CASEY ENGINEERING

PRELIMINARY TECHNICAL INFORMATION REPORT (T.I.R.)

CARNATION FARMER'S MARKET

CITY OF CARNATION FILE NO. _____

PREPARED FOR: SNOQUALMIE VALLEY TILTH

PREPARED BY: CASEY ENGINEERING.
P.O. BOX 1255
FALL CITY, WA 98024-1255
(206) 227-8187

DATE: February 27, 2009
REVISED:

CITY OF CARNATION
NOV 22 2010
RECEIVED

CARNATION FARMER'S MARKET

TECHNICAL INFORMATION REPORT

TABLE OF CONTENTS

SECTION I:	PROJECT NARRATIVE
SECTION II:	CONDITIONS AND REQUIREMENTS SUMMARY
SECTION III:	OFF SITE ANALYSIS
SECTION IV:	FLOW CONTROL BMP'S
SECTION V:	CONVEYANCE SYSTEM ANALYSIS AND DESIGN
SECTION VI:	SPECIAL REPORTS AND STUDIES
SECTION VII:	OTHER PERMITS
SECTION VIII:	TESC/SWPPP ANALYSIS AND DESIGN
SECTION IX:	BOND QUANTITIES, FACILITY SUMMARIES AND DECLARATION OF COVENANT
SECTION X:	OPERATIONS AND MAINTENANCE MANUAL

CARNATION FARMER'S MARKET

SECTION I: PROJECT NARRATIVE

Site Information:

The Proposed Carnation Farmer's Market site is within the corporate boundaries of the City of Carnation, King County, Washington The dimensions of the site is approximately 75'x100' or 7,500sf. (.17ac). The site is within a portion of the NW¼ of the SE¼ of S16, T 25 N, R7E, WM. A vicinity map showing the location of the site is provided in this section. The property fronts Bird Street (North), Stossel Avenue (East), and an alley to the south. The site is generally flat. The property is currently undeveloped and vacant. There is a small shed at the NW corner of the site that has been used for storage of Farmer Market activities in the past. The site has been field surveyed by Lovell-Sauerland & Associates, Inc. The existing condition plan sheet information is based upon the field survey.

Purpose:

The purpose of this report is to provide a small site storm drainage design that is in compliance with the 2005 DOE Manual and Chapter 15.64.170 of the City of Carnation Municipal Code.

Existing Condition:

The site is approximately 7,500sf. The site is currently covered with grass. There is a shed at the NW corner of the site and four trees along the eastern property line. The survey indicated that the trees were Apple, however the Landscape Architect has indicated that the trees are Pear. The existing condition field by survey Lovell-Sauerland & Associates, Inc.is provided on plan Sheet 1 of 4 of the attached drawings.

There is an existing septic drainfield system within the site that was installed in the past but is no longer in use due to the recent installation of Sanitary Sewer systems within the City. The locations of some of the components of the old drainfield are shown on the Existing Condition Plan sheet based upon field survey. It is not known at this time if the drainfield has been abandoned. The drainfield is located within the western portion of the site.

There is no known stormwater conveyance system along the frontage of the site that conveys stormwater to a downstream system located within the City. Therefore, it is assumed that the rainwater that enters the site infiltrates within the site.

Developed Condition:

The proposal at this time is to construct an enclosed structure (24'x24') at the southeast corner of the site and two covered areas that can be used for market sales or other community activities. The southern east/west covered structure (including roof overhangs) is proposed

as being 37'x16'. The eastern north/south covered structure (including roof overhangs) is proposed as being 42'x16'. The size of the proposed structures may change during the review and approval process and may change as a function of available funding. However, for the purpose of this report, the current proposed structure impervious areas will be used to determine the applicable stormwater requirements for the site. In addition, it has been communicated that approximately 500sf of new impervious area will be created with alley paving. It is not known at this time the extent or location of the proposed alley paving. The Total new impervious surface proposed is 2,340sf.

Design Intent:

Soils Information Discussion:

The Limited Geotechnical Engineering Investigation prepared by Krazan & Associates, Inc. provided in Section VI of this report indicates that the site is not suitable for infiltration (p10) based upon the sample that was taken at 3' below grade. The report further states "We recommend using drywells or other dispersion methods for stormwater management at this site." Most of the hand auger samples only went to a depth of 3' to 4.5'. HA-1 went to a depth of 7'.

There is a parcel of land (parking lot) owned by Carnation Hardware on the eastern side of Tolt Avenue (SR 203) that is approximately 200' to the west of the site that has clean infiltratable gravel at a depth of 8'(conversation with owner).

The existing septic drainfield within the site is a "Gravity system" indicating that the design of the system was based upon an infiltration capacity of the existing soils.

It is recommended that during the review and approval process, additional on-site test pits be excavated to a depth of 10' in the vicinity of the proposed structure to determine if there is a permeable layer wherein drywells would be applicable to the proposed improvements for the site.

Proposed Preliminary Storm Drainage System(BPM's):

Two preliminary BMP options are provided below.

Option 1:

The proposed preliminary system is to provide underground storage for the 25-yr-24hr runoff from the new impervious area created by the proposal. The assumption is that all of the run-off from the pervious areas will infiltrate in the manner that they currently do and the areas from the new impervious areas will be directed to a system equal in volume to the runoff from a 25-yr storm which will slowly infiltrate into the existing soils.

Option 2.

This option uses the same facility as in Option 1 with the addition of an assumed nominal infiltration rate of 1in/hr. The runoff from the impervious area is routed through the facility

with a discharge curve based upon the nominal infiltration rate. In this option, the 100yr-24hr storm was used.

Due to the small size of the site the Hydrograph method (Waterworks) was used in determining the runoff volume (Option 1) and the routing of the stormwater through the facility (Option 2). The resulting information of both Option 1 and Option 2 for the on-site system is provided in Section IV of this report.

It is recognized that the Proposed System may change as a part of the review and approval process.

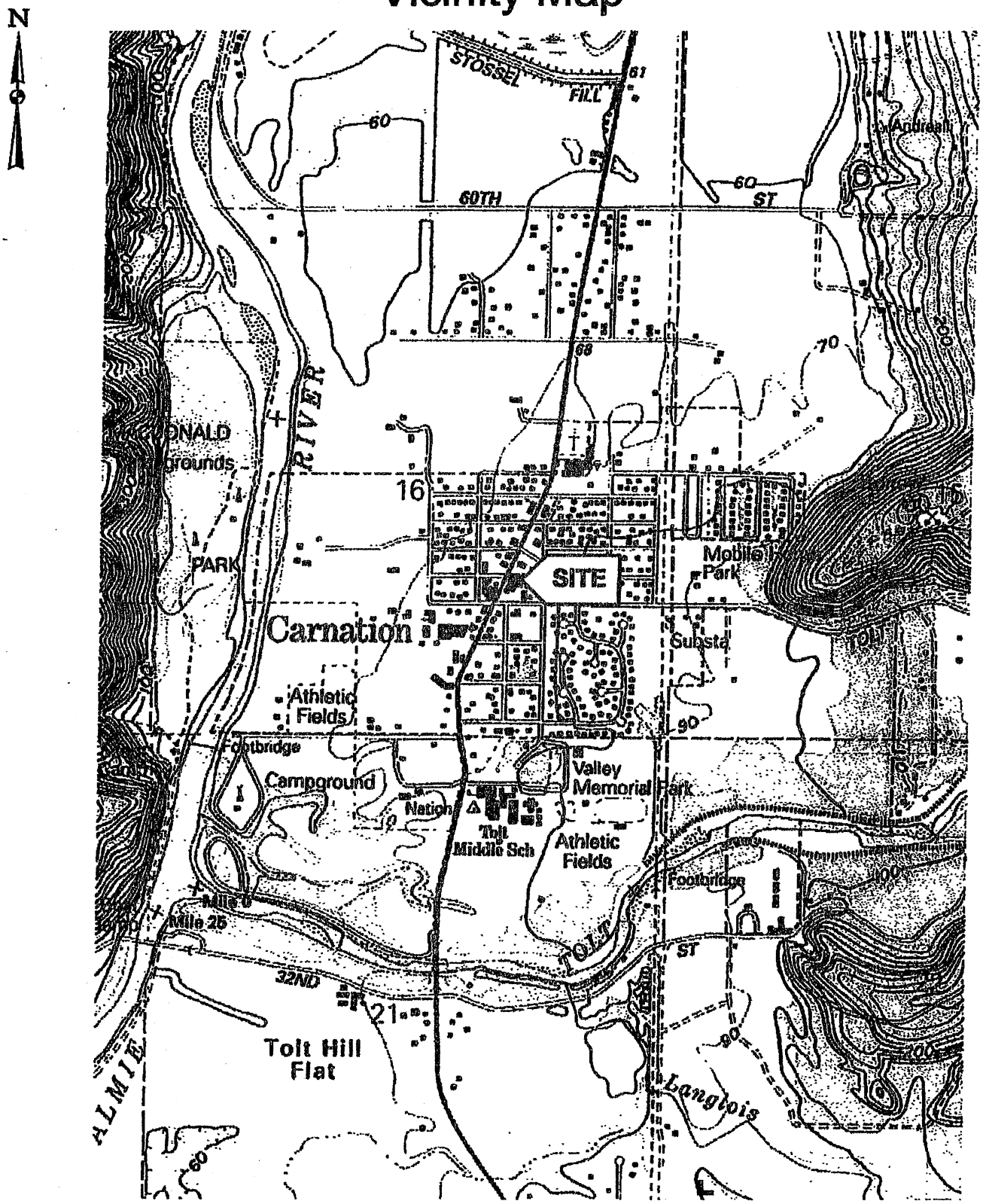
The following information was used in the preparation of this report:

1. Site visit walking the site and observing drainage patterns both within the site and adjacent to the site.
2. Field Survey prepared by Lovell-Sauerland & Associates Dated 1-8-09
3. 2005 DOE Manual
4. Proposed Site Improvements by Barker Landscape Architects.
5. January 13, 2009 Limited Geotechnical Engineering Investigation by Krazan & Associates, Inc.

