File No. EA2021-119

CITY OF RICHLAND
Determination of Non-Significance

Description of Proposal: Construction of five (5) rectangular buildings and 1 irregular shaped building totaling 53,305 s.f. total.

Proponent: Knutzen Construction on behalf of TTB Investments, LLC
Attn: Paul Knutzen
5401 Ridgeline Drive, Suite 160
Kennewick, WA 99338

Location of Proposal: The project site is located at 300 Wellhouse Loop, Richland, WA.

Lead Agency: City of Richland

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

( ) There is no comment for the DNS.

(**X**) This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for fourteen days from the date of issuance.

( ) This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

Responsible Official: Mike Stevens
Position/Title: Planning Manager
Address: 625 Swift Blvd., MS #35, Richland, WA 99352
Date: April 30, 2021

Signature _____

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization, or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [HELP]

1. Name of proposed project, if applicable:

   MEGA Garage Suites Storage Facility

2. Name of applicant:

   Paul Knutzen – Knutzen Engineering

3. Address and phone number of applicant and contact person:

5401 Ridgeline Drive Suite #160, Kennewick, WA 99338
(509) 222-0959

4. Date checklist prepared:

3/18/2021

5. Agency requesting checklist:

City of Richland

6. Proposed timing or schedule (including phasing, if applicable):

Construction to begin in the summer of 2021 and expected to take about 4 months.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No plans for future expansions at this time.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

A Geotech report will be done, along with a stormwater report & critical area report (aquifer recharge)

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None have been prepared for at this time.

10. List any government approvals or permits that will be needed for your proposal, if known.

A Building Permit, Critical Areas Compliance, Erosivity Waiver (Ecology), Right of Way permit, and a soil destabilization notice with BCAA will be required.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

This project will be turning this land into a condominium RV storage facility. Proposed is 5 rectangular buildings, 1@(224' x 60'), 2@(48'x196), 1@(42' x 196'), and 1 irregular shaped building (232' x 62') totaling 53,305 sf total. The lot is 2.27 acres in size.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

300 Wellhouse Loop. Located on the northeast corner of Wellhouse Loop and Wyman Street. Parcel #115981013205001

B. Environmental Elements [HELP]

1. *Earth* [help]

a. General description of the site:

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other. _____

b. What is the steepest slope on the site (approximate percent slope)?

The steepest slope on site is approximately one (1%) percent.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Soil types on site are silt loam and fine sandy loam.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

There are no indications of unstable soils in immediate vicinity of the site.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

The site will be graded for drainage and desired building elevations. Approximately 500 cy will be moved and will balance on-site.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Erosion could occur on this site but will be minimized through implementation of BMP's during construction, including silt fencing, construction entrance, ground cover, waddles, site watering for dust control, catch basin inserts and protection. All stormwater runoffs will be contained and managed on site.

g.About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 75-80% will be impervious surfaces.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Standard erosion control methods will be used such as catch basin protection (Witch Hats), Silt fencing, and stabilized construction entrances. Dust during construction will be controlled by the use of a water truck, as necessary.

2. *Air* [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

During construction, minor amounts of dust and exhaust from equipment activity may occur. The completed project will have minor exhaust from vehicles on site.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Dust control measures will be implemented in accordance with recommendations by the Department of Ecology. Measures include, but are not limited to, watering, lowering speed, limit of construction vehicles, and reducing the number of dust-generating activities on windy days.

3. *Water* [help]

a. Surface Water: [help]

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The Yakima river is approximately 0.5 miles south west of the site and the Columbia river is approximately 1 mile northeast of the site.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

There will be no work near any of the listed bodies of water.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No fill or drudge material will be placed nor removed from surface water or wetlands.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground Water: [help]

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

No, City water will be provided at this site for typical domestic uses.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . .; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

None.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

The new impervious area on-site will generate stormwater run-off. The stormwater system will consist of sub-surface infiltration and will be managed on-site.

2) Could waste materials enter ground or surface waters? If so, generally describe.

No activities generate discharge like this on this site

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

No, all runoff will be retained on-site.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

All runoff will be retained on-site and stormwater facilities and designed in compliance with the Eastern Washington Storm Water Manual

4. *Plants* [help]

a. Check the types of vegetation found on the site:

X deciduous tree: alder, maple, aspen, other
____evergreen tree: fir, cedar, pine, other
____shrubs
X grass
____pasture
____crop or grain
____Orchards, vineyards, or other permanent crops.
____wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
____other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Dry Grass and Russian Thistles will be removed from site.

c. List threatened and endangered species known to be on or near the site.

None according to the Washington State Department of Fish and Wildlife Services.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

The frontage will be landscaped to add curb appeal to the project.

e. List all noxious weeds and invasive species known to be on or near the site.

None observed

5. *Animals* [help]

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

None according to the Washington State Department of Fish and Wildlife Services.

Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other _____

b. List any threatened and endangered species known to be on or near the site.

None according to the Washington State Department of Fish and Wildlife Services.

c. Is the site part of a migration route? If so, explain.

Yes, the Columbia Basin is part of a migration route for a number of fowl. Specifically the Pacific Flyway.

d. Proposed measures to preserve or enhance wildlife, if any:

None currently.

e. List any invasive animal species known to be on or near the site.

None known.

6. *Energy and Natural Resources* [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Electric will be used predominantly for condo owner uses including heating & lights, gas will be explored but is unlikely to be used.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

The proposed structures will meet current building codes and energy efficient standards. Project will comply with Washington State Commercial Energy Code.

7. *Environmental Health* [help]

a. Are there any environmental health hazards, including exposure to toxic chemicals? risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

None known.

1) Describe any known or possible contamination at the site from present or past uses.

None known.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

None known.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Diesel fuel maybe stored on-site during construction. No hazardous chemicals will be stored on the completed project.

4) Describe special emergency services that might be required.

The site will use typical emergency services provided through the City of Richland.

5) Proposed measures to reduce or control environmental health hazards, if any:

None currently.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Normal traffic noise from Wyman Street and Wellhouse Loop. This will not impact the project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Short term: Construction noises
Long term: Traffic noises from patrons associated with the site.

3) Proposed measures to reduce or control noise impacts, if any:

None.

8. *Land and Shoreline Use* [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The site currently is vacant and currently zoned as C-3 (General Business). Properties to the north east and the south are zoned similarly. Parks and recreational site are located to the west. The proposal is not expected to affected the land use of adjacent properties.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

No.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

No.

c. Describe any structures on the site.

