April 16, 2003 SEISMIC SAMPLE

Client Name
Client Business
Client Address

Subject: **SEISMIC/PROBABLE LOSS REPORT**
The Provident Building
568 First Avenue South
Seattle, Washington 98104

Gentlemen:

In accordance with the terms of our proposal dated March 19, 2003, we are pleased to submit this "Seismic/Probable Loss Report," for the above referenced subject property, in Seattle, Washington. This report, prepared in a manner consistent with the intent and methodologies of ASTM-E-2026-99 "Standard Guide for the Estimation of Building Damageability In Earthquakes," summarizes our approach to the project along with results and conclusions.

The purpose of this study is to provide you with adequate information to evaluate seismic conditions as they may relate to the existing structures and to assess the Probable Loss (PL) based on the recorded maximum seismic occurrence. A visual review of the site was conducted on April 8, 2003.

The independent conclusions offered in this report represent Environmental Associates, Inc.'s (EAI) best professional judgment based on information and data available to us during the course of this assignment. Our evaluations, analysis and opinions are not representations regarding design integrity, structural soundness or actual value of the property. The conclusions presented are based on the data provided along with observations and conditions that existed on the date of the assessment.

We appreciate this opportunity to have been of service to you on this project and trust that the information provided here will be of value in your planning and management activities. Should you have any questions regarding this report or need additional consultation, please feel free to call us.

Sincerely,

ENVIRONMENTAL ASSOCIATES, INC.

Don W. Spencer, M.Sc., P.G., R.E.A.
Principal

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SECTION I- IDENTIFICATION

CLIENT:	Client name
PROJECT NAME:	Seismic/Probable Loss Report
PROJECT LOCATION:	568 First Avenue South Seattle, Washington 98104
OBSERVED BY:	Don Spencer, Chris Cass, Bruce MacVeigh
OBSERVATION DATE:	April 8, 2003

SECTION II - OBJECTIVE

The purpose of our review is to evaluate the structural and seismic condition of the property and to assess the Seismic/Probable Loss (PL) for the property based on the past seismic occurrence.

SECTION III - PROCEDURES AND LIMITATIONS

This report is not intended to serve as a guarantee of how the property will perform in a seismic occurrence. Rather, it is a review based upon statistical and historical data which is intended to suggest how a particular construction class of building may be affected by the anticipated ground motion during a large probable seismic event.

In the preparation of this report, Environmental Associates, Inc. (EAI) has provided a professional opinion regarding the damage to be expected as a result of projected earthquake ground motion based solely on the observed building type, condition, geologic setting, soil/rock types, and site location. The opinion expressed in the PL is an estimate based on probability of seismic activity and an estimation of the resistance of this type facility to damage from the seismic activity. The actual loss value would be known only after an actual earthquake.

The processes involved in developing the PL are not exact and are subject to a number of estimations and projections that typically include:

(1) The underlying soil response;

(2) The possible magnitude and duration of the earthquake;

(3) The effects of the distance to the epicenter;

(4) The type of structure, and;

(5) The quality of the structure's design and construction

At present, there is no single universally accepted methodology for estimating the seismic risk of structures. Methods that are currently used depend to a large degree on the subjective interpretations of the engineer or geologist and on consensus opinion surveys of the assessor. Our analysis of this particular site employed the damage prediction method developed by Charles C. Thiel, Jr., M.EERI and Theodore C. Zsutty, M.EERI (see "Earthquake Spectra" Vol. 3, No. 4: Nov. 1987, titled Earthquake Characteristics and Damage Statistics hereafter referred to as Ref. 1). Technical judgement is a necessary component of this review since analytical methods do not exist that will encompass all parameters necessary to determine a precise estimate of the cost of any damage caused by a probable maximum earthquake.

Any documents and data provided by the Client, designated representatives of the Client or other interested parties, and consulted in the preparation of this report, are reviewed when made available to us, and may be referenced herein with the understanding that Environmental Associates, Inc. assumes no responsibility or liability for their accuracy. This method estimates probable earthquake damage based on historical observations and expert opinions.

In order to implement the method cited above, the following factors were evaluated and quantified.

(1) The construction type and quality of the subject building including building geometry, structural systems to resist both vertical and lateral loads, and previous structural upgrades.