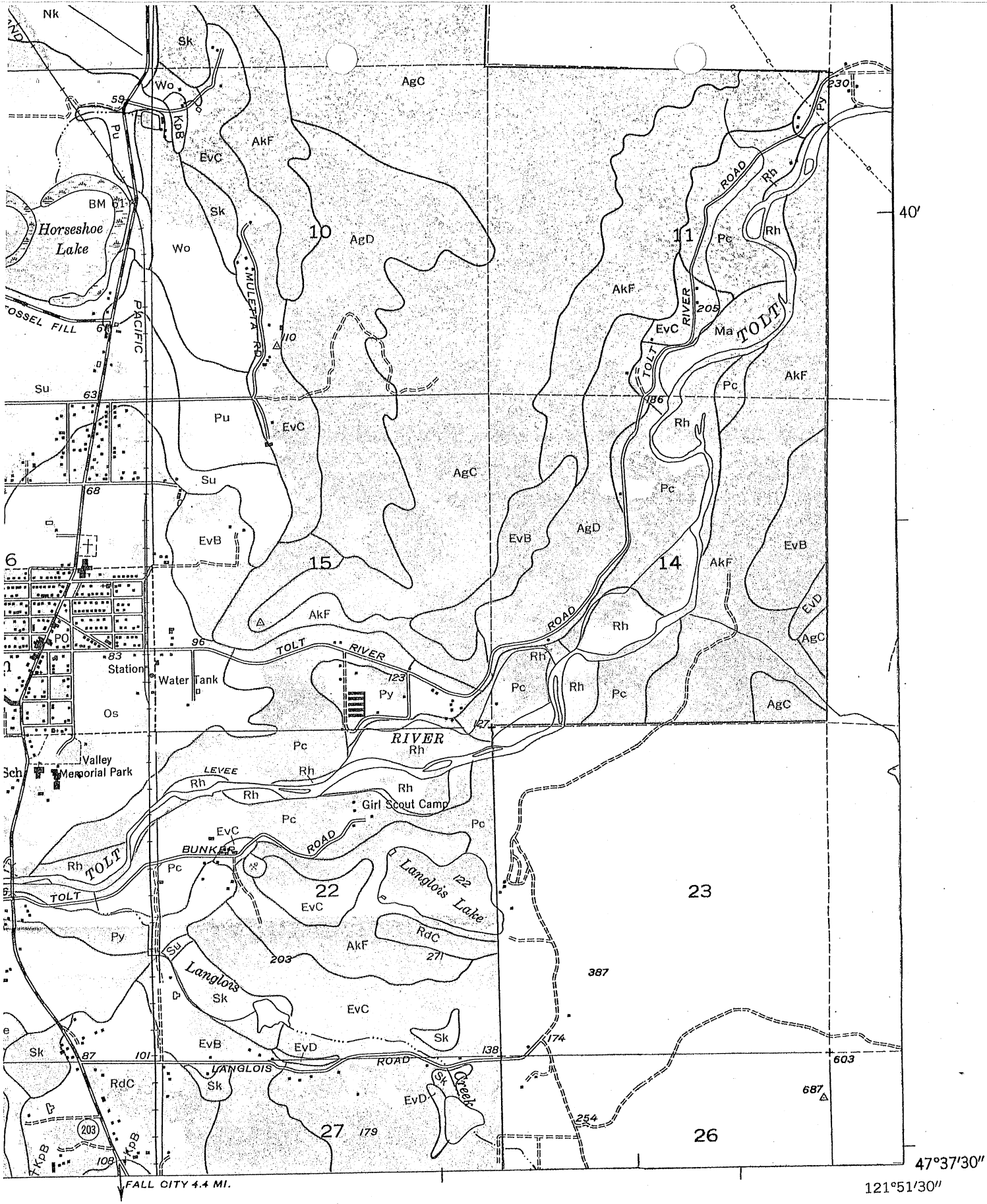
Provided in this Section is the following:

1. Vicinity Map (From Krazan Report)
2. Soils Map (Portion of Sheet 3 1973 King County Soil Survey)

Vicinity Map



Krazan & ASSOCIATES, INC.		
Proposed Farmers Market		
Date: January 13, 2009	Reference: Maptech, 1999	
Drawn By: PAH	Figure 1	Project Number: 092-08116



N

2 Miles

10000 Feet

Orthophotobase compiled in 1970 by USGS. Planimetric detail obtained from USGS 7½' minute series maps.

Polyconic projection. 1927 North American datum. 10,000-foot grid based on Washington coordinate system,

CARNATION FARMER'S MARKET

SECTION II: CONDITIONS AND REQUIREMENTS SUMMARY

This Section will be completed at which time there are conditions placed upon the project by the City of Carnation. There are no known conditions to be addressed at this time.

CARNATION FARMER'S MARKET

SECTION III: OFF-SITE ANALYSIS

There is no known conveyance system that collects and transmits stormwater from the site to a downstream facility. Therefore, a downstream analysis has not been prepared for this project. The design intent is to contain all of the stormwater within the site.

CARNATION FARMER'S MARKET

SECTION IV: FLOW CONTROL BMP'S

A. Impervious Areas:

The project proposes to create approximately 2,340sf of new impervious area. A breakdown of the new impervious area is as follows:

1.	Structure at 24'x24' =	576sf
2.	Southern covered area at 37'x16' =	592sf
3.	Eastern covered area at 42'x16' =	672sf
4.	Alley paving (Estimated) =	500sf
	Total proposed new Impervious =	2,340sf

B. Runoff Volume:

Using the Hydrograph Method (Waterworks see attached) the runoff volume is determined as follows:

For an area of 2,000sf of impervious area the runoff would be 579cf. The site has more than 2000sf of impervious therefore the proportional increase of volume required would be:

Volume = 579cf + [(579cf/2000sf)]x(340sf) = **677.4cf = Volume Required**

C. Proposed Storage facility:

The goal is to provide on-site storage with the assumption that the stormwater will slowly infiltrate into the existing native soils. For this preliminary design the following is proposed:

Use Infiltrator Systems, Inc-Quick High Capacity Chambers with storage capacity of 8.3cf/4lf or 2.08cf/lf (See attached information).

Length Required = (677.4cf)/(2.08cf/lf) = 325.7lf therefore use **326lf Required.**

Design parameters:

- 5' min setback from property lines
- 5' min setback from structures
- 5' min separation between trenches

Plan sheet 2 of 3 shows the proposed location of the storage/infiltration trenches within the site

D. Discussion:

It is recognized that the Infiltrator Systems product may not be the best solution for the site. However, the Infiltrator Systems product does provide information concerning storage capacity equivalent to other products available on the market. As the design review and approval process proceeds, alternative systems could be evaluated based upon Traffic loading requirements, additional on-site soils evaluation, and revisions to the site design.

The following information is provided in this section:

1. Figure 2.2 of the 2005 DOE Manual
2. Figure 3.2.1.C 25yr-24hr Isopluvials (2005 KCSWDM)
3. WaterWorks Printout of Stormwater Runoff for the 25yr-24hr storm for the site
4. Infiltrator Systems Specification Information

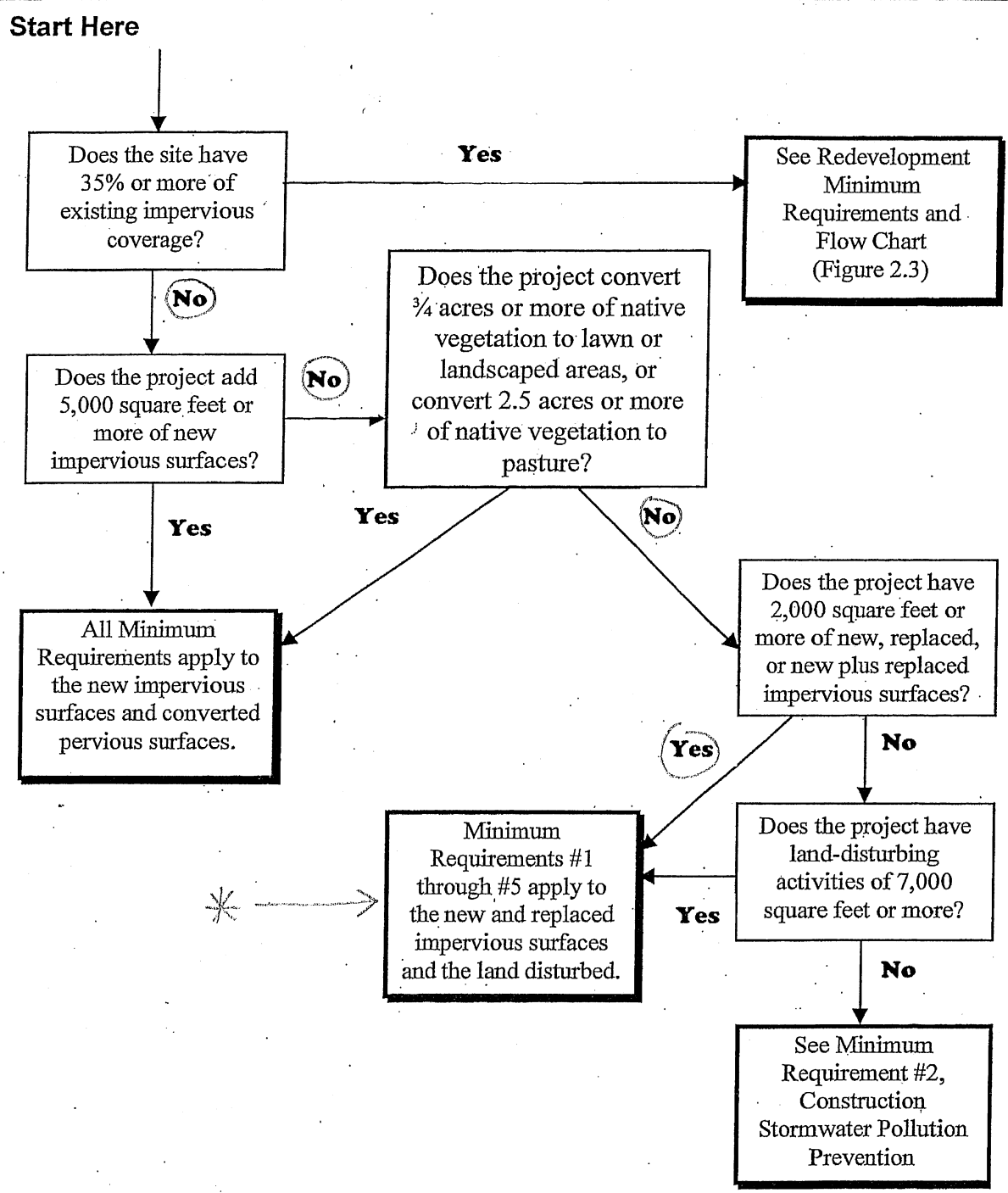
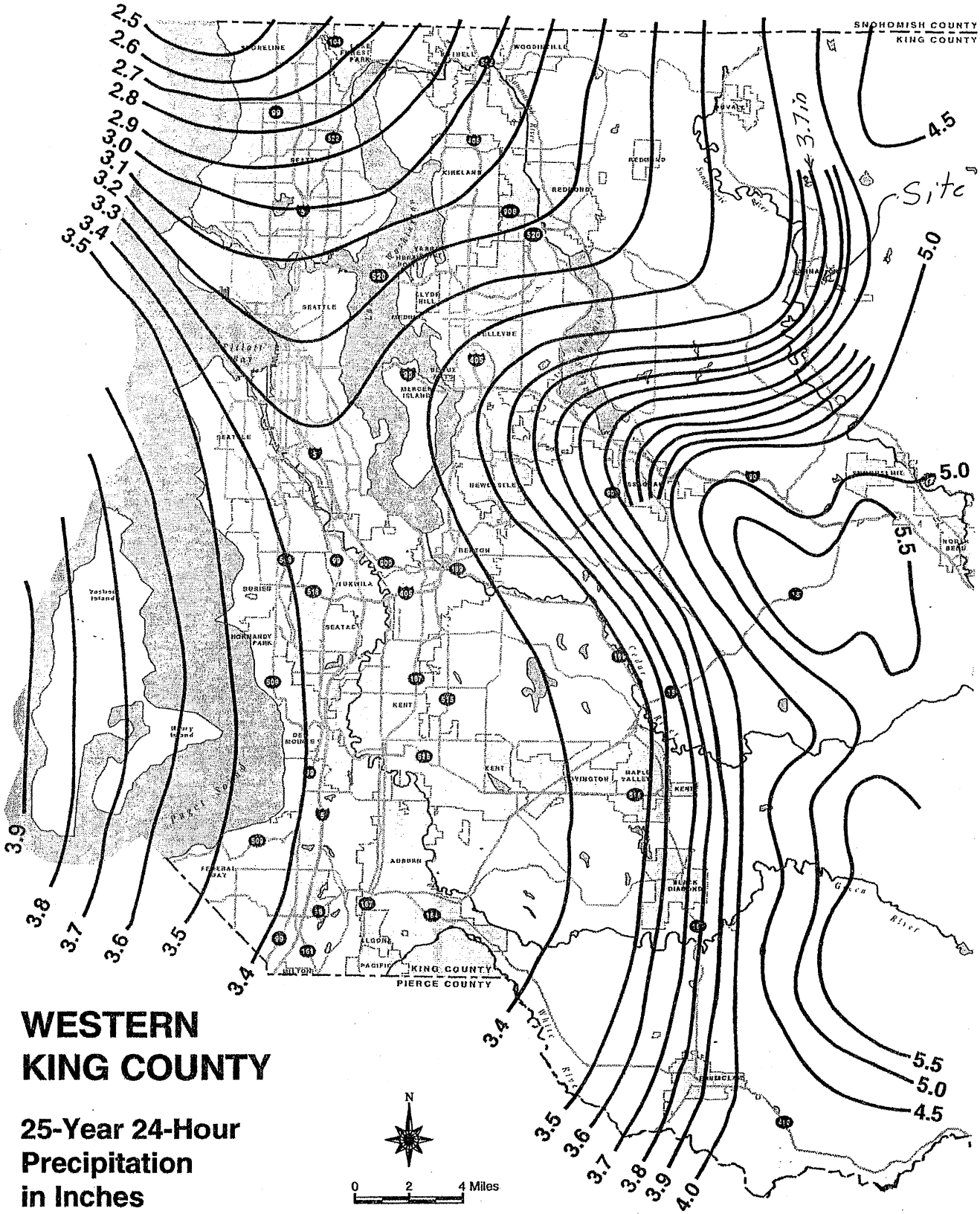