None.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

C-3 (General Business)

f. What is the current comprehensive plan designation of the site?

Commercial is the current Comprehensive Plan Designation for the site.

g. If applicable, what is the current shoreline master program designation of the site?

N/A.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

The site is currently designated in an Aquifer Recharge Area.

i. Approximately how many people would reside or work in the completed project?

It is not expected that any people will work or reside in the project.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

None.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The project will be permitted through local jurisdiction with all applicable zoning ordinances.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

N/A.

9. *Housing* [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

N/A.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

N/A.

c. Proposed measures to reduce or control housing impacts, if any:

None.

10. *Aesthetics* [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The tallest point for the buildings is about 25 ft. The exterior building materials consist of split face concrete block and pre-finished metal panels.

b. What views in the immediate vicinity would be altered or obstructed?

None.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Landscaping, setbacks, and building façade requirements.

11. *Light and Glare* [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Building lights would be proposed for late evenings and night times.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

All outdoor lighting will be in conformance with the City of Richland code 23.58.030 Outdoor Light Fixtures – General Requirements.

12. *Recreation* [help]

a. What designated and informal recreational opportunities are in the immediate vicinity?

Unimproved Lawless Park is located just across the street on Wellhouse Loop to the west. The Academy of Children's theater is located just south at 213 Wellsian Way.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None needed.

13. *Historic and cultural preservation* [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.

None per the Department of Archaeology and Historic Preservation WISAARD system.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

The site is considered in the area of the Confederated Tribes of the Warm Springs per the Department of Archaeology and Historic Preservation WISAARD system. No features or evidence of artifacts have been found however.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

The WISAARD system of the DAHP was used to assess potential impacts.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Upon any discovery of potential or known archaeological resources at the property prior to or during on-site construction, the developer, contractor, and/or any other parties involved in construction shall immediately cease all on-site construction, shall act to protect the potential or known historical and cultural resources area from outside intrusion, and shall notify within a maximum period of twenty-four hours from the time of discovery, City of Richland officials of said discovery.

14. *Transportation* [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

The site is on the corner of the Wellhouse Loop and Wyman Street Intersection.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

There is a bus stop on the opposite end of Wyman Street from the site. Stop I.D. is RC085.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

There will not be any non-project parking added/removed due to this project.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

There will need to be some improvements for the driveways required and sidewalks.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and non-passenger vehicles). What data or transportation models were used to make these estimates?

Approximately 133 trip ends would be generated on a weekday. Peak volumes would occur in the PM hours (4-6 PM) and that volume is estimated to be 14 trip ends. The ITE 10th edition trip generation manual, land use code 151 was used.

g. Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No.

h. Proposed measures to reduce or control transportation impacts, if any:

None at this time.

15. *Public Services* [help]

a. Would the project result in an increased need for public services (for example: fire protection,

police protection, public transit, health care, schools, other)? If so, generally describe.

Yes, this site will utilize fire and police protection, as well as public transportation.

b. Proposed measures to reduce or control direct impacts on public services, if any.

The completed project will provide additional tax revenue for the City and will pay any impact fees that may be required by the City.

16. *Utilities* [help]

a. Circle utilities currently available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other. _____

c. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Electricity – Richland Energy Services

Refuse Service – City of Richland

Water/Sewer – City of Richland

Natural Gas – Cascade Natural Gas

Telephone – Charter, Ziply

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Paul Knutzen

Name of signee Paul Knutzen

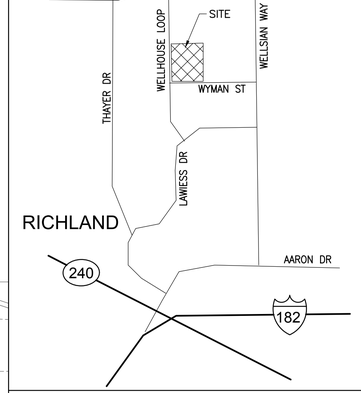
Position and Agency/Organization Principal Engineer/Knutzen Engineering

Date Submitted: 3/18/2021

KEY NOTES

1. HEAVY ASPHALT SECTION – 3" THICK ASPHALT OVER 8" TOP COURSE PER WSDOT 9-03.9(3)
2. HEAVY CONCRETE SECTION – 6" THICK CONCRETE SIDEWALK OVER 6" TOP COURSE PER WSDOT 9-03.9(3). TROWEL CONTROL JOINTS AT 10' O.C. AND INSTALL EXPANSION JOINTS AT 30' O.C.
3. PAINT WHITE 4" WIDE PARKING STRIPING, LETTERING, AND ACCESSIBLE PARKING SYMBOLS PER ADA REQUIREMENTS AS SHOWN ON PLAN
4. ACCESSIBLE PARKING SIGN
5. ACCESSIBLE RAMP AT EXISTING CURB DROP, PER CITY STD ST5
6. ACCESSIBLE RAMP AT EXISTING CURB DROP, MODIFY EXISTING CURB AD NEEDED, PER CITY STD ST5
7. TRASH ENCLOSURE
8. PAINT WHITE ELONGATED DIRECTIONAL ARROWS AS SHOWN ON PLAN PER MUTCD AND CITY STANDARDS
9. REMOVE CURB FOR NEW DRIVEWAY, PER CITY STD ST2A
10. SIDEWALK, PER CITY STD ST1
11. SIDEWALK WALK AROUND VAULT, PER CITY STD ST1
12. REMOVE AND REPLACE CURB, PER CITY STD ST1
13. REMOVE AND REPLACE ASPHALT, PER CITY STD U2
14. MAN GATE
15. 22.0' WIDE ROLL GATE WITH POWER
16. 8.0' TALL BLOCK WALL FENCING
17. FIRE HYDRANT WITH BOLLARD PROTECTION
18. SEWER SERVICE TAP
19. WATER METER ON EXISTING SERVICE STUB

VICINITY MAP



NOTES

1. PARKING:
   1 ACCESSIBLE VAN STALL.
2. AREA:
   92,614 SF IMPERVIOUS AREA, 6,165 SF PERVIOUS AREA (6.4%), 98,779 SF TOTAL PROPERTY AREA.