(2) The characteristics of the site, the projected intensity of ground motions, and the nature of the foundation soil, based on area-wide seismic and geological data.

(3) Appropriateness of the original design and details to resist seismic forces.

SECTION IV - PROPERTY DESCRIPTION

GENERAL

The subject property includes a single regular-shaped parcel (tax parcel number 766620-6871) covering approximately 10,748 square feet (0.25 acres) of land. Improvements to the property include a six (6)-story building of reinforced concrete construction enclosing approximately 10,625 square feet of space which was reportedly constructed in 1909 and extensively renovated with seismic "retrofit" in 1999-2000. Currently the subject building is occupied by several offices with vacant retail space on the ground-level floor. The building is located within the downtown "core" of Seattle, Washington.

BUILDINGS AND SITE CHARACTERISTICS

Structures can be grouped into various building classes. Different buildings within the same class can be expected to perform similarly during earthquake shaking. To account for the differences between buildings with the same class, additional information is utilized. For example, the year built provides an insight into the level of design code used. Generally speaking, the more information that is made available about a particular building, the more reliably potential damage can be estimated. Architectural design plans were provided to us and reviewed. Geotechnical reports, if any exist, were not provided to EAI by the client. Therefore, references to soil in this report are based primarily upon visual observations during the site inspection and upon published geologic reports for the area in which the subject property resides. It appears that for this seismic area, the basic elements of a lateral force resisting system have been provided in accordance with the building code in effect at the time of the seismic retrofit.

The subject building is essentially rectangular in shape. The building foundation support is provided by timber piles. The footings may bear on compacted engineered fill.

The structural aspect of the building consists of a perimeter reinforced concrete shear wall and a reinforced concrete wall which is oriented in an east-to-west direction through the center of the structure. The roof consists of a built-up flat membrane system supported by wooden beams along with interior wooden columns. Site observations suggest that the wooden beam support system is tied into the concrete reinforced shear wall.

Lateral loads are resisted by the reinforced concrete central and perimeter walls and integrated roof/floor system, providing a “ridged box” geometry.

A copy of a memorandum dated November 22, 1999, regarding seismic evaluation of the subject building by Mr. Andy Quinn and Mr. Todd Perbix of Perbix-Bykonen (structural engineers) was provided to us by Mr. Mark Astor of Martin Smith, Inc on April 9, 2003. This memorandum advises that proposed retrofit activities included (but not limited to): "Infill openings in the existing concrete walls, to increase the length of continuous shear wall, and add structural steel boundary elements as required", "provide plywood sheathing in selected areas over the existing decking to increase the diaphragm strength", "provide tension ties connecting the concrete walls to the diaphragms...", and "provide metal straps, connectors, and tension ties between the individual wood members to insure positive connection between elements of the gravity load bearing system". Mr. Todd Perbix advised us through a telephone interview on April 14, 2003 that all of the seismic retrofit activities for the building proposed in the November 22, 1999-dated memorandum were completed in 2000, prior to the Nisqually Earthquake of 2001.

BUILDING CHARACTERISTICS

Construction Class:	Reinforced concrete and interior wood-framing.
Number of Stories:	Six (6)-story, plus basement-level parking garage.

Year Constructed:	1909
Occupancy type:	Retail/Office

Secondary Structural Characteristics:

Shape Configuration:	Essentially rectangular-shaped.
Setback/Overhangs:	Minimal
Redundancy:	Yes
Torsion:	Low
Cladding:	None
Building Exterior:	Concrete
Ornamentation:	Brick veneer on exterior west wall of the building.
Purlin ties:	Yes
Structural Upgrade:	Reported renovation with seismic "retrofit" in 1999-2000
Engineered Foundation:	Timber pile supports.
Construction Quality:	Moderate.
Hazardous Exposure:	None reported or observed.

SITE CHARACTERISTICS

The soil conditions at a site can influence the damage ability of a structure in two general ways:

(1) Soft soils tend to amplify ground motion;

(2) Collateral hazards such as soil liquefaction, sliding or rupturing can potentially result in considerable damage to a structure.

Physiographically, the site is situated on an artificially-filled tidal flat area of Elliott Bay which was filled in approximately 1905.