Figure 2.2 – Flow Chart for Determining Requirements for New Development

FIGURE 3.2.1.C 25-YEAR 24-HOUR ISOPLUVIALS



==========

BASIN SUMMARY

BASIN ID: OPTIONA NAME: 1000sf ROOF AREA 25yr-24hr (289 ft3)
SBUH METHODOLOGY

TOTAL AREA.....:	0.02 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE....:	TYPE1		PERV	IMP
PRECIPITATION....:	3.70 inches	AREA..:	0.00 Acres	0.02 Acres
TIME INTERVAL....:	10.00 min	CN....:	0.00	98.00
		TC....:	0.00 min	5.00 min

ABSTRACTION COEFF: 0.20
PEAK RATE: 0.04 cfs VOL: 0.01 Ac-ft TIME: 590 min

BASIN ID: OPTIONB NAME: 2000sf ROOF AREA 25yr-24hr (579 ft3)
SBUH METHODOLOGY

TOTAL AREA.....:	0.05 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE....:	TYPE1		PERV	IMP
PRECIPITATION....:	3.70 inches	AREA..:	0.00 Acres	0.05 Acres
TIME INTERVAL....:	10.00 min	CN....:	0.00	98.00
		TC....:	0.00 min	5.00 min

ABSTRACTION COEFF: 0.20
PEAK RATE: 0.08 cfs VOL: 0.01 Ac-ft TIME: 590 min

BASIN ID: OPTIONC NAME: 3000sf IMPERV AREA 25yr-24hr (868 ft3)
SBUH METHODOLOGY

TOTAL AREA.....:	0.07 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE....:	TYPE1		PERV	IMP
PRECIPITATION....:	3.70 inches	AREA..:	0.00 Acres	0.07 Acres
TIME INTERVAL....:	10.00 min	CN....:	0.00	98.00
		TC....:	0.00 min	5.00 min

ABSTRACTION COEFF: 0.20
PEAK RATE: 0.13 cfs VOL: 0.02 Ac-ft TIME: 590 min

BASIN ID: OPTIOND NAME: 4000sf IMPERV AREA 25yr-24hr (1157 ft3)
SBUH METHODOLOGY

TOTAL AREA.....:	0.09 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE....:	TYPE1		PERV	IMP
PRECIPITATION....:	3.70 inches	AREA..:	0.00 Acres	0.09 Acres
TIME INTERVAL....:	10.00 min	CN....:	0.00	98.00
		TC....:	0.00 min	5.00 min

ABSTRACTION COEFF: 0.20
PEAK RATE: 0.17 cfs VOL: 0.03 Ac-ft TIME: 590 min

==========

HISTORY OF HYDROGRAPH ACTIVITY

Option 2

Date of Session: 3/10/09 7:46:21 pm
CLEARHIS

Remark
1. The first step executed above is to clear the History File

The purpose of this program is to create a template program that can be used for the analysis of the proposed Carnation Farmer's Market using a nominal infiltration within the storage facility.

Section IV.C of this TIR determines the facility length based upon the assumption that the facility can store the 25yr-24hr storm with no infiltration.

The analysis contained in this program routes the 100yr-24hr storm through the same facility with a discharge equal to an infiltration rate of 1"/hr.

2. The Basin "Prop1" is moved to hydrograph register Hyd1

lstend

```
MOVE   Prop1 to  1
            0.0546 cfs    0.0183 ac-ft      8.00 hrs
```

Remark

3. Hydrograph 1 is now routed through the Storage Structure "QH4" with a Stage Discharge outlet structure defined as "Out1". The resulting hydrograph is placed in Hyd2.
lstend

```
LPOOL  1 "100YR-24HR ROUTE" 1 1 QH4 OUT1  2
   Description          MatchQ   PeakQ Sto   Dis      PkStg    OutQ  hyd    Volume
   100YR-24HR ROUTE       0.05    0.05  QH4    OUT1     0.22    0.02    2      197.75 cf
```

Remark
The result shows that the facility is more than adequate to store and infiltrate the 100yr-24hr storm.

lstend

End program file C:\CASEYE~1\2009-0~1\WATERW~1\FARMER~1.pgm

Carnation: Farmer's Market | 3-8-09

Stage Area: Per X-Section

Option 2

Elev	Area(ft^2)
0	0
.25	.49
.50	.45
.75	.37
1.0	.17

Stage Storage: (Using Length = 326 Lf)

Elev	Vol	Vol(1.405)*	Σ Vol(ft^3)
0	0	0	0
.25	159.74	224.4	224.4
.50	146.70	206.1	430.5
.75	120.62	169.5	600.0
(11.5") .958	55.42	77.9	677.9

Determine Discharge Rate (Infiltration)

Assume a small rate of 1"/hr

Convert to Cfs for Trench: 326 Lf x 34" (2.833')

$$\therefore CFS = \left(\frac{1\,in}{hr}\right)\left(\frac{hr}{60\,min}\right)\left(\frac{min}{60\,sec}\right)\left(\frac{ft}{12\,in}\right)(326')(2.833')$$

$$= .021\,ft^3/sec \longleftarrow \text{Q out Infiltration}$$

STAGE STORAGE TABLE

Option 2

CUSTOM STORAGE ID No. QH4
Description: QUICK HIGH 4 CHAMBERS 326LF

STAGE (ft)	STORAGE cf	STORAGE Ac-Ft	STAGE (ft)	STORAGE cf	STORAGE Ac-Ft	STAGE (ft)	STORAGE cf	STORAGE Ac-Ft	STAGE (ft)	STORAGE cf	STORAGE Ac-Ft
0.00	0.0000	0.0000	0.30	265.62	0.0061	0.60	498.30	0.0114	0.90	658.43	0.0151
0.10	89.760	0.0021	0.40	348.06	0.0080	0.70	566.10	0.0130	0.95	677.90	0.0156
0.20	179.52	0.0041	0.50	430.50	0.0099	0.80	619.48	0.0142			

STAGE DISCHARGE TABLE

Option 2

DISCHARGE LIST ID No. OUT1
Description: INFILTRATION DISCHARGE

STAGE (ft)	<--DISCHARGE---> ---cfs-- -------	STAGE (ft)	<--DISCHARGE---> ---cfs-- -------	STAGE (ft)	<--DISCHARGE---> ---cfs-- -------	STAGE (ft)	<--DISCHARGE---> ---cfs-- -------
0.00	0.0000	0.30	0.0210	0.70	0.0210	0.96	0.0210
0.10	0.0084	0.40	0.0210	0.75	0.0210		
0.20	0.0168	0.50	0.0210	0.80	0.0210		
0.25	0.0210	0.60	0.0210	0.90	0.0210		