KNUTZEN ENGINEERING
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No.	REVISIONS	DATE	DESIGN	CHKD	APPD

PAUL T. KNUTZEN
STATE OF WASHINGTON
PRELIMINARY
44313
REGISTERED
PROFESSIONAL ENGINEER
03/17/21

NOT FOR CONSTRUCTION
CITY SITE PLAN

TIM BUSH
STORAGE FACILITY
WELLHOUSE LOOP, RICHLAND WA 99352

APPROVAL		
DESIGN	SJT	03/17/21
CHECKED	PTK	03/17/21
APPROVED	PTK	03/17/21

SCALE: AS NOTED
CADFILE: 20249SP01
JOB No. 20249
REV. 0
DWG. No. SP01

A1 CITY SITE PLAN
SCALE: 1" = 20'-0"

1" = 20'

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

Critical Aquifer Recharge Area Report

Wellhouse Loop RV Storage

300 Wellhouse Loop
Richland, WA 99352

Prepared For:

TTB Investments, LLC
520 Columbia Dr
Kennewick, WA 99336

Prepared By:

Paul Knutzen, PE
Robert McLeod
Project No. 20249

4/23/2021

Preparation Date:

April 23, 2021

Table of Contents

Appendices

1.0 Project Overview

The Wellhouse Loop RV Storage project site is located at 300 Wellhouse Loop, Richland, WA 99352. Benton County parcel #115981013205001. The 2.26-acre site is currently undeveloped and zoned C-3 General Business. The project proposes 5 RV-Storage buildings totaling approximately 53,350 SF. The buildings would provide 37 RV-Storage units with water, sewer, and internet services. The project would cover approximately 95% of the site with impervious surfaces, consisting of roofing, concrete, and asphalt. Refer to Appendix A for the Vicinity Map and Appendix B for the Site Plan.

The site located completely within an Aquifer Recharge Critical Area, as shown by City of Richland's critical area online mapping. As identified in the City's Wellhead Protection Program, the site is near the 10-year time of travel zone for the Wellsian Way Wellfield (SO2). See Appendix C for the map taken from mentioned program.

2.0 Site Geology

The existing site topography is very flat, with approximately 2' of elevation variation across the site. There is no evidence of on-site storm runoff leaving the site. Additionally, there is no evidence of the site receiving storm runoff off-site sources.

GeoProfessional Innovation prepared a geotechnical engineering evaluation for the project on April 13, 2021. They performed 4 test pits, 10 feet below the surface. They also performed a single infiltration test approximately 4 feet below ground surface. They encountered brown sandy silt and alluvial silty sand. Neither bedrock nor groundwater was encountered in any of the test pits. See Appendix D for the Geotechnical Report and additional information.

3.0 Groundwater

GeoProfessional Innovation finds the groundwater level likely to be within 20 feet of the ground surface, based on well data and the site's proximity to the Yakima River. The groundwater level is likely to rise and fall with the change of seasons. A nearby well log provided by the Department of Ecology identified the static water level at 43' below ground surface. See Appendix E for the well log.

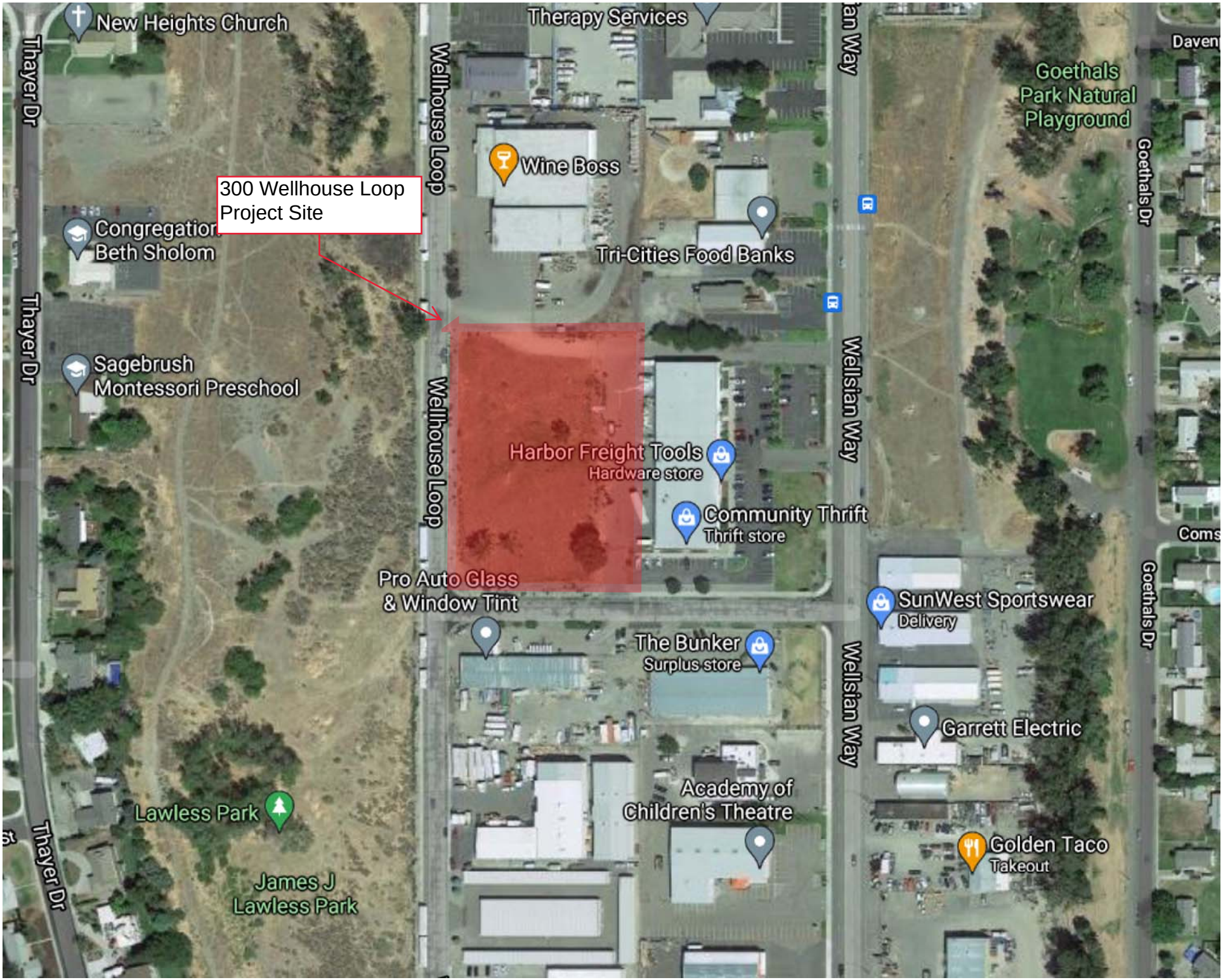
A report provided by USGS identifies the general hydraulic gradient in the area as towards the northeast. See Appendix F for exhibits showing shallow water table level contours, Saddle Mountain basalt water level contours and Wanapum basalt contours.