Published geologic maps for the site vicinity (Liesch, Price, & Walters, 1963) suggest that much of the material underlying the subject site has been modified extensively by excavation, filling, and/or construction. These man-made processes have greatly modified or obscured the original geology

of the area. Materials that may underlie the site at some depth include imported fill, tidal deposits such as silt, sand, and gravel, or glacial-derived materials such as till, a dense heterogenous mixture of silt, sand, and gravel.

Although no site specific information has been developed by our firm with respect to depth to groundwater at this site, our experience in the area suggests that groundwater beneath the site may lie at a depth less than 15 feet beneath the ground surface.

The damage prediction method developed by Thiel, and Zsutty as employed here, assumes that "ground failure" such as landslide, liquefaction, and/or differential settlement is not the cause of damage to the structure.

A site-specific geotechnical investigation could be conducted if a more accurate assessment of ground failure potential is desired. For the purpose of this report in the context being used and the type of property involved, additional costs may vastly exceed the perceived benefits as it would not likely result in significant changes to the results of the Thiel and Zsutty method provided here. For that reason, no additional site-specific work is recommended.

COLLATERAL HAZARDS

Liquefaction Potential:	Moderate-to-high.
Landslide Potential:	Low.
Fault Rupture Potential:	None to date.

SECTION V - SEISMIC REVIEW

REGIONAL SEISMICITY

The subject site is located within the south-central portion of the Puget Sound region. The Puget Sound area has experienced a number of small to large earthquakes and occasionally strong shocks during the brief 155-year historical record in the Pacific Northwest. The major (large magnitude) earthquakes in the region are believed to be associated with deep-seated plate tectonic activity. Plate 2, Major Fault Zone Map, depicts the locations and suspected locations of the major faults within the Puget Sound region. The United States Geological Survey (USGS) has stated that there is evidence of recent movement on some of these faults. A major earthquake along the Seattle Fault is thought to have raised Restoration Point about 21 feet and Alki Point (West Seattle) at least 12 feet, in 900 AD. More recently, a Richter Magnitude 5.0 earthquake between Seattle and Tacoma on January 29, 1995 may have occurred along the Seattle Fault. According to the USGS, "large earthquakes" could occur on any of the faults depicted on Plate 2, however, the average time

between such "large earthquakes" may be hundreds or even thousands of years. The USGS acknowledges that many of the epicenters of the recorded earthquakes in the Puget Sound Region do not appear to be associated with the major known faults as depicted on Plate 2, but may be associated with as of yet unmapped "active faults." In recent years the USGS has stepped up its efforts to identify faults within the Puget Sound region.

Historical Earthquakes

Historical records for the region indicate that the Olympia earthquake of April 13, 1949, with a Richter magnitude of 7.1, produced ground-shaking of intensity VIII near its epicenter; and the Seattle-Tacoma earthquake of April 29, 1965, with a Richter magnitude of 6.5, produced a ground-shaking of intensity IV to VIII on the Modified Mercalli Intensity Scale (MMI) near its epicenter. Most recently the Nisqually earthquake of February 28, 2001 produced a ground shaking of VII to VIII (MMI) near its epicenter. These historical levels of ground-shaking are estimated to be the maximums that have occurred in the region during the 155 years of historic record.

The following table lists three (3) representative earthquake events near the area of the subject site, along with the most recent Nisqually quake. This table shows the potential loss to the subject property in the event of an earthquake producing a similar MMI ground shaking at the subject site as was historically felt near the epicenter of these quakes.

Epicenter Location	Distance From Site (Miles)	Richter Magnitude	MMI at Epicenter	Probable Loss (PL)
Seattle/Tacoma (1939)	14	5.75	VII	~5.88 %
Tacoma/Seattle (1965)	16	6.5	VIII	~10.04 %
Olympia (1949)	40	7.1	VIII	~10.04 %
Nisqually (2001)	35	6.8	VIII *	~10.04 %

* According to information available from the University of Washington Geophysics Department (Plate 3) ground shaking intensity at the subject property from the Nisqually quake likely corresponded to a VIII on the MMI scale.