==========

BASIN SUMMARY

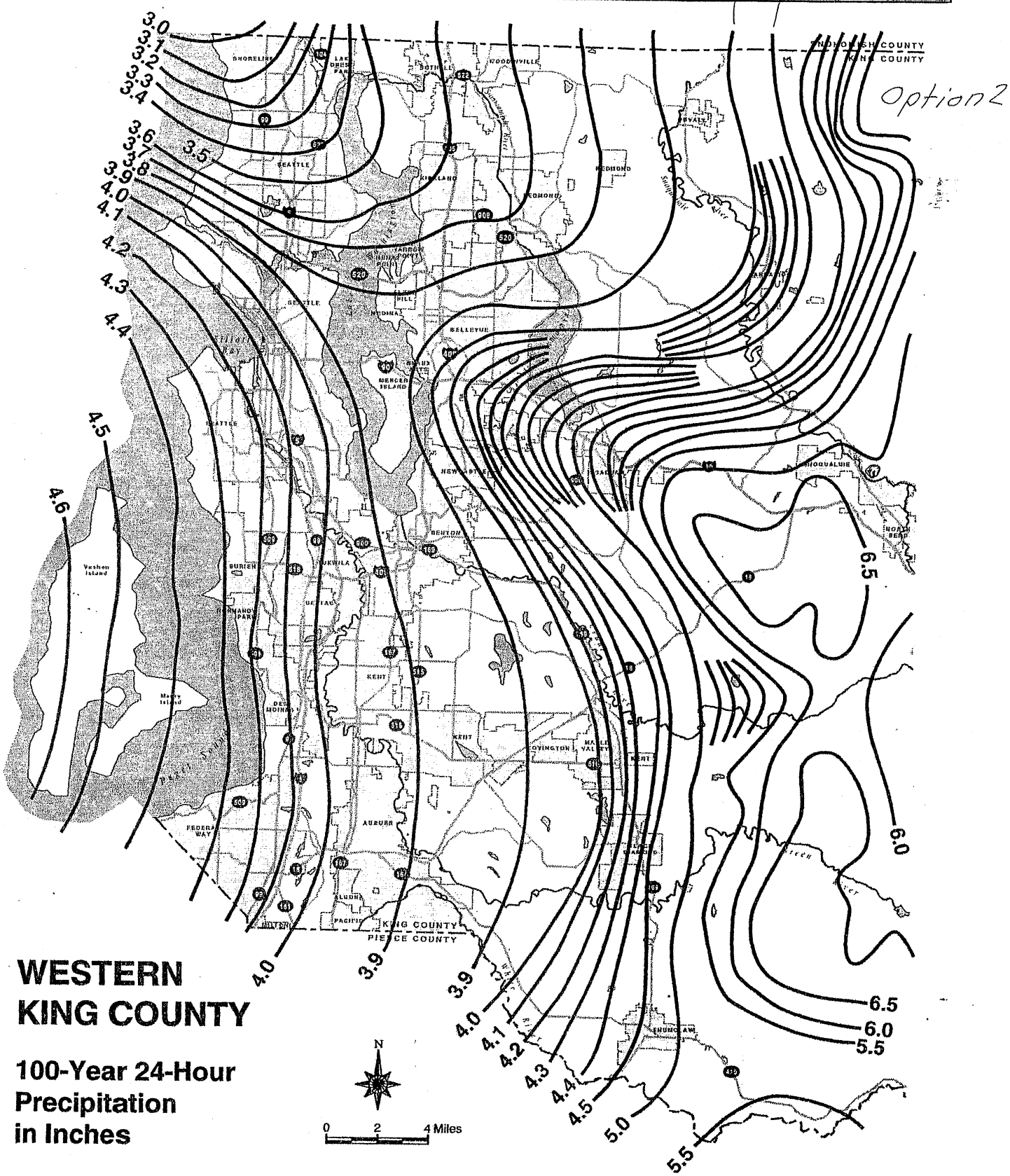
Option 2

BASIN ID: Prop1 NAME: 2340sf Imperv Area 100yr-24
SBUH METHODOLOGY

TOTAL AREA.....:	0.05 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE....:	USER1		PERV	IMP
PRECIPITATION....:	4.30 inches	AREA..:	0.00 Acres	0.05 Acres
TIME INTERVAL....:	10.00 min	CN....:	0.00	98.00
		TC....:	0.00 min	10.00 min

ABSTRACTION COEFF: 0.20
PEAK RATE: 0.05 cfs VOL: 0.02 Ac-ft TIME: 480 min

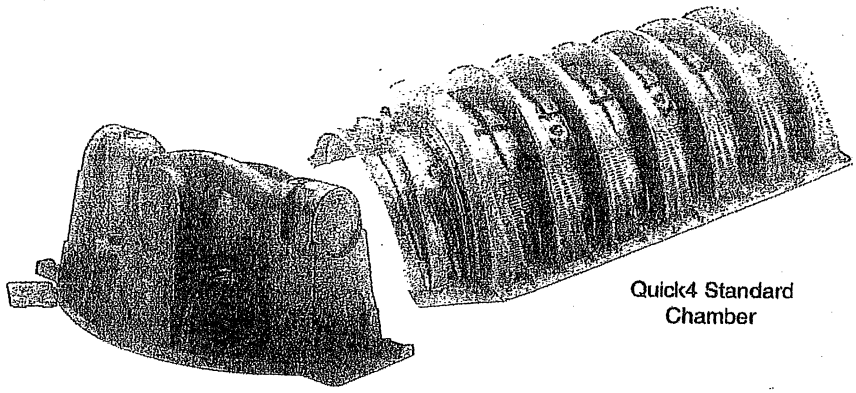
FIGURE 3.2.1.D 100-YEAR 24-HOUR ISOPLUVIALS



Product Information

Quick4 Standard Chamber Nominal Specifications

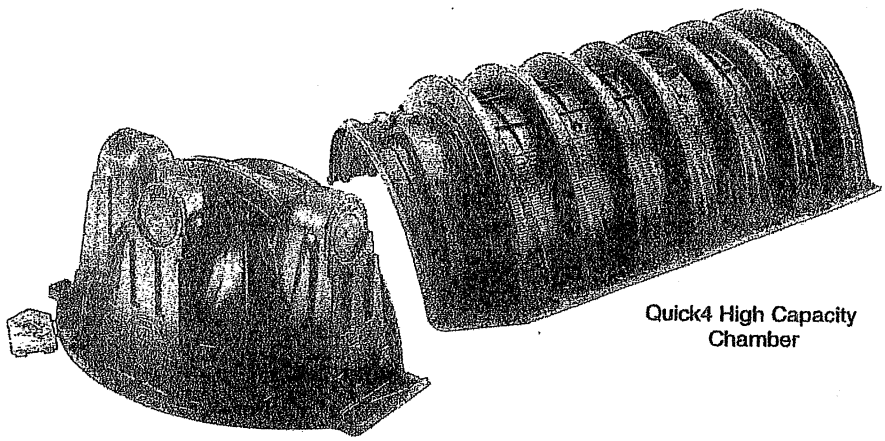
Size (W x L x H)	34" x 48" x 12"
Invert Height	8"
Storage Capacity	44 gal (5.8 ft³)
Additional Storage Capacity With End Caps	18.3 gal (2.4 ft³)



Quick4 Standard Chamber

Quick4 High Capacity Chamber Nominal Specifications

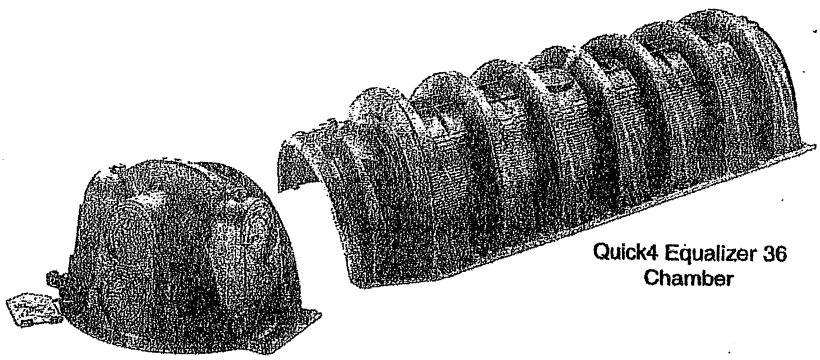
Size (W x L x H)	34" x 48" x 16"
Invert Height	11.5"
Storage Capacity	62 gal (8.3 ft³)
Additional Storage Capacity With End Caps	28.8 gal (3.9 ft³)



Quick4 High Capacity Chamber

Quick4 Equalizer36 Chamber Nominal Specifications

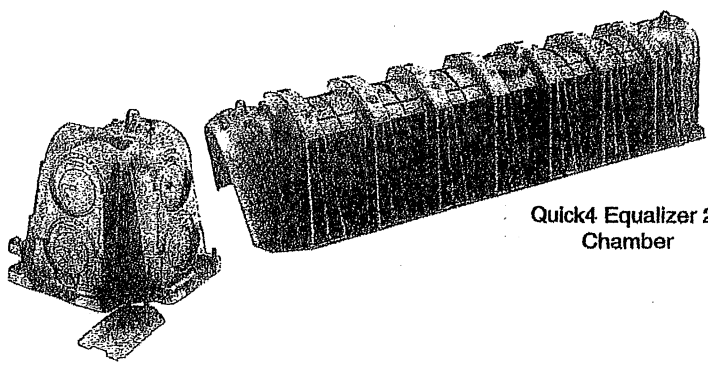
Size (W x L x H)	22" x 48" x 12"
Invert Height	6"
Storage Capacity	32 gal (4.3 ft³)
Additional Storage Capacity With End Caps	11.1 gal (1.5 ft³)



Quick4 Equalizer 36 Chamber

Quick4 Equalizer 24 Chamber Nominal Specifications

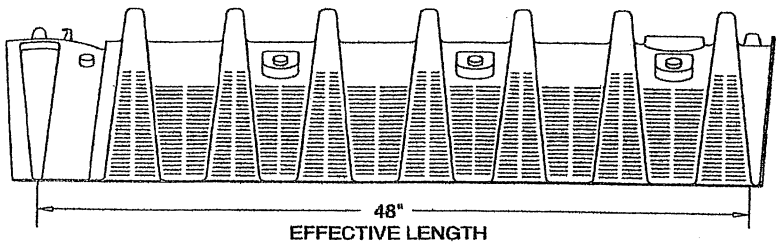
Size (W x L x H)	16" x 48" x 11"
Invert Height	6"
Storage Capacity	21 gal (2.8 ft³)
Additional Storage Capacity With End Caps	7.7 gal (1.0 ft³)