4.0 Project Impact and Mitigation Plan

Due to the presence of shallow groundwater, it is likely that stormwater produced by the site's impervious surfaces could enter the belowground aquifer. No storage or usage of chemicals are proposed on-site.

The principal component of the site's mitigation plan is ensuring pollutants do not enter groundwater through the stormwater management plan. The stormwater plan for the site collects and infiltrates all stormwater runoff through conveyance systems and an underground infiltration trench, compliant with the Stormwater Management Manual for Eastern Washington. The site is classified as a low pollutant loading site, per table 5.22 of the SWMMEW. GeoProfessional Innovation identifies the site's soils as satisfying a high vadose-zone treatment capacity. Therefore, per table 5.23 of the SWMMEW, the required pre-treatment is a two-stage drywell. Catch basins with inverted tees are proposed at the entrances of the underground infiltration trench, satisfying the requirement of a two-stage drywell. Based on the site conditions found and the proposed stormwater pre-treatment structures, the proposed project should have no significant impact to the Critical Aquifer Recharge Area. No additional plans are proposed to limit the impact on the area at this time.

APPENDIX A
Vicinity Map

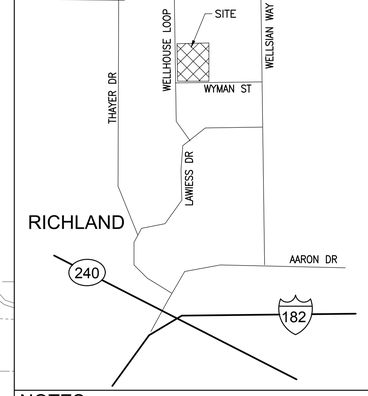

New Heights Church
Therapy Services
Thayer Dr
Wellhouse Loop
Wellsian Way
Goethals Park Natural Playground
Goethals Dr
Wine Boss
300 Wellhouse Loop
Project Site
Congregation Beth Sholom
Tri-Cities Food Banks
Sagebrush Montessori Preschool
Harbor Freight Tools
Hardware store
Community Thrift
Thrift store
Pro Auto Glass & Window Tint
SunWest Sportswear
Delivery
The Bunker
Surplus store
Garrett Electric
Academy of Children's Theatre
Golden Taco
Takeout
Lawless Park
James J Lawless Park

APPENDIX B
Site Plan

KEY NOTES

1. HEAVY ASPHALT SECTION – 3" THICK ASPHALT OVER 8" TOP COURSE PER WSDOT 9-03.9(3)
2. HEAVY CONCRETE SECTION – 6" THICK CONCRETE SIDEWALK OVER 6" TOP COURSE PER WSDOT 9-03.9(3). TROWEL CONTROL JOINTS AT 10' O.C. AND INSTALL EXPANSION JOINTS AT 30' O.C.
3. PAINT WHITE 4" WIDE PARKING STRIPING, LETTERING, AND ACCESSIBLE PARKING SYMBOLS PER ADA REQUIREMENTS AS SHOWN ON PLAN
4. ACCESSIBLE PARKING SIGN
5. ACCESSIBLE RAMP AT EXISTING CURB DROP, PER CITY STD ST5
6. ACCESSIBLE RAMP AT EXISTING CURB DROP, MODIFY EXISTING CURB AD NEEDED, PER CITY STD ST5
7. TRASH ENCLOSURE
8. PAINT WHITE ELONGATED DIRECTIONAL ARROWS AS SHOWN ON PLAN PER MUTCD AND CITY STANDARDS
9. REMOVE CURB FOR NEW DRIVEWAY, PER CITY STD ST2A
10. SIDEWALK, PER CITY STD ST1
11. SIDEWALK WALK AROUND VAULT, PER CITY STD ST1
12. 6" TOP COURSE PER WSDOT 9-03.9(3)
13. REMOVE AND REPLACE ASPHALT, PER CITY STD U2
14. MAN GATE
15. 22.0' WIDE AUTOMATIC ROLL GATE WITH POWER AND KEY
16. 8.0' TALL BLOCK WALL FENCING
17. 20.0' WIDE MANUAL GATE WITH A DOUBLE LOCK, 1 KNOX LOCK FOR FIRE AND 1 LOCK PROVISION FOR POWER
18. SEWER SERVICE TAP
19. WATER METER ON EXISTING SERVICE STUB
20. PYLON SIGN

VICINITY MAP



NOTES

1. PARKING:
   1 ACCESSIBLE VAN STALL.
2. AREA:
   92,614 SF IMPERVIOUS AREA, 6,165 SF PERVIOUS AREA (6.4%), 98,779 SF TOTAL PROPERTY AREA.

KNUTZEN ENGINEERING
5401 RIDGELINE DR.
SUITE 160
KENNEWICK, WA 99338
1-509-222-0959
www.knutzenengineering.com

No.	REVISIONS	DATE	DESIGN	CHKD	APPD

PAUL T. KNUTZEN
STATE OF WASHINGTON
PRELIMINARY
44313
REGISTERED
PROFESSIONAL ENGINEER
03/26/21

NOT FOR CONSTRUCTION
CITY SITE PLAN

TIM BUSH
STORAGE FACILITY
WELLHOUSE LOOP, RICHLAND WA 99352

APPROVAL		
DESIGN	SJT	03/25/21
CHECKED	PTK	03/25/21
APPROVED	PTK	03/25/21

SCALE: AS NOTED
CADFILE: 20249SP01
JOB No. 20249
REV. 0
DWG. No. SP01

CALL 811
2 BUSINESS DAYS
BEFORE YOU DIG

0' 10' 20' 40' 60'
1" = 20'

A1 CITY SITE PLAN
SCALE: 1" = 20'-0"