DAMAGE FROM RECENT SEISMIC EVENTS

Numerous cracks were noted on the interior of the reinforced concrete perimeter wall and on the central concrete wall. Many of the cracks, particularly near windows and doorways, have apparently been injection grouted. Mr. Todd Perbix of Perbix-Bykonen (206-264-7784), structural engineer for the building renovation/seismic retrofit in 1999-2000, advised us through a telephone interview on April 14, 2003 that this injection grouting was completed during the seismic retrofit, and that the only noted damage to the structure during the Nisqually 2001 quake (shortly after the retrofit was completed) was minor shear cracks on the east- and west-facing perimeter walls. We were further advised that crack repairs on the perimeter walls were completed shortly after the Nisqually 2001 quake by injection grouting. Mr. Mark Astor of Martin Smith, Inc. advised us through a telephone interview on April 15, 2003 that the total amount spent on earthquake repairs and debris cleanup following the Nisqually 2001 quake was approximately $121,240. Mr. Perbix further informed us that the interior cracks which were not injection grouted during the recent seismic retrofit were interpreted to represent "shrinkage cracks", not related to earthquake damage.

SITE SEISMICITY

The Richter Magnitude Scale gives an implication of the absolute energy released in an earthquake. However, generally speaking, the farther a building is from the epicenter, the less shaking it will experience. As such, just considering the magnitude of an earthquake does not give an adequate picture of the building's risk, since the distances from potential earthquake sources to the subject site must also be considered.

The Modified Mercalli Intensity Scale considers the reduction, or attenuation, of ground motion as the distance between source and site increases; the scale is calibrated I to XII. For example, in a large earthquake, a site next to the fault may experience intensity IX shaking, while a site many miles away may experience only intensity VI shaking.

A brief description of the effect of these intensity levels are as follows:

I - Not felt except by a very few under especially favorable circumstances.

II - Felt by only a few persons at rest, especially on upper floors of buildings; delicately suspended objects may swing.

III - Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake; standing motor cars may rock slightly; vibration like passing of truck.

IV - During the day felt indoors by many, outdoors by few; at night some awakened; dishes, windows, doors disturbed; walls make cracking sound; sensation like heavy truck striking building; standing motor cars rocked noticeably.

V - Felt by nearly everyone, many awakened; some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned; disturbances of trees, piles, and other tall objects sometimes noticed; pendulum clocks may stop.

VI - Felt by all, many frightened and run outdoors; some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.

VII - Everybody runs outdoors; damage negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, considerable in poorly build or badly designed structures; some chimneys broken; noticed by persons driving motor cars.

VIII - Damage slight in specially designed structures, considerable in ordinary substantial buildings, with partial collapse, great in poorly built structures; panel walls thrown out of frame structures; fall of chimneys, factory stacks, columns, monuments, walls; heavy furniture over-turned; sand and mud ejected in small amounts; changes in well water; persons driving motor cars disturbed.

IX - Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse; buildings shifted off foundations; ground cracked conspicuously; underground pipes broken.

X - Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked; rails bent; landslides considerable from river banks and steep slopes; shifted sand and mud; water splashed over banks.

XI - Few, if any (masonry) structures remain standing; bridges destroyed; broad fissures in ground; underground pipelines completely out of service; earth slumps and land slips in soft ground; rails bent greatly.

XII - Damage total; practically all works of construction are damaged greatly or destroyed; waves seen on ground surface; lines of slight and level are distorted; objects thrown into the air.

Several earthquakes of moderate-to-large magnitude have occurred in Puget Sound in recent history. The following table lists historical earthquakes with magnitude greater than 5.0 (Richter) and their corresponding effect (MMI) at the epicenter; these earthquakes are within a 110-mile radius of the subject site as recorded since 1896 (Modified from "Washington State Earthquake Hazards" by Linga Lawrence Noson, Anthony Qamar, and Gerald W. Thorsen, 1988) and supplemented by data available from USGS. The epicenters of these quakes are depicted on Plate 1, Earthquakes Map.

