and by reimbursement vs improvement fees.

Section 8. Exemptions.

(a) Structures and uses established and existing on or before the effective date of the resolution.

(b) Additions to single-family dwellings that do not constitute the addition of a dwelling unit, as defined by the City's building code are exempt from all portions of the system development charge.

(c) An alteration, addition replacement or change in use that does not increase the parcel's or structure's use of a capital improvement are exempt from all portions of the system development charge.

Section 9. Credits.

(a) A permittee is eligible for credit against the system development charge for constructing a qualified capital improvement. A qualified capital improvement means one that meets all of the following criteria:

(1) Is required as a condition of development approval by the City Council; and

(2) Is identified in the adopted System Development Charge Fund Project Plan; and

(3) (i) Is not located within or contiguous to the property or parcel that is subject to development approval; or

(ii) Is not located in whole or in part on, or contiguous to, property that is the subject of development approval and required to be built larger or with greater capacity than is necessary for the particular development project to which the improvement fee is related.

(4) This credit shall be only for the improvement fee charged for the type of improvement being constructed. Credit under this section may be granted only for the cost of that portion of the improvement that exceeds the facility size or capacity needed to serve the development project.

(b) Applying the adopted methodology, the City may grant a credit against the improvement charge for capital facilities provided as part of the development that reduces the development's demand upon existing capital improvements or the need for further capital improvements or that would otherwise have to be constructed at City expense under the then existing City Council policies.

(c) When the construction of a qualified public improvement gives rise to a credit amount greater than the improvement fee that would otherwise be levied against the project receiving development approval, the excess credit may be applied against improvement fees that accrue in subsequent phases of the original development project.

(d) All credit requests must be in writing and filed with the City before the issuance of a building permit. Improvement acceptance shall be in accordance with the usual and customary practices, procedures and standards of the city of Scappoose . The amount of any credit shall be determined by the City and based upon the subject improvement construction contract documents, or other appropriate information, provided by the applicant for the credit. Upon a finding by the City that the contract amounts exceed prevailing market rate for a similar project, the credit shall be based upon market rates. The City shall provide the applicant with a credit on a form provided by the City. The credit shall state the actual dollar amount that may be applied against any system development charge imposed against the subject property. The applicant has the burden of demonstrating qualification for a credit.

(e) Credits shall be apportioned against the property which was subject to the requirements to construct an improvement eligible for credit. Unless otherwise requested, apportionment against lots or parcels constituting the property shall be proportionate to the anticipated public facility service requirements generated by the respective lots or parcels. Upon written application to the City , however, credits shall be reapportioned from any lot or parcel to any other lot or parcel within the confines of the property originally eligible for the credit. Reapportionment shall be noted on the original credit form retained by the City.

(f) Any credits are assignable; however, they shall apply only to that property subject to the original condition for land use approval upon which the credit is based or any partitioned or subdivided parcel or lots of such property to which the credit has been apportioned. Credits shall only apply against system development charges, are limited to the amount of the fee attributable to the development of the specific lot or parcel for which the credit is sought and shall not be a basis for any refund.

(g) Any credit request must be submitted before the issuance of a building permit. The applicant is responsible for presentation of any credit and no credit shall be considered after issuance of a building permit.

(h) Credits shall be used by the applicant within ten years of their issuance by the City.

Section 10. Notification/Appeals.

(a) The City shall maintain a list of persons who have made a written request for notification prior to adoption or amendment of the system development charge methodology. These persons shall be so notified in writing of any such proposed changes at least 45 days prior to the first hearing to adopt or amend such methodology(ies). This methodology shall be available at least 30 days prior to the public hearing. No challenge to the system development charge methodology shall be accepted after 60 days following final adoption by the City Council.

Section 11. Annual Accounting.

(a) The City shall provide an annual accounting for system development charges showing the total amount of system development charges collected for each system along with a list of projects funded in whole or in part through system development charges.

Memo

KCM

Date: November 3, 1998

To:

c: Central Files:

From: *Gordon Munro*

Project No.: *2830078*

Subject: *Oregon City – South End Sewer*

START UP –TRI CITY SERVICE DISTRICT RESPONSE

Ted Kyle called on November 3, 1998 and indicated that they would not be able to attend the start up meeting due to previous obligations. We spoke about the project and possible impacts on the Tri City Service District.

- The Willamette Interceptor is operated by the Tri City Service District to a certain point. He was not sure if the existing connection point at Second and Highway 99 is within their jurisdiction.

- The Willamette Interceptor is HDPE pipe, and he was unsure of the exact size (possibly 21"). There is a steep grade on the pipe, so he does not believe that capacity will be a problem. Modeling shows that there will be one or two places in the line that will start to back up during a five year storm event in the year 2010

- The City is projecting somewhere around 8 to 9 mgd from the South End Sewer. He indicated that sounded about right, but he would be double-checking this week with his consultant. He will get that updated modeling to Nancy at the City.

- There have been enough changes/additions to the pipe that it would be best to look inside the manholes rather than rely on as-builts. The Willamette Interceptor is built down the centerline of Highway 99 East.

- Have some concern that there has been corrosion in the manhole. If there is, then they would ask that it be repaired as part of this project.