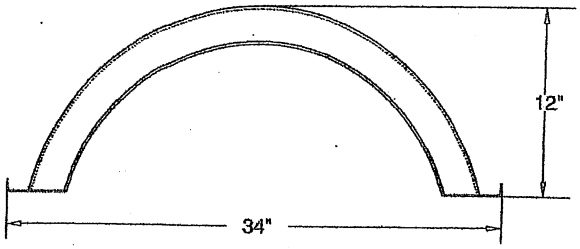


Quick4 Equalizer 24 Chamber

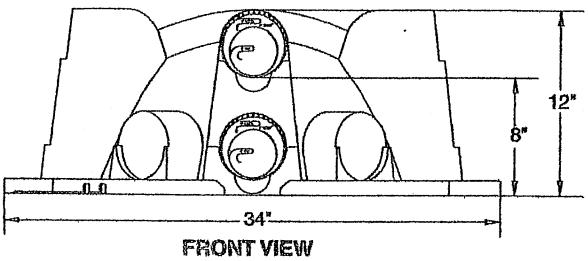
Product Information

QUICK4 STANDARD CHAMBERS
SIDE AND END VIEWS
(Not to scale)

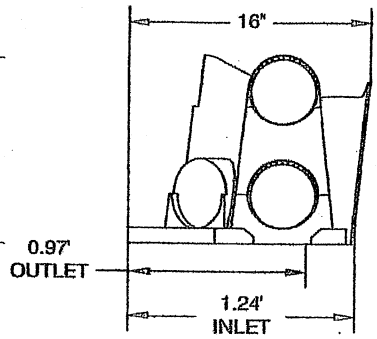




MULTIPORT END CAP
(Not to scale)

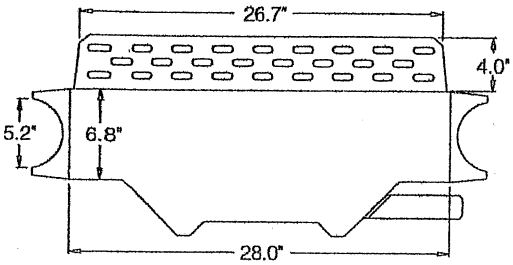


FRONT VIEW

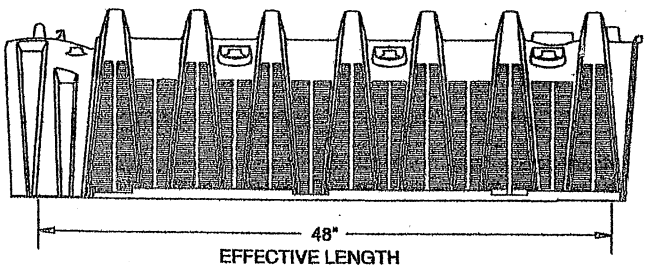


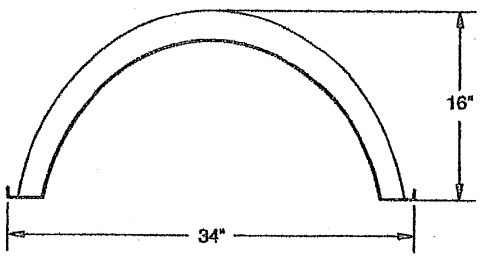
SIDE VIEW

HIGH FLOW SPLASH PLATE
(Not to scale)

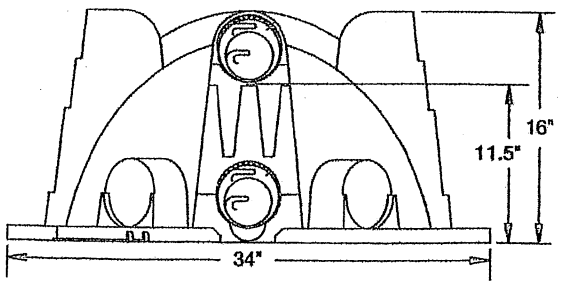


QUICK4 HIGH CAPACITY CHAMBERS
SIDE AND END VIEWS
(Not to scale)

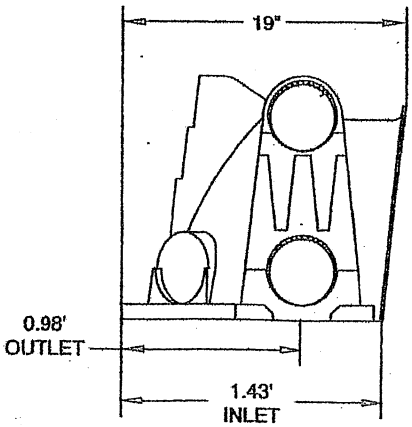




MULTIPORT END CAP
(Not to scale)



FRONT VIEW



SIDE VIEW

SECTION V: CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The proposal is to contain all of the stormwater runoff within the site. There is an existing conveyance system along Bird Street to the north of the site, however, it is my understanding from discussions with the City Engineer that this system is confined and limited to a short distance and does not connect to a downstream conveyance. Therefore, the design intent is to contain all of the stormwater runoff within the site.

As a result, no conveyance system analysis and design has been prepared as a part of this TIR.

CARNATION FARMER'S MARKET

SECTION VI: SPECIAL REPORTS AND STUDIES

Provided in this section is the following:

1. January 13, 2009 Limited Geotechnical Engineering Investigation Report Prepared by Krazan & Associates.
2.

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

January 13, 2009

KA Project No. 092-08116

Barker Landscape Architects PS
Attention: John Barker
1514 NW 52nd Street
Seattle, WA 98107

RE: **LIMITED GEOTECHNICAL ENGINEERING INVESTIGATION**
Proposed Farmer's Market
Southwest corner of Bird Street & Stossel Avenue Intersection
Carnation, Washington

Dear Mr. Barker:

This letter report presents the results of our Limited Geotechnical Engineering Investigation for the proposed Farmer's Market at the referenced site. The scope of this study was outlined in our Proposal No. G08-194WAB, dated November 21, 2008.

Site Conditions

The site is located southwest of the intersection of Bird Street and Stossel Avenue in Carnation, Washington. The general location of the property is shown on the attached Vicinity Map (Figure 1). The subject property is currently undeveloped and vegetated with grasses and sparse trees. The property is rectangular and approximately 7,500 square feet in area. The site is generally level and is bordered by Bird Street to the north, Stossel Avenue to the east, to the west by undeveloped land, and to the south by residential properties.

Proposed Construction

The project details are still preliminary at this time. We understand that a new farmer's market structure will be constructed in the south and east portions of the site and that site stormwater will be infiltrated (if feasible). We anticipate that the proposed market structure will be founded on shallow spread footings or columns. Footing loads are expected to be light to moderate.

We have not yet received a grading plan for the project. Preliminarily, we anticipate maximum cuts and/or fill depths on the order of approximately 2 feet or less.

In the event that the structural or grading information detailed in this report is inconsistent with the final design, the geotechnical engineer should be notified so that we may update this writing as applicable.

Field Investigation

A limited field investigation consisting of four exploratory hand auger borings, which ranged in depth from approximately 3 to 7 feet below the existing site grades was completed for shallow subsurface exploration. A Krazan & Associates geologist completed the hand auger borings. The holes were excavated by manually advancing a metal rod hand auger with a bucket type bit. The metal rods were pin connected and the hand auger was turned with a T-handle.

The soils encountered in the exploratory hand auger borings were continuously examined and visually classified in accordance with the Unified Soil Classification System (USCS).

Figure 2 shows the approximate locations of the exploratory hand auger borings. Representative samples of the subsurface soils encountered in the hand auger borings were collected and sealed in plastic bags. These samples were transported to our Bothell Office for storage and selected laboratory testing (30 days).

Geologic Setting

The site lies within the central Puget Lowland. The lowland is part of a regional north-south trending trough that extends from southwestern British Columbia to near Eugene, Oregon. North of Olympia, Washington, this lowland is glacially carved, with a depositional and erosional history including at least four separate glacial advances/retreats. The Puget Lowland is bounded to the west by the Olympic Mountains and to the east by the Cascade Range. The lowland is filled with glacial and nonglacial sediments consisting of interbedded gravel, sand, silt, till, and peat lenses.

The Geologic map of King County, Washington, indicates that the property is located near the contacts of Recent Alluvium and Vashon Recessional Outwash. Recent Alluvium consists of interbedded gravel, sand, silt and clay deposited by the Snohomish and Tolt Rivers and their tributaries. The Vashon Recessional Outwash deposits consist, primarily of stratified outwash sand and gravel with variable amounts of silt, cobbles, boulders, and silt and clay interbeds, deposited by melt water in front of the receding Vashon Glacier (glaciofluvial environments).

Soil Profile and Subsurface Conditions

The subsurface conditions observed within the exploratory hand auger borings appeared to be typical of those encountered in the geologic region of the site.

All of the exploratory hand auger borings encountered approximately 4 inches of grass and topsoil underlain by 2 to 2.5 feet of stiff silt with variable amounts of fine sand (Alluvium). This layer was underlain by stiff silt with trace clay (Alluvium) down to the termination depths of the hand auger borings.

For additional information about the soils encountered, please refer to the attached logs of the exploratory hand auger borings.

Groundwater

The hand auger borings were checked for the presence of groundwater during and immediately following the excavation operations. At the date and time of our investigation, groundwater was not encountered.

It should be recognized that water table elevations may fluctuate with time. The groundwater level will be dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

Groundwater flow may become heavier during construction, which takes place during the wet weather season. This may cause difficulties with the grading and excavation work. Certain remedial and/or de-watering measures may be required.

Seismic Hazard

The native soils encountered in the exploratory hand auger borings were generally stiff. The overall soil profile corresponds to a soil profile Site Class *D* as defined by Table 1613.5.2 of the 2006 International Building Code (2006 IBC). A Site Class *D* applies to a profile consisting of medium dense to very dense soils within the upper 100 feet.

We referenced the U.S. Geological Survey (USGS) Earthquake Hazards Program Website to obtain values for S_S, S_1, F_a, and F_v. The USGS website includes the most updated published data on seismic conditions. The site specific seismic design parameters and adjusted maximum spectral response acceleration parameters are as follows:

PGA	(Peak Ground Acceleration, in percent of g)
28.12	(10% Probability of Exceedence in 50 years)
51.93	(2% Probability of Exceedence in 50 years)
S_S	117.40% of g
S_1	39.10% of g
F_A	1.03
F_V	1.62

Additional seismic considerations include liquefaction potential and amplification of ground motions by soft soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. Our scope of work did not include liquefaction analyses.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the findings of this investigation, it is our opinion that the proposed market structure may be supported on a shallow foundation system bearing on the stiff native soils or on properly compacted structural fill placed on the stiff native soils.