Date	Lat./Long. (Degrees)	Distance (Miles)	Richter Magnitude	MMI Rate
Jan 3, 1896	48:30 122:48	63	5.7 (felt)	VII
Jan 11, 1909	48:42 122:48	78	6.0 (felt)	VII
Jan 23, 1920	48:36 123:00	75	5.5 (felt)	VII
Nov 12, 1939	47:24 122:36	14	5.75	VII
Feb 14, 1946	47:18 122:54	35	6.3	VII
April 13, 1949	47:06 122:42	40	7.1	VIII
April 29, 1965	47:24 122:24	16	6.5	VIII
Jan 29, 1995	47:22 122:21	20	5.0	V
May 3, 1996	47:45 121:52	25	5.4	V
Feb 28, 2001	47.15 N 122.72 W	35	6.8	VIII
June 10, 2001	47.17 N 123.50 W	63	5.0	VII

PROBABLE MAXIMUM GROUND ACCELERATION

According to National Seismic Hazard Maps published by the United Stated Geological Survey, the probable maximum ground acceleration, with a 50-year 10% chance of exceedance, for the subject property area zip code is 0.0.3377g .

Referencing Uniform Building Code (UBC) Seismic Zone Maps, the subject property area lies within Zone 3. The UBC reports 0.3g for an expected maximum ground acceleration in Zone 3 areas.

PROBABLE LOSS

The Probable Loss (PL) is the monetary loss of a structure on firm soil as a result of vibratory motion from the maximum probable earthquake. The PL can be modified to incorporate the effects of the site condition and the quality of building construction. Historically, probable loss has been applied to a group or class of structures and is meant to represent the probable monetary loss that will not be exceeded for 9 out of 10 structures of that class. The probable earthquake used to calculate this loss is defined as the event that has a 10 percent chance of exceedance in a 50-year exposure period, commonly referred to as the "475 year event." The PL is expressed as a damage ratio that equals the approximate repair cost divided by the replacement cost of the building. Replacement costs do not include the value of the land nor do they refer to the market value of the property.

Applying the methodology of Charles C. Thiel, Jr., M.EERI, and Theodore C. Zsutty, M.EERI, 1987, the following parameters, among others, were used to deduce a **14.49 %** probable loss damage ratio for the subject building.

Building Construction Class	Combination wood-frame / Reinforced concrete shear wall.
Local Geology	Artificial fill and tidal deposits, water table less than 30 feet.
Probable Maximum Ground Acceleration	0.3g

SECTION VI - CONCLUSIONS

Based on conditions observed during our field visit on April 8, 2003 and using the damage prediction method developed by Thiel and Zsutty, it is our professional judgement that the calculated 475-year Probable Loss (PL) for the subject building is **14.49** percent.

A review of the total costs to repair damages sustained from the 2001 Nisqually Earthquake (which followed the seismic upgrades discussed earlier in the report) reflects a total expenditure on the order of $121,240. The breakdown of these cost components is provided in the Appendix in the form provided to us. Taking this actual cost against the owner-reported current value of the building of $12 million dollars, the percentage actual "loss" reflected by the repairs needed is calculated as one (1) percent.

The difference between the actual cost percentage (1 percent) and the probable loss (PL) of 14.49 percent derived using the ASTM/Thiel-Zsutty method employed here simply lies in the fact that the probabilistic approach considers ordinary original construction, not specialized retrofitted structures and the fact that the subject building received a substantial seismic upgrade in the year prior to the last large destructive seismic event in this region, namely the Nisqually Earthquake. The fact that

the building performed substantially better than predicted is not taken as an indictment of the industry-adopted probabilistic approach, but rather is a likely testament to the success of the seismic retrofit improvements. Based upon the actual building system performance demonstrated during the 2001 Nisqually seismic event, we would anticipate similar costs to repair damages in future similar magnitude seismic events.

LIMITATIONS

This report has been prepared for specific application to this project in a manner consistent with that level of care and skill normally exercised by members of the geologic profession currently practicing under similar conditions in the area, and in accordance with the terms and conditions set forth in our proposal dated March 19, 2003. This report is for the exclusive use of the client along with their several representatives, as noted in the cover letter for the purposes stated therein. No other warranty, expressed or implied, is made.

If new information is developed in future site or local area work that may include excavations, borings, studies, etc., Environmental Associates, Inc., must be retained to reevaluate the conclusions of this report and to provide amendments as required.

Respectfully submitted,
ENVIRONMENTAL ASSOCIATES, INC.

Chris Cass
Environmental Geologist / Project Manager

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APPENDIX

Actual Repair Costs - 2001 Earthquake