\2020\20249-Bush Wyman RV Condos\DWG\20249SP01.dwg - Mar 29,2021 - 08:31am - sto

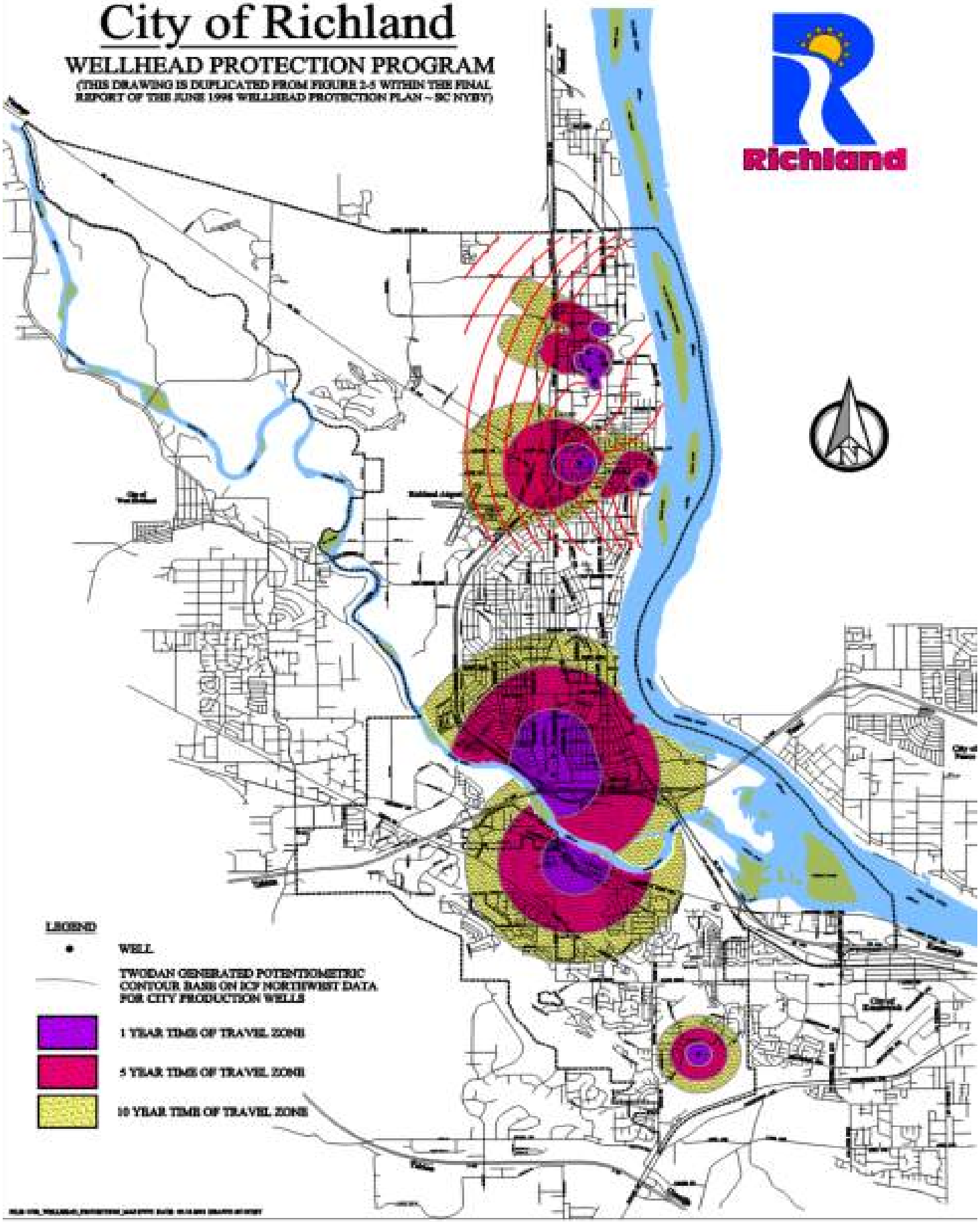
APPENDIX C
Wellhead Map

City of Richland

WELLHEAD PROTECTION PROGRAM

(THIS DRAWING IS DUPLICATED FROM FIGURE 2-5 WITHIN THE FINAL REPORT OF THE JUNE 1998 WELLHEAD PROTECTION PLAN – SC NYBY)

Richland



APPENDIX D
Geotechnical Report

GeoProfessional Innovation.

April 13, 2021
File: PU21020A

Mr. Tim Bush
c/o Mr. Paul Knutzen, P.E.
Knutzen Engineering, Inc.
5401 Ridgeline Dr., Ste. 160
Kennewick, WA 99336

RE: Geotechnical Engineering Evaluation
Bush RV Storage Facility
Wellhouse Loop and Wyman Street
Richland, Washington

Greetings, Tim and Paul:

GeoProfessional Innovation Corporation (GPI) has performed the authorized geotechnical engineering evaluation for the upcoming Bush Recreational Vehicle (RV) Storage Facility to be located northeast of the Wellhouse Loop and Wyman Street intersection in Richland, Washington. Our services were performed referencing our proposal dated January 22, 2021.

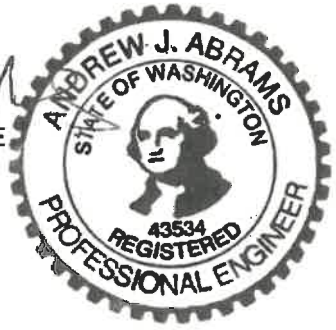
Our evaluation's purpose was to explore subsurface conditions within the proposed improvement area and provide geotechnical engineering recommendations and opinions to assist project planning, design, and construction. Herein we summarize our field and laboratory test results and present our geotechnical opinions and recommendations. Read and implement the report in its entirety. Individual report portions or attachments cannot be relied upon outside the context of the entire document.

We look forward to assisting you throughout project design and construction. Please contact us if you have any questions or comments so that we may address them in a proactive and timely fashion to help facilitate project design and construction.

Sincerely,
GPI

Amanda Carlson, E.I.
Staff Engineer

Andrew J. Abrams, P.E
Senior Engineer



AJA/mg

Geotechnical Engineering Evaluation

Bush RV Storage Facility
Wellhouse Loop and Wyman Street
Richland, Washington

PREPARED FOR:
Mr. Tim Bush
c/o Mr. Paul Knutzen, P.E.
Knutzen Engineering, Inc.
5401 Ridgeline Dr., Ste. 160
Kennewick, WA 99336

PREPARED BY:
GeoProfessional Innovation Corporation
6 O'Donnell Road
Pullman, WA 99163
509.339.2000

April 13, 2021

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TABLES AND FIGURES

PLATES AND APPENDICES

Geotechnical Engineering Evaluation
Bush RV Storage Facility
Wellhouse Loop and Wyman Street
Richland, Washington

INTRODUCTION

Our investigation's purpose was to assess subsurface conditions at the site and to prepare this report providing geotechnical recommendations to assist Mr. Tim Bush and designer, Knutzen Engineering, Inc. (Knutzen), with design and construction for the planned Bush Recreational Vehicle (RV) Storage Facility located north of the Wellhouse Loop and Wyman Street intersection in Richland, Washington. The project location is shown on the attached Plate 1, *Exploration Map*. Our services were performed referencing our proposal dated January 22, 2021. The following text describes the project understanding and scope of services, as well as presents the exploration findings and laboratory test results.