Local overexcavation or recompaction of loose/soft native soils may be necessary. We expect any overexcavation to be less than 1 to 1.5 feet, provided work is performed during the drier months of the year. During the winter months, standing water can degrade the subgrade soils and additional removal of loosened soils may become necessary.

Site Preparation

Site clearing should be limited to the areas necessary for construction of the structure and associated parking areas. Clearing should include removal of vegetation; trees and associated root systems; wood; existing utilities; structures including foundations, basement walls and floors; rubble; and rubbish. Site stripping should extend to a minimum depth of 4 to 6 inches (preliminary; based on our hand auger boring locations), or until all organics in excess of 3 percent by volume are removed. These materials will not be suitable for use as structural fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

After stripping operations and removal of any undocumented fill, the building pad areas should be visually inspected to identify any loose areas. Any remaining loose soils should be overexcavated to the level of the stiff native soils. The resulting excavations should be filled with approved on site material, or imported structural fill. Structural fill material should be within ± 2 percent of the optimum moisture content, and the soils should be compacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557.

During wet weather conditions, typically October through May, subgrade stability problems and grading difficulties may develop due to excess moisture, disturbance of sensitive soils and/or the presence of perched groundwater. Construction during the extended wet weather periods could create the need to overexcavate exposed soils if they become disturbed and cannot be recompacted due to elevated moisture contents. The on site native soils have variable silt contents and are considered moisture sensitive. If overexcavation is necessary, it should be confirmed through continuous monitoring and testing by a qualified geotechnical engineer or senior geologist. Soils that have become unstable may require drying and recompaction. Selective drying may be accomplished by scarifying or windrowing surficial material during extended periods of dry, warm weather (typically during the summer months). If the soils cannot be dried back to a workable moisture condition, remedial measures may be required. General project site winterization should consist of the placement of aggregate base and the protection of exposed soils during the construction phase. It should be understood that even if Best Management Practices (BMP's) for wintertime soil protection are implemented and followed there is a significant chance that moisture disturbed soil mitigation work will still be required.

Any buried structures encountered during construction should be properly removed and backfilled. Excavations, depressions, or soft and pliant areas extending below the planned finish subgrade levels should be cleaned to firm undisturbed soil, and backfilled with structural fill. In general, any septic tanks, underground storage tanks, debris pits, cesspools, or similar structures should be completely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the geotechnical engineer. The resulting excavations should be backfilled with structural fill.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction and stability of the material. The geotechnical engineer may reject any material that does not meet compaction and stability requirements. Further recommendations, contained in this report, are predicated upon the assumption that earthwork construction will conform to the recommendations set forth in this section and in the Structural Fill Section.

Temporary Excavations

The on site soils have variable cohesion strengths, therefore the safe angles to which these materials may be cut for temporary excavations is limited, as the soils may be prone to caving and slope failures in temporary excavations deeper than 4 feet. Temporary excavations in the stiff soils should be sloped no steeper than 1H:1V (horizontal to vertical) where room permits. If the soil in the excavation is subject to vibration from heavy traffic, the temporary excavation should be sloped no steeper than 1½H:1V.

All temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. The temporary slope cuts should be visually inspected daily by a qualified person during construction work activities and the results of the inspections should be included in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and minimizing slope erosion during construction. The temporary cut slopes should be covered with visqueen to help minimize erosion during wet weather and the slopes should be closely monitored until the permanent retaining systems are complete. Materials should not be stored and equipment operated within 10 feet of the top of any temporary cut slope.

A Krazan & Associates geologist or geotechnical engineer should observe, at least periodically, the temporary cut slopes during the excavation work. The reasoning for this is that all soil conditions may not be fully delineated during the previous geotechnical exploratory work. In the case of temporary slope cuts, the existing soil conditions may not be fully revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of the temporary slope will need to be reevaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed smoothly and required deadlines can be met.

If any variations or undesirable conditions are encountered during construction Krazan & Associates should be notified so that supplemental recommendations can be made.

Structural Fill

Best Management Practices (BMP's) should be followed when considering the suitability of native material for use as structural fill. The native soils have variable fines (silt and clay) contents and are considered moisture sensitive. The native soils may also have elevated natural moisture contents, and may need to be dried back during dry, warm weather (typically during the summer months). The native glacial soils are generally considered suitable for reuse as structural fill, provided the soil is relatively free of organic material and debris, and it is within ± 2 percent of the optimum moisture content. If the native glacial soils are stockpiled for later use as structural fill, the stockpiles should be covered to help protect the soil from wet weather conditions. We recommend that a representative of Krazan & Associates be on site during the excavation work to determine which soils are suitable for structural fill.

It should not be taken for granted that the on site soils may be used as the sole source for structural fill (especially during winter construction activities). During wet weather conditions the soils with higher silt and clay contents will be moisture sensitive, easily disturbed and most likely will not meet compaction requirements. Furthermore, during the winter, the native soils typically have elevated natural moisture contents, which will limit the use of these materials as structural fill without proper mitigation measures. The contractor should use Best Management Practices to protect the soils during construction activities and be familiar with wet weather and wintertime soil work. An allowance for importing structural fill should be incorporated into the construction cost of the project (for wintertime construction this may be as high as 100 percent import).

Imported structural fill material should consist of well-graded gravel or a sand and gravel mixture with a maximum grain size of 1½ inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). All structural fill material should be submitted for approval to the geotechnical engineer at least 48 hours prior to delivery to the site.

Fill soils should be placed in horizontal lifts not exceeding 8 inches loose thickness, moisture-conditioned as necessary, (moisture content of soil shall not vary by more than ±2 percent of optimum moisture) and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. In place density tests should be performed on all structural fill to verify proper moisture content and adequate compaction. Additional lifts should not be placed if the previous lift did not meet the compaction requirements or if soil conditions are not considered stable.

Groundwater Influence on Structures/Construction

Groundwater was not encountered during our field exploration work. If groundwater is encountered during the construction work, the groundwater is most likely perched. This perched groundwater develops where vertical infiltration of surface precipitation is impeded by a relatively impermeable soil layer, resulting in horizontal migration of the groundwater within overlying more permeable soils. If groundwater is encountered during construction, we should observe the conditions to determine if de-watering will be needed. Design of temporary dewatering systems to remove groundwater should be the responsibility of the contractor.

If earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated. These soils may "pump," and the materials may not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with drier materials; removing and replacing the soil with an approved fill material. A qualified geotechnical engineering firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Erosion Control

Erosion and sediment control (ESC) is used to minimize the transportation of sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be taken and these measures should be in general accordance with local regulations. As a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features of the site:

1) Phase the soil, foundation, utility, and other work, requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), limited grading activities can be undertaken during the wet season (generally October through April). It should be noted that this typically increases the overall cost of the project.

2) All site work should be completed and stabilized as quickly as possible.

3) Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.

4) Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

5) Vegetation should be re-established in landscaped and slope areas prior to the onset of wet weather (typically October through April). The owner should understand that the landscaped and slope areas may require periodic maintenance. The owner should visually inspect the landscaped areas and slopes where vegetation has been re-established after adverse rain events and at least once a week during prolonged rain events until vegetation has taken root. Once the vegetation has taken root, the owner should visually inspect the landscaped slopes at least bi-annually for any variations or undesirable conditions. If any variations or undesirable conditions are observed a geotechnical engineer should be notified so that supplemental recommendations can be made.

Drainage and Landscaping

The ground surface should slope away from building pads and pavement areas, toward appropriate drop inlets or other surface drainage devices. It is recommended that adjacent exterior grades be sloped a minimum of 2 percent for a minimum distance of 5 feet away from structures. Roof drains should be tightlined away from foundations and slope surfaces. Roof drains should not be connected to the footing drains, but may use the same outfall piping if connected well away from the structure such that roof water will not backup into the footing

drains. Subgrade soils in pavement areas should be sloped a minimum of 1 percent and drainage gradients should be maintained to carry all surface water to collection facilities, and/or dispersion trenches, away from slope surfaces. These grades should be maintained for the life of the project. The collection facilities and/or dispersion trenches should be tightlined away from slopes that exceed 30 percent and disposed of where down slope properties, structures and slopes are not jeopardized.

Specific recommendations for and design of storm water disposal systems or septic disposal systems are beyond the scope of our services and should be prepared by other consultants that are familiar with design and discharge requirements. Infiltration systems should not be located on slopes that exceed 30 percent nor should systems be "stacked" or lined up with one another down the slope. Infiltration systems should not be located up slope of residences or retaining structures.

Utility Trench Backfill

Utility trenches should be excavated in accordance with Occupational Safety and Health Administration (OSHA) standards, by a contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Relatively silty soil conditions were encountered at shallow depths at this site. While these soils have some cohesion, they can cave in trench wall excavations along joint fractures. Shoring or sloping back trench sidewalls may be required within these soils.

All utility trench backfill should consist of imported structural fill or suitable on-site material. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Floor Slabs and Exterior Flatwork

If slab on grade structures are proposed and reducing floor dampness is desired, such as in areas covered with moisture sensitive floor coverings, we recommend that concrete slab-on-grade floors be underlain by a water vapor retarder system. The water vapor retarder system should be installed in accordance with ASTM Specification E164-94 and Standard Specifications E1745-97. According to ASTM Guidelines, the water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 4-inches of compacted clean (less

than 5 percent passing the U.S. Standard No. 200 Sieve), open-graded coarse rock of ¾-inch maximum size. The vapor retarder sheeting should be protected from puncture damage.

The exterior floors should be placed separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be structural fill.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with ASTM guidelines. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Foundations

The proposed structure may be supported on a shallow foundation system (continuous or column) bearing on the stiff native soils or on properly compacted structural fill placed on the stiff native soils. Continuous wall or column footings may be designed for a net allowable bearing pressure of 1,500 pounds per square foot (psf) dead plus live load, if the footings bear directly on stiff native soils or on structural fill placed on the stiff native soils. Note that overexcavation of loose/soft soils may be necessary to completely penetrate any localized loose soils or undocumented fill.

A 1/3 increase in the above value may be used for short duration, wind and seismic loads. Structural fill placed on bearing, native subgrade should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Footing excavations should be inspected to verify that the foundations will bear on suitable material.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches regardless of load.

If constructed as recommended, the total settlement is not expected to exceed 1 inch. Differential settlement, along a 20-foot exterior wall footing, or between adjoining column footings, should be less than ½ inch, producing an angular distortion of 0.002. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated or if a strong seismic event results in liquefaction of the underlying soils. It should be noted that the risk of liquefaction is considered low, given the composition and density of the native, on site soils.