- If a drop connection is needed at the manhole, they like outside drops. He does not think one will be required, as the manhole is shallow.

DRAFT

RESOLUTION NO. _____

A RESOLUTION OF THE CITY COUNCIL OF SCAPPOOSE, OREGON, ADOPTING A METHODOLOGY AND ESTABLISHING A FEE FOR ITS STORM DRAINAGE SYSTEM DEVELOPMENT CHARGE.

WHEREAS, Ordinance _____ of the City of Scappoose establishes system development charges pursuant to ORS 223.297-223.314; and

WHEREAS, the City has retained KCM, Inc. to review, analyze and make recommendations regarding the City's storm drainage capital improvement requirements and system development charges; and

WHEREAS, the City, working with KCM, Inc., has prepared a "Storm Drain System Master Plan" dated _____ 1998, which applies the City's methodology for storm drainage system development charges to the reimbursement portion of the fee; and

WHEREAS, the City has adopted the capital improvements contained in the KCM, Inc. "Storm Drain System Master Plan" which identifies the specific projects, their costs and estimated time of construction. These projects and their costs will constitute the basis for the City's system development charge improvement fee; and

WHEREAS, Ordinance ____ of the City of Scappoose imposes the reimbursement and improvement elements of system development charges on new development within the City's service area and provides that system development methodologies for both the reimbursement and improvement portions of the charge be adopted through resolution;

NOW, THEREFORE, BE IT RESOLVED that:

SECTION 1: **Methodology.** The methodology contained in the "Storm Drain System Master Plan" (_____ 1998) by KCM, Inc. is hereby adopted as the methodology for the City's storm drainage system development charge.

SECTION 2: **Charges Established.**

Storm Drainage - The reimbursement and improvement elements of the City's system development charge are hereby established. The two charges shall be in the amount identified in the "Storm Drain System Master Plan," dated _____ 1998.

SECTION 3: **Permits.** The charges in this resolution shall be due and payable upon the issuance of a permit to connect to the City's storm drainage system or at the time of increased usage of the storm drainage system as established in Ordinance No. _____.

SECTION 4: **Project Plan**. The City Council has adopted the "System Development Charge Funds Project Plan." The costs supporting development of the City's fee are limited to those projects contained in the Plan which make available existing capacity or add to the capacity of the City's water system or increase the system's level of performance in order to accommodate the impacts of new development on the City's water system.

SECTION 5: **Effective Date**. This resolution shall take effect on _____.

THIS RESOLUTION ADOPTED BY THE CITY OF SCAPPOOSE CITY COUNCIL THIS _____ DAY OF _____, 1998.

CITY OF SCAPPOOSE
STEPS TOWARD EVALUATING EXISTING FACILITIES AND CAPITAL IMPROVEMENT LISTS FOR SDC ELIGIBILITY

ORS 223

1. Capital improvements means the facilities or assets used for storm drainage systems. This definition DOES NOT ALLOW costs for operation or routine maintenance of the improvements.
2. The SDC improvement base for the SDC shall consider the cost of projected capital improvements needed **to increase the capacity** of the systems to which the fee is related.
3. An increase in system capacity is established if a capital improvement increases the "level of performance or service" provided by **existing** facilities or provides **new** facilities.

Under the proposed approach, the following rules will be followed:

1. REPAIR COSTS ARE NOT TO BE INCLUDED*;
2. REPLACEMENT COSTS WILL NOT BE INCLUDED **UNLESS** THE REPLACEMENT INCLUDES AN UPSIZING OF SYSTEM CAPACITY AND/OR THE LEVEL OF PERFORMANCE OF THE FACILITY IS INCREASED*;
3. NEW REGULATORY COMPLIANCE FACILITY REQUIREMENTS FALL UNDER THE LEVEL OF PERFORMANCE DEFINITION AND SHOULD BE INCLUDED;
4. COSTS WILL NOT BE INCLUDED WHICH BRING DEFICIENT SYSTEM UP TO ESTABLISHED DESIGN LEVELS.

GIVEN THE PROJECTS CONTAINED IN THE CIP THAT QUALIFY UNDER RULES 1-4, PLEASE ADDRESS THE FOLLOWING QUESTIONS:

A. HOW MUCH, IF ANY, OF THE CAPITAL IMPROVEMENT WOULD BE NECESSARY IF NO NEW CONNECTIONS TO THE DRAINAGE SYSTEM WERE ANTICIPATED?
B. HOW MUCH, IF ANY, OF THE CAPITAL IMPROVEMENT IS NECESSARY TO BRING AN EXISTING FACILITY UP TO EXISTING REGULATORY MANDATES?
C. HOW MUCH, IF ANY, OF THE CAPITAL IMPROVEMENT IS NECESSARY TO UPGRADE AN EXISTING FACILITY TO MEET NEW REGULATORY MANDATES?

* A PROPORTIONATE SHARE OF THESE COSTS MAY BE INCLUDED UNDER THE REIMBURSEMENT PORTION OF THE FEE TO THE EXTENT THAT COSTS MEET THE TEST OF NEW DEVELOPMENT PAYING NO MORE THAN AN EQUITABLE SHARE OF THE COST FOR EXISTING FACILITIES.