SCOPE OF SERVICES

To provide this geotechnical engineering evaluation, the following services were accomplished:

1. Coordinated subsurface exploration with the Washington Utility Notification Center to help reduce the potential for damage to subsurface utilities during exploration.

2. Explored the site via test pit excavations, visually classified and logged the soil encountered in reference to the *Unified Soil Classification System* (USCS). Approximate exploration locations are shown on Plate 1.

3. Accomplished 1 field infiltration test to evaluate the near surface soils' infiltration characteristics in the anticipated infiltration facility location outlined to us by Knutzen.

4. Accomplished laboratory testing on samples collected during exploration, referencing *ASTM International* (ASTM) test procedures.

5. Performed engineering analyses referencing field and laboratory data in order to provide geotechnical recommendations for design and construction.

6. Prepared this deliverable containing our geotechnical information and recommendations, including exploration and laboratory test results and schematics necessary to illustrate the geotechnical recommendations.

PROJECT UNDERSTANDING

Existing Site Conditions

The site is located at the northeast corner of the Wellhouse Loop and Wyman Street intersection in Richland, Washington. The site is bordered on the north and east by existing commercial developments, Wyman Street to the south, and Wellhouse Loop to the west. The site is currently undeveloped and maintains moderate brush, grass, weeds, and some mature trees. Most of the site appears to be relatively level, with less than 3 feet of vertical relief across the existing ground surface.

Proposed Construction

The RV storage facility is planned to comprise 5 separate structures ranging from 7,840 to 13,800 square feet, for a total of approximately 53,504 square feet. The structures are expected to be single-story, wood- or metal-framed buildings supported on concrete slab-on-grade floors and typical shallow spread footings. Structural loads are not developed yet, but are expected to be less than 25 kips per column and 3 kips per linear foot along perimeter footings. Slabs-on-grade will be structurally designed by Knutzen to support RV loads, estimated at 30,000 pounds gross vehicle weight (GVW).

We do not expect significant site grading will be accomplished to construct a pad for the planned improvements. Cuts or fills greater than about 1 to 2 feet are not planned, outside of new foundation and utility excavations. Stormwater will be directed to on-site facilities to be designed by Knutzen, such as near-surface swales or galleries for disposal via infiltration. Asphalt paved drive lanes will provide vehicular access to each storage structure from the primary site access off of Wellhouse Loop. City and franchise utilities will extend to the improved site from existing alignments in Wellhouse Loop and Wyman Street.

FIELD EXPLORATION

GPI accomplished exploration at the site via 4 exploratory test pits extending 10 feet below the surface in the approximate locations shown on Plate 1. Test pits were excavated with a Z-axis 135 backhoe equipped with standard soil excavation teeth. During exploration, GPI's geotechnical engineer visually classified, described, and logged the soil encountered according to the USCS. We collected select in-place soil samples from various depths and locations for subsequent laboratory testing. The USCS is presented in *Appendix A* along with exploration logs and should be used to interpret the soil conditions in this document and on the individual exploration logs.

While on site, we performed an infiltration test in test pit TP-21020A-1 at approximately 4 feet below the existing ground surface. Infiltration testing was accomplished referencing the methods outlined in Appendix 6B of the *Washington State Department of Ecology* (Ecology) *Stormwater Management Manual for Eastern Washington* (SMMEW).

LABORATORY TESTING

Laboratory testing was performed in reference to ASTM standards on select soil samples obtained during exploration. Laboratory testing included:

- In-Situ moisture content (ASTM D2216)
- Grain size distribution (ASTM D6913)
- Cation exchange capacity
- Moisture density Proctor (ASTM D1557)
- In-place density (ASTM D1587)
- Organic content

Laboratory test results are included in Appendix B, and on the exploration logs in Appendix A.

SUBSURFACE CONDITIONS

Topsoil was encountered at the ground surface from approximately 0.7 to 1.0 foot below the existing ground surface in each exploration. Topsoil consisted of brown sandy silt that was loose and moist, containing vegetation and organics associated with various grass, shrubs, and weeds. Beneath topsoil, alluvial silty sand was encountered in each test pit location, extending 4.0 to 4.5 feet below the ground

surface. Silty sand was described as brown, loose to medium dense, and moist. This silty surface soil graded to become sandier with depth.

Neither bedrock nor groundwater was encountered in the depths or locations explored. From reviewing water well logs published on the Ecology website, groundwater is documented within 20 feet of the ground surface at various locations within 1 mile of this site. Further, these Ecology records indicate bedrock is greater than 50 feet below the ground surface within the project site vicinity. Localized, perched groundwater tables can be encountered at the site at any elevation in the future. Such variations can be associated with seasonal changes in irrigation, precipitation, and stormwater management practices for nearby developments.

GEOTECHNICAL OPINIONS AND RECOMMENDATIONS

Earthwork

Site Stripping

Topsoil containing vegetation and organics was encountered extending 0.7 to 1.0 foot below the ground surface in each test pit location. Strip surface topsoil, soil containing vegetation and organics from planned improvement areas prior to preparing subgrades to receive structural fill, concrete, or other planned improvements. Budgeting for an average 0.9 feet of topsoil stripping in improvement areas should remove the majority of topsoil and organics with isolated thicker removal required in some areas around brush or trees. Extend stripping laterally at least 5 feet outside of any planned improvement areas. Soil containing vegetation and organics should be disposed offsite or may be reused on site for landscaping, but it may not be re-used as structural fill.

Test Pit Remediation

All loose test pit backfill located beneath the planned building and pavement areas must be remediated during earthwork construction. Loose test pit backfill shall be excavated and removed to expose undisturbed native soil, then backfilled with on-site soil or imported fill per the requirements stated in this report's *Structural Fill* section.

Establishing Subgrades

Following site stripping and test pit remediation, but prior to placing structural fill or concrete, achieve subgrades using the methods described below:

- Building foundation and slabs-on-grade: expose native silty sand alluvium beneath foundations and slab-on-grade floors, then scarify at least 0.7 feet deep, moisture condition, and compact the exposed subgrade to 95% of the soil's maximum dry density per ASTM D1557 referencing the *Structural Fill* report section.

