Ninyo & Moore Transmittal

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To:	Eva Chu	**Date:**	May 2, 2000
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From:	Kris Larson	**Total Pages:**	7
Subject:	Botany Report	**Project No:**	

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Eva,

Attached is the botanist report for the plant sustainability regarding the Greenway Project. If you have any questions please call.

Thank you

Kris Larson
Senior Staff Environmental Geologist

- **Geotechnical Engineering**
- **Engineering Geology**
- **Materials Testing and Inspection**
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- Geophysical Studies
- Mineral Resource Evaluations
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- Forensic Studies
- Expert Witness Testimony

APPENDIX D

REPORT ON PLANT TOLERANCE FOR THE GREENWAY PROJECT

March 28, 2000

York Gorzolla
Ninyo & Moore
675 Hegenberger Road, Suite 220
Oakland, CA 94621-1919

Re: Plant Tolerance of Soil Metals and Potentially Saline Water at Alameda Greenway

Dear Mr. Gorzolla:

ENTRIX was contracted by Ninyo & Moore to review tolerance of plants planned for the Alameda Greenway project to chemicals detected in soil as well as potentially saline groundwater that may result from salt water intrusion at the site. To evaluate potential impacts to plants from chemicals in the soil, ENTRIX compared levels of contaminants to established soil screening benchmark values (Efroymson et al. 1997) for plants and regional background soil levels for metals (LBNL 1995). The effects of potential salt water intrusion at the site were evaluated by researching the salt tolerance of the species to be planted in the greenway. Results of our evaluation are discussed below.

Potential Impacts to Plants from Chemicals

ENTRIX reviewed data for metals and organic compounds in soil and groundwater at the Main Street Greenway Project provided by Ninyo & Moore. Data for samples collected outside the greenway area were not included in the evaluation. TPH and VOCs were not detected in any soil samples collected within the greenway area. With the exception of one well (WP-3), results for groundwater collected within the greenway area did not show the presence of total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs). Well WP-3 is in the northwest corner of the site, where additional soil remediation is planned. Due to the relatively low concentrations of organics seen in only one well at the edge of the site, potential exposure of plants to these chemicals at the greenway is considered low and was not evaluated further.

Data provided by Ninyo & Moore for metals in soil were evaluated for samples collected within the greenway. These data are summarized in Table 1. The reporting limits for these analyses, although not shown in Table 1, were also reviewed and found to be sufficiently low to compare to screening benchmark values (SBVs) and background levels. SBVs are typically used in ecological risk assessment as a conservative first screening step to determine if further assessment of risk is necessary at an impacted site. Although that is not the objective here, they can be used as an indication of levels of metals that may have an impact on plant viability. The SBVs used here are from a widely used Oak Ridge National Laboratory report (Efroymson et al. 1997). Comparison of the results to regional background levels is also helpful, as it puts site levels in context. The background data used for comparison here are drawn from a 1995 study at Lawrence Berkeley National Laboratory (LBNL 1995), which calculated background metals concentrations in five separate geologic units in the eastern San Francisco Bay Area.

Sample concentrations of metals shown in bold type in Table 1 exceed both the SBV and the upper end of the range of background concentrations for the particular metal. Only four measurements from a total of three samples fall into this category Cobalt and vanadium show

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exceedances in sample SP3-3, located in the northwest corner of the site, which will be subject to additional soil remediation prior to planting. Zinc slightly exceeds background in sample SB-3, and lead slightly exceeds the SBV in sample SB7-3. As shown in Table 1, regional background levels of vanadium and zinc (as well as other metals) greatly exceed their respective SBVs, indicating that these SBVs are highly conservative and too low to be a realistic indicator of plant viability in the Bay Area.

Results indicate that there is likely to be minimal impact to plant viability and growth from metals levels detected at the greenway area. Additional amendment of the soil with organic material and/or addition of clean topsoil may reduce the availability of metals present, or other management actions may be beneficial.

Salt Tolerance of Proposed Plants

Many plants do not tolerate exposure to salt, either air-borne or in the soil and groundwater. To evaluate the effects of potential salt-water intrusion at the Main Street Greenway site, the U.S. Salinity lab data posting, native plant selection guides, and garden manuals covering the Alameda area were reviewed for the species proposed (see reference list). Table 2 lists the proposed species and available data regarding salt tolerance for each. For most of the species, either no data were available or the species can be assumed to be non-tolerant of salt. Yarrow and Matilija poppy were the only species noted as salt-tolerant. Coast redwood and deer grass were listed as species that do well near the seacoast. However, plants that are tolerant of sea winds are not always tolerant of salt in the soil or groundwater.

In addition, it should be noted that dawn redwood is described as growing best in soil containing peat moss or leaf mold. Plants with this preference usually need acidic soil to do well and would be expected to grow poorly in alkaline soil.

ENTRIX appreciates this opportunity to be of service. Please do not hesitate to call with any questions or comments.

Sincerely,

ENTRIX, Inc.

Judy Nedoff
Environmental Scientist

jn/JN/GL

Attachments

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Literature Cited

SBVs and Background Concentrations

Efroymson, R.A., M.E. Will, G.W. Suter, and A.C. Wooten. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. ES/ER/TM-85/R3

LBNL. 1995. Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory (LBNL). August 1995.