Seasonal rainfall, water run-off, and the normal practice of watering trees and landscaping areas around the proposed structure, should not be permitted to flood and/or saturate footings. To prevent the buildup of water within the footing areas, continuous footing drains (with cleanouts) should be provided at the bases of the footings. The footing drains should consist of a minimum 4-inch diameter perforated pipe, sloped to drain, with perforations placed down and enveloped by 1-inch sized washed rock in all directions and filter fabric to prevent the migration of fines.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.30 acting between the bases of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 225 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces. The allowable friction factor and allowable equivalent fluid passive pressure values include a factor of safety of 1.5. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A 1/3 increase in the above values may be used for short duration, wind and seismic loads.

Infiltration Analyses

We performed a sieve-hydrometer test on a sample collected from Exploratory Hand Auger Boring HA-1 at 3 feet below the existing site grade.

The soil infiltration rate based on the textural analysis is presented in the following table.

INFILTRATION RATE BASED ON TEXTURAL ANALYSIS			
Hand Auger Boring	**Sample Depth (feet)**	**Infiltration Rate (min./in.) No Factor of Safety**	**USDA Soil Classification Based on Sieve/Hydrometer Test**
HA-1	-3	N/A	Silt*

*USDA Soil Classification does not take into account particle sizes greater than the No. 10 sieve (>2mm in diameter).

The native alluvial soils are comprised primarily of silt with minor clay and sand. These materials are considered impermeable and infiltration is not feasible. We recommend using drywells or other dispersion methods for stormwater management at this site.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our services as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Geotechnical engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences improves. Although your site was analyzed using the most appropriate current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to improvements in the field of geotechnical engineering, physical changes in the site either due to excavation or fill placement, new agency regulations or possible changes in the proposed structure after the time of completion of the soils report may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that two years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the geotechnical engineer should be notified so that supplemental recommendations can be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The geotechnical engineer should be notified of any changes so that the recommendations can be reviewed and reevaluated.

This report is a limited geotechnical engineering investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any environmental site assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater or atmosphere, or the presence of wetlands. Any statements, or absence of statements, in this report or on any hand auger boring log, regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessments.

The geotechnical information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical developments. We emphasize that this report is valid for this project as outlined above, and should not be used for any other site.

We hope that this report provides the information required at this time. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (425) 485-5519.

Respectfully submitted,

KRAZAN & ASSOCIATES, INC.

State of Washington
Engineering Geologist
2513
Licensed Geologist
1/13/09
PHILLIP HABERMAN

A. GOPALASINGAM
STATE OF WASHINGTON
32985
REGISTERED
PROFESSIONAL ENGINEER
1/13/09

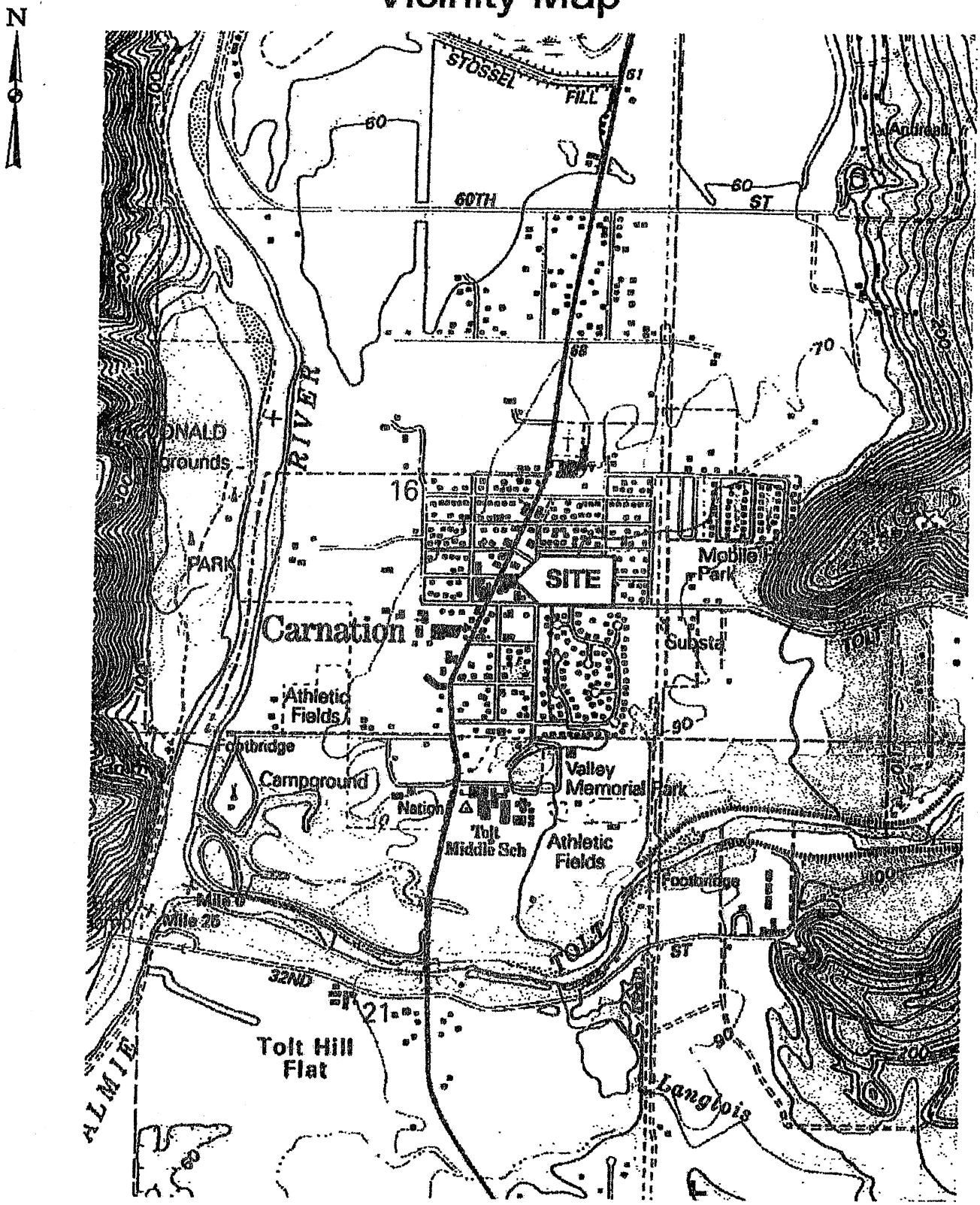
Phil Haberman, P.G., P.E.G.
Senior Engineering Geologist

Gopal A. Singam, P.E.
Geotechnical Division Manager

PH/gs

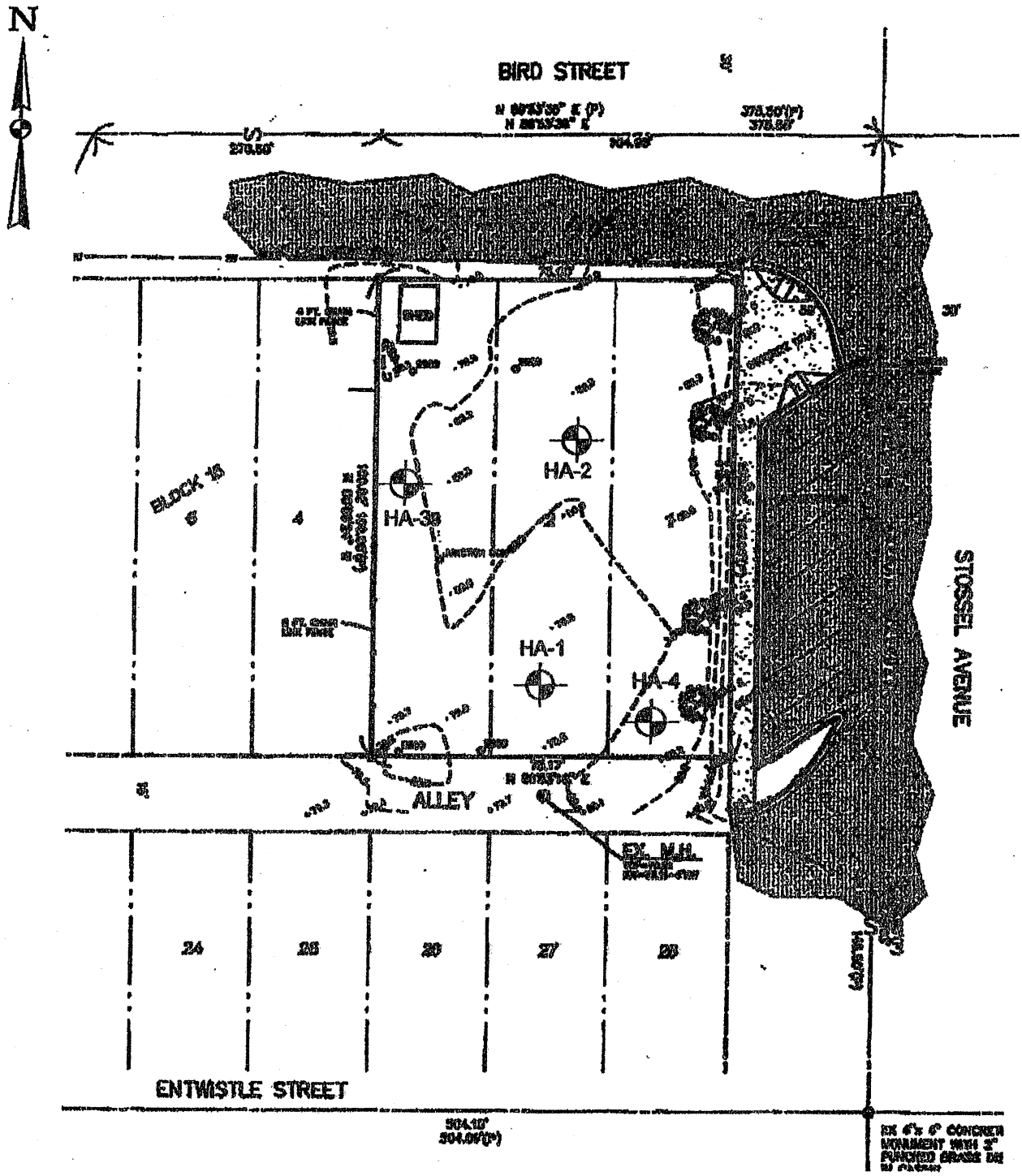
Attachments: Figures (6)