- All other subgrades: native soil that has been scarified at least 0.7 feet below the subgrade elevation, moisture-conditioned and recompacted to 90% of the soil's maximum dry density per ASTM D1557 referencing the *Structural Fill* report section.

The near-surface silty sand is moisture sensitive and susceptible to disturbance when moist or wet. Soil disturbance will negatively impact the soil's performance below foundations, slabs, pavements, and other improvements. Disturbed soil shall not be allowed below any structure and especially at foundation

subgrades. The contractor should begin final subgrade preparations at the furthest point from the excavation access point and work toward the excavation exit to load transport vehicles. After preparing subgrades, it is the contractor's sole responsibility to protect subgrades from degradation, freezing, saturation, or other disturbance.

Careful construction and earthwork procedures are critical to achieving adequate subgrade preparation and reducing over-excavation. Specifically, these procedures could include, but are not limited to, carefully staging equipment and/or stockpiles, routing construction equipment away from subgrades, and implementing aggressive site drainage procedures to help reduce saturating subgrades during wet weather conditions. It is the contractor's responsibility to protect subgrades throughout construction. Subgrade disturbance that occurs due to the contractor's means and methods must be repaired at no cost to Tim Bush, the Owner.

Undocumented or Uncontrolled Fill

We did not encounter undocumented or uncontrolled fill within the depths or locations explored. However, we expect some previously placed fill is present at the site, atop existing utility alignments that traverse the improvement area. Where existing utilities are removed, all fill above them will also be removed, and must be replaced as *Structural Fill* per this report's recommendations.

Where existing utilities will remain in place, or where other undocumented or uncontrolled fill deposits are encountered beneath planned improvements, the geotechnical engineer retained for construction must evaluate the fill and determine whether the fill meets this report's *Structural Fill* requirements. At a minimum, we recommend this evaluation should be performed via a combination of test holes, visual observations and in-place density testing to compare the soil's in-place density to its maximum dry density per ASTM D1557. Where the existing fill's in-place dry density exceeds 90 percent of its maximum dry density per ASTM D1557, it may remain in place. If the fill exhibits in-place dry density lower than 90 percent, or contains debris or other unsuitable material, remove it to expose undisturbed native soil and replace it with *Structural Fill* per this report's requirements.

Excavation Characteristics

We anticipate that site soil may be excavated using conventional excavation techniques. Carefully plan and implement site excavations to be sloped, shored, or braced referencing the *Washington Industrial Safety and Health Act* (WISHA) regulations and local codes. The site soil is generally classified as "C" type soil according to WISHA requirements when it remains in a dry condition. We recommend that provisions may be made to allow temporary excavations of any type be sloped back to at least 1.5H:1.0V for type C soil. Construction vibrations can cause excavations to slough or cave. Do not stockpile material immediately adjacent excavations, which may cause a surcharge and contribute to excavation instability. Ultimately, the contractor is solely responsible for site safety and excavation configurations factoring in ground/stormwater, construction access, adjacent loading, and other factors that contribute to excavation instability.

Although groundwater is not expected within the anticipated excavation depths at this site, the contractor should plan excavations with water collection points and utilize conventional sumps and pumps to remove nuisance water from runoff, seeps, springs, or precipitation, if it should occur. During building construction, site soil excavations may degrade when exposed to runoff and require over-excavation and replacement with granular fill if they aren't backfilled immediately. We recommend construction activities and excavation backfilling be performed as rapidly as possible following excavation to reduce the potential

for subgrades to degrade under construction traffic. Further, installing perimeter drainage systems (see *Site Drainage* section) proactively can facilitate drainage during construction and reduce over-excavation.

Structural Fill

Various fill materials are required throughout construction. Place and compact all fill for this project as structural fill. Site soil (excluding topsoil containing vegetation and organics, or soil containing debris) may be re-used as *General Structural Fill* provided it meets the requirements in Table 1. Our recommended material requirements for structural fill are provided, referencing the latest *Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT Standards). Project structural fill products are described in Table 1.

Table 1: Structural Fill Specifications and Allowable Use

Fill Label	Fill Product Description	Allowable Use	Material Specifications
SF-1	**General Structural Fill**	• General site grading • Utility trench backfill • Stemwall backfill	• Soil classified as ML, SM, SP, GM, GP, or GW according to the USCS. • Soil must contain less than 3 percent (by weight) of organics, vegetation, wood, metal, plastic, or other deleterious substances. • Soil may not contain particles larger than 0.6 feet in diameter. • Site soil free of vegetation, organics and debris meets these requirements.
SF-2	**Granular Structural Fill**	• SF-1 applications • Over-excavations	• Soil meeting requirements stated in Section 9-03.14(2) – Select Borrow of WSDOT Standards.
CS-1	**Crushed Surfacing**	• SF-2 applications • Slab & pavement support aggregate	• Soil meeting requirements stated in Section 9-03.9(3) – Crushed Surfacing of WSDOT Standards. • Includes Top Course and Base Course.
PB-1	**Pipe Bedding**	• Utility pipe bedding	• Soil meeting requirements stated in *Section 9-03.12(3)- Gravel Backfill for Pipe Zone Bedding* of WSDOT Standards.
-	**Unsatisfactory Soil** (Unsuitable Soil)	• NONE	• Soil classified as ML, CL, CH, MH, OH, OL or PT shall not be used for site grading or backfill. • Any soil containing more than 3 percent organics by weight or other deleterious substances (wood, metal, plastic, waste, etc.) is unsatisfactory soil.

Compaction

Fill placed to support any structure or improvement must be compacted to the structural fill requirements presented below. Table 2 below summarizes fill compaction requirements.

Table 2: Required Structural Fill Products for Designated Project Areas

Project Area	Required Structural Fill Product	Compaction Requirement[1]
Subgrades beneath planned buildings	Native Soil	95%[2]
Subgrades outside building footprints, beneath pavements, and other exterior hardscapes	Native Soil	90%[2]
Structural fill placed beneath the planned building, and general site grading, utility trench backfill, stemwall backfill	SF-1	95%
Backfilling over-excavations	SF-1, SF-2[3]	95%
Slab-on-grade & pavement support aggregate	CS-1	95%

1. Compaction percentage relative to the maximum dry density, referencing ASTM D1557 (Modified Proctor).
2. Prior to structural fill or concrete placement, subgrades must be scarified a minimum 0.7 foot and moisture conditioned to near optimum moisture content per ASTM D1557.
3. Imported coarse soil with greater than 30% retained on the ¾-inch sieve should be compacted to the *Coarse Fill* section requirements below.