Salt Tolerance

Coate, B. 1990 (2nd ed.). Water-conserving plants and landscapes for the Bay Area. East Bay Municipal Utilities District.

S&S Seeds. 1996. Seed selection guide. Carpinteria, CA: S&S Seeds.

Sunset. 1988. Sunset western garden book. Menlo Park, CA: Lane Publishing Co.

USSL. 1990. United States Salinity Laboratory at www.ussl.srs.usda.gov/test/ows/SALTT44 on 3/23/2000.

Table 1. Comparison of Soil Data to Screening Benchmark Values and Background Levels
City of Alameda Main Street Greenway Project

Boring	Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Molybdenum	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SP2-3[1]	02/25/00	ND	8.04	237	ND	ND	76.6	16.2	23.8	23.8	2.96	0.17	98.2	1.17	ND	2.82	38	51.2
SP3-3	02/25/00	ND	2.43	433	ND	3.14	56.1	37.9	13.7	13.7	5.71	0.13	46.5	ND	ND	5.26	184	50.2
SB-3[2]	02/25/00	ND	15.1	96.4	ND	ND	29.7	ND	40.1	40.1	ND	0.21	20.1	ND	ND	4.35	79.9	144
SB4-1	02/25/00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB5-3	02/25/00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SB6-3	02/25/00	ND	7.41	79.4	ND	0.352	38.1	10.5	35.5	35.5	2.67	0.13	39.6	ND	ND	4.75	45	90.9
SB7-3	02/25/00	ND	6.87	77.5	ND	ND	65.5	5.9	52.5	52.5	2.8	0.47	43.8	0.874	ND	3.02	44.8	49.2
SB9-2	02/25/00	ND	3.89	62.5	ND	ND	31.7	5.21	18.1	18.1	1.79	0.33	28.1	0.531	ND	1.59	26	102
SBV		*5*	*10*	***500***	***10***	*4*	***1***	***20***	***100***	***50***	***2***	***0.3***	***30***	***1***	***2***	***1***	***2***	***50***
Background		*5.2 - 7.1*	*9.3 - 31*	***154 - 411***	***0.8 - 1.0***	***1.5 - 3.3***	***59 - 142***	***21 - 25***	***41 - 100***	***8.9 - 21.5***	***3.2 - 11.4***	***0.3 - 0.6***	***70 - 144***	***4.7 - 7***	***1.5 - 2.2***	***8.7 - 42.5***	***36 - 90***	***85 - 136***

Notes
All units in milligrams per kilogram
Values in bold exceed screening benchmark values.
ND Not detected
[1]S = soil sample, P = Alameda Power & Telecom boring; 1 = boring location and -2 = depth of sample in feet
[2]S = soil sample, B = City of Alameda Public Works boring; 1 = boring location and -3.5 = depth of sample in feet
NA Not analyzed
SBV = Screening Benchmark Value

These are copper core. NOT lead core..!

Table 2. Salt Tolerance of Proposed Plant Species

Type	Common Name	Scientific Name	Salt Tolerance
Tree	white alder	Alnus rhombifolia	-
Tree	common manzanita	Arctostaphylos manzanita	-
Tree	birch	Betula jacquemontii	-
Tree	western redbud	Cercis occidentalis	ng-1, nt-2
Tree	dawn redwood	Metasequoia glyptostroboides	3
Tree	coast redwood	Sequoia sempervirens	sc-2
Tree	swamp myrtle, water gum	Tristaniopsis laurina 'Elegant'	nt-2
Tree	bay laurel	Umbellularia californica	-
Shrub	bearberry	Arctostaphylos 'Emerald Carpet'	-
Shrub	spice bush	Calycanthus occidentalis	-
Shrub	wild lilac	Ceanothus gloriosus exaltatus 'Emily Brown'	ng-1
Shrub	wild lilac	Ceanothus griseus horizontalis 'Yankee Point'	ng-1
Shrub	flannel bush	Fremontodendron californicum	ng-1, nt-2
Shrub	island bush snapdragon	Galvezia speciosa	-
Shrub	Matilija poppy	Romneya coulteri	ng-1, a-2
Perennial	yarrow	Achillea millefolium	H-1, a-2
Perennial	Oregon-Pacific aster	Aster hybrid	-
Perennial	monkey flower (buff orange)	Mimulus aurantiacus	ng-1
Perennial	royal beard tongue	Penstemon spectabilis	ng-1
Perennial	sage	Salvia clevelandii	nt-2
Perennial	purple sage	Salvia leucophylla	ng-1
Annual	California low-growing wildflower mix		-
Grass/grass-like	soft rush	Juncus effusus	-
Grass/grass-like	California gray rush	Juncus patens	-
Grass/grass-like	deer grass	Muhlenbergia rigens	ng-1, sc-2
Grass/grass-like	purple needle grass	Stipa pulchra (Nasella)	ng-1, nt-2
Grass/grass-like	grass mix		-

1 = S&S Seeds: H=high, M=medium, ng = not given, although species is on list

2 = EBMUD: sc= tolerates seacoast conditions, a = tolerates alkaline soil, ng = not shown as tolerant

3 = Sunset: "grows best in soil containing peat moss or leaf mold". Probably not tolerant of alkaline soil.

*Ceanothus gloriosus in another form shown as nt-2