Vicinity Map



Krazan & ASSOCIATES, INC.		
Proposed Farmers Market		
Date: January 13, 2009	Reference: Maptech, 1999	
Drawn By: PAH	Figure 1	Project Number: 092-08116

Site Plan



Note: Site Plan Based On Plan Provided By Client

LEGEND

HA-1

Hand Auger Boring Location

Krazan & ASSOCIATES, INC.		
Proposed Farmers Market		
Date: January 13, 2009	Project Number: 092-08116	
Drawn By: PAH	Figure 2	Not To Scale

KRAZAN AND ASSOCIATES
11715 North Creek Parkway South
Suite C-106
Bothell, Washington 98011

LOG OF EXPLORATORY HAND AUGER BORING HA-1

PROJECT: Carnation Farmers Market
PROJECT NO.: 09208116

DATE: 01/05/09
PAGE: 1 of 1

SURFACE ELEVATION:
SAMPLE METHOD: Grab

LOCATION:

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	EQUIVALENT N-VALUE (DCP)	SAMPLES	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 20, 40, 60, 80)
			GRASS AND TOPSOIL		G	
			SILT WITH TRACE SAND (ML) Stiff, very fine to fine grained sand, brown, moist.			
1						
2						
			SILT (ML) Stiff, very fine to fine grained sand, yellowish brown, moist to wet.		G	
3						
4						
5						
6						
7			End of Exploratory Hand Auger Boring			
8						
9						
10						

Water Level Initial: ⊻ Final: ⊻

Water Observations:

Notes:

KRAZAN AND ASSOCIATES
11715 North Creek Parkway South
Suite C-106
Bothell, Washington 98011

LOG OF EXPLORATORY HAND AUGER BORING HA-2

PROJECT: Carnation Farmers Market
PROJECT NO.: 09208116
DATE: 01/05/09
PAGE: 1 of 1

SURFACE ELEVATION:
SAMPLE METHOD: Grab
LOCATION:

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	EQUIVALENT N-VALUE (DCP)	SAMPLES	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 20, 40, 60, 80)
			GRASS AND TOPSOIL		G	
1			**SILT WITH TRACE SAND (ML)** Stiff, very fine to fine grained sand, brown, moist.			
2			**SILT (ML)** Stiff, very fine to fine grained sand, yellowish brown, moist to wet.		G	
3			End of Exploratory Hand Auger Boring			
4						
5						
6						
7						
8						
9						
10						

Water Level Initial: ▽ Final: ▽

Water Observations:

Notes:

KRAZAN AND ASSOCIATES
11715 North Creek Parkway South
Suite C-106
Bothell, Washington 98011

LOG OF EXPLORATORY HAND AUGER BORING HA-3

PROJECT: Carnation Farmers Market
PROJECT NO.: 09208116

DATE: 01/05/09
PAGE: 1 of 1

SURFACE ELEVATION:
SAMPLE METHOD: Grab

LOCATION:

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	EQUIVALENT N-VALUE (DCP)	SAMPLES	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 20, 40, 60, 80)
			GRASS AND TOPSOIL			
1			**SILT WITH TRACE SAND (ML)** Stiff, very fine to fine grained sand, brown, moist.			
2			**SILT (ML)** Stiff, very fine to fine grained sand, yellowish brown, moist to wet.			
3						
4			End of Exploratory Hand Auger Boring			
5						
6						
7						
8						
9						
10						

Water Level Initial: ⊻ Final: ⊻

Water Observations:

Notes:

KRAZAN AND ASSOCIATES
11715 North Creek Parkway South
Suite C-106
Bothell, Washington 98011

LOG OF EXPLORATORY HAND AUGER BORING HA-4

PROJECT: Carnation Farmers Market
PROJECT NO.: 09208116

DATE: 01/05/09
PAGE: 1 of 1

SURFACE ELEVATION:
SAMPLE METHOD: Grab

LOCATION:

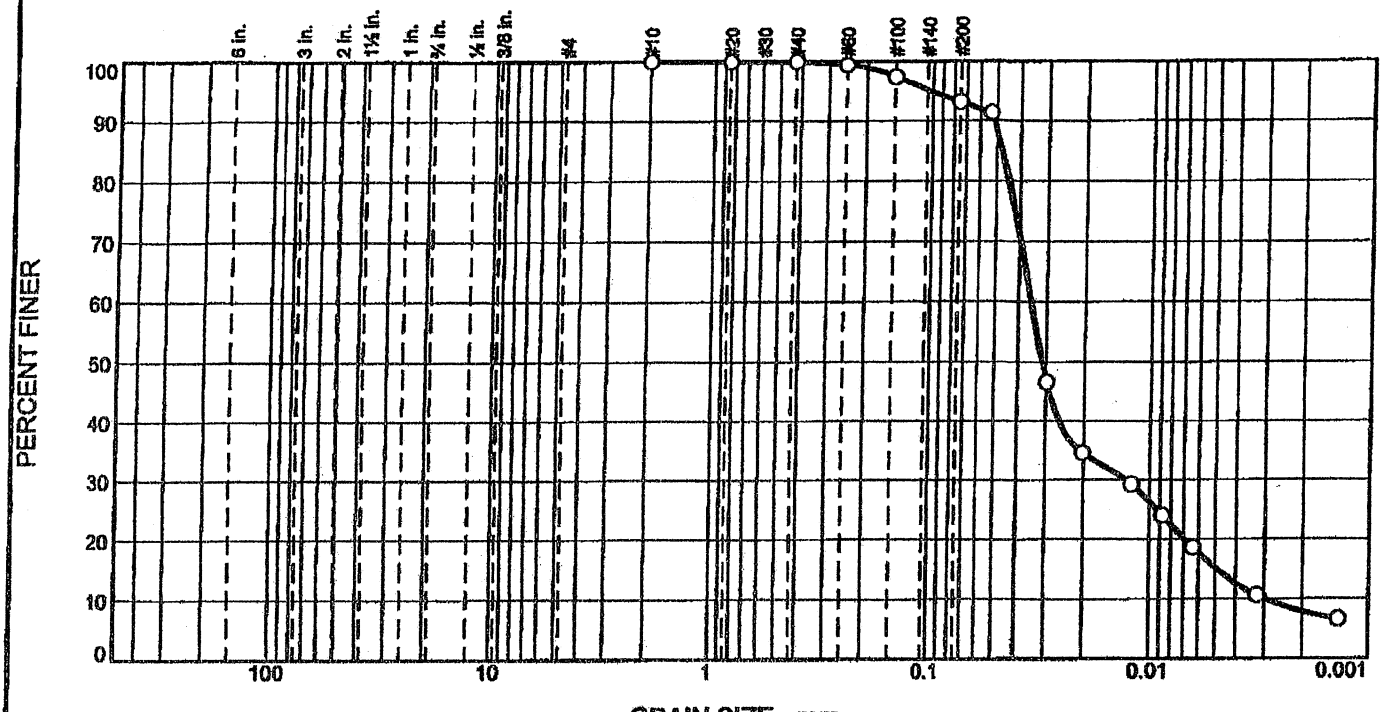
DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	EQUIVALENT N-VALUE (DCP)	SAMPLES	Natural Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 20, 40, 60, 80)
			GRASS AND TOPSOIL			
1			**SILT WITH TRACE SAND (ML)** Stiff, very fine to fine grained sand, brown, moist.			
2						
3			**SILT (ML)** Stiff, very fine to fine grained sand, yellowish brown, moist to wet.			
4						
5			End of Exploratory Hand Auger Boring			
6						
7						
8						
9						
10						

Water Level Initial: ⊻ Final: ⊻

Water Observations:

Notes:

Krazan & Assoc. Sieve/Hydrometer Analysis



% Stones	% +3"	% Gravel			% Sand					% Silt		% Clay
		Coarse	Medium	Fine	V. Crs.	Crs.	Med.	Fine	V. Fine	Crs.	Fine	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	4.6	3.5	56.9	26.5	7.9

Test Results (ASTM D 422 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	100.0		
#60	99.4		
#100	97.3		
#200	93.1		
#270	91.3		
0.0299 mm.	46.6		
0.0203 mm.	34.6		
0.0121 mm.	29.3		
0.0088 mm.	23.9		
0.0064 mm.	18.6		
0.0032 mm.	10.6		
0.0014 mm.	6.6		

* (no specification provided)

Material Description

Yellowish-brown SILT.

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= ML AASHTO (M 145)= A-4(0)

Coefficients

D_{90}= 0.0514 D_{85}= 0.0473 D_{60}= 0.0354
D_{50}= 0.0314 D_{30}= 0.0128 D_{15}= 0.0049
D_{10}= 0.0030 C_u= 11.87 C_c= 1.54

Remarks

Sample ID: 33472.
HA-1/S-2

Date Received: 1/6/09 **Date Tested:** 1/12/09
Tested By: Chris McMillen
Checked By: Corbett Mercer
Title: Lab Manager

Location: Hand Auger 1, Sample No. 2 **Date Sampled:** 1/5/09
Sample Number: 33472

Krazan

Client: Barker Landscape Architects, P.S.
Project: Carnation Farmers Market
Project No: 09208116

SECTION VII: OTHER PERMITS

The following additional permits may be required for the proposal:

1. Water service connection from the City of Carnation
2. Sanitary Sewer connection from the City of Carnation
3. ROW use permit from the City of Carnation for any proposed frontage improvements or cuts into the existing ROW for utility connections.
4. King County Health Department approval of the proposed Commercial Kitchen.

Due to the size of the site, an NPDES permit is not required.

CARNATION FARMER'S MARKET

SECTION VIII: TESCP/SWPPP ANALYSIS AND DESIGN

The site is approximately 7,500sf. The engineering plan set contains the basic elements to satisfy the requirements of this section. The basic elements to be implemented are as follows:

1. Establish clearing limits
2. Provide stabilized construction entrance
3. Provide Tree Protection fencing during construction
4. Provide on-site BMP's during construction

The detail of the proposed elements is proportional to the size of the project and the potential impact of sediment laden stormwater leaving the site during the construction phase of the proposed structure and covered areas.

CARNATION FARMER'S MARKET

SECTION IX: BOND QUANTITIES, FACILITY SUMMARIES AND DECLARATION OF COVENANT

Prior to plan approval, the Bond Quantities, Facility Summaries and Declaration of Covenant information that is relevant to the design of the site will be included in this section.

SECTION X: OPERATIONS AND MAINTENANCE MANUAL

Prior to plan approval, the Operations and Maintenance information that is relevant to the design of the site will be included in this section.