Place structural fill only over approved subgrades. Never place structural fill over frozen, saturated, or soft subgrades. Structural fill products must be free of debris, vegetation, organics and frozen material. Structural fill must be moisture conditioned to near optimum moisture content and placed in maximum 1-foot-thick, loose lifts, provided compaction equipment weighs at least 10 tons. If smaller or lighter compaction equipment is provided, reduce the lift thickness to meet the compaction requirements presented herein. The contractor is responsible for selecting equipment suitable for achieving compaction with respect to their means and methods.

Coarse Fill

Any material with greater than 30 percent retained above the ¾-inch sieve is too coarse for Proctor density testing. Coarse SF-2 products are often known locally as "pit-run." However, such coarse material may be used as SF-1 and SF-2. Compact coarse fill using a "method specification" developed during construction, based on the material characteristics and the contractor's means and methods. It is common that method specifications are developed during construction, specific to the materials and conditions encountered. At a minimum, GPI recommends coarse fill be placed in maximum 1.5-foot-thick lifts and compacted with 5 complete passes of a 10-ton, vibratory or grid roller. Vibratory rollers must have a dynamic force of at least 30,000 pounds per impact per vibration, and at least 1,000 vibrations per minute. Coarse fill must be compacted to a dense, interlocking, and unyielding surface. GPI should review the soil and aggregate materials planned for fill use and monitor compaction efforts during construction.

Wet Weather/Soil Construction

We recommend earthwork construction take place during dry weather conditions (May-November). The site soil may be susceptible to pumping or rutting from heavy loads, such as rubber-tired equipment or vehicles, any time of the year. If the soil cannot achieve the required compaction, apply diligent efforts to moisture condition the soil. Drying can be accomplished by ripping and aerating the wet soil during dry weather conditions. After attempting moisture conditioning, remove pumping or rutting subgrade areas to depths of 1.0 to 1.5 feet at GPI's and Knutzen's direction and replace the excavation with geotextile fabric and SF-2 or CS-1.

Utility Trench Construction Considerations

Pipe bedding for utility construction should conform to WSDOT *Section 9-03.12(3)-Gravel Backfill for Pipe Zone Bedding* and Table 1 of this report. Loose soil must be removed from the base of utility trenches prior to placing pipe bedding. In addition, if water is encountered, it must be removed from the base of the utility trench before placing pipe bedding. We recommend utility pipes be placed on and be surrounded with at least 0.5 feet of bedding (PB-1) placed over undisturbed native soil supported according to the pipe manufacturer's specifications and WSDOT requirements.

Thoroughly place and compact PB-1 below pipe haunches between the pipe invert and the spring line. Then place PB-1 and compact it from the pipe invert to 1 foot above the top of the pipe with tamping bars and/or plate compactors to a dense and unyielding condition. To accomplish bedding compaction, the distance between the side of the pipe at the spring line and the trench wall should be at least 0.5 feet. Pipes shall always be placed at least 1 foot below any pavement or slab and according to local plumbing codes. The remainder of the utility trench should be backfilled with SF-1 in accordance with this report's *Compaction* section.

Geotextiles

Geotextile separation fabric is not specifically required for any project aspect, other than perimeter foundation drain construction. However, it can aid various construction activities. Neither is geogrid reinforcement required, but it can help improve persistently soft subgrades encountered during construction. Geotextiles shall meet the minimum requirements in *WSDOT Standards Section 9-33.2(1) – Table 3*, and the minimum properties shown in Table 3 below:

Table 3: Geotextile Specifications

Geosynthetic Type	Use	Minimum Material Specifications
Non-Woven Geotextile	• Over-excavation of soft areas • Roadways and parking areas	• Grab tensile strength: 200 pounds (ASTM D4632) • Puncture resistance: 430 pounds (ASTM D6241) • Permittivity: 0.1 seconds^{-1} (ASTM D4491) • Generally conforming to WSDOT Standards *Section 9-33.2(1) Table 3 for Soil Stabilization*
Triaxial or Biaxial Geogrid	• Construction access roads • Persistent soft subgrade conditions	• 93 percent junction efficiency (GRI-GG2-05) • 0.65 m-N/degree aperture stability • Ultimate tensile strength of 1,310 lb/ft • Flexural stiffness of 750,000 mg-cm

Apply geotextiles directly on approved subgrades, taut, free of wrinkles, and overlapped at least 1 foot. Consult GPI to review geosynthetic applications or other subgrade improvement alternatives.

Compaction Documentation

Successful earthwork activities are important to the project's long-term performance. Retaining experienced earthwork contractors is the first step in having confidence that earthwork will be performed in reference to this report's requirements. Providing the necessary testing and engineering verification of earthwork activities is the second step. The firm retained to verify design-specified subgrade conditions, soil bearing units, and compaction shall become the geotechnical engineer-of-record for construction. The

criteria below outline the minimum testing and observation frequencies to implement during earthwork and foundation construction.

1. Site Stripping and Test Pit Backfill Remediation: site stripping confirmed by experienced geotechnical engineer to confirm conditions required by design. Test pit backfill compaction observed by an experienced geotechnical engineer or geoprofessional to confirm *Structural Fill* conditions are achieved.

2. Mass Grading/Structural Fill Placement: 1 compaction test every 5,000 sf, per fill lift, minimum 3 tests per testing event.

3. Foundation, Slab, and Pavement Bearing Surfaces: bearing surface conditions verified by an experienced geotechnical engineer to confirm conditions as required by design. Additionally, and as applicable pending materials encountered, 1 compaction test every 100 linear feet (lf) of continuous foundations (+2 per column) and 2,500 sf for slab/pavement areas, or a minimum of 4 tests per alignment/area. Verification and compaction requirements should be reevaluated at a final building plan is established.

4. Foundation Stemwall Backfill: 1 compaction test every 100 lf of wall or minimum 3 tests per wall line (interior and exterior), whichever results in the greater number of tests, per fill lift.

5. Utility Trench Backfill (beneath structural improvements): 1 compaction test every 100 lf of trench and minimum 3 tests per utility alignment, whichever results in the greater number of tests, per each fill lift.

6. Pavement Construction: 1 compaction test every 5,000 sf, per paving lift, minimum 3 tests per testing event. One laboratory test suite on a bulk sample of hot mix asphalt per each day's paving, including oil content, gradation and maximum theoretical (Rice) specific gravity.

Shallow Foundation Design

Bear shallow foundations on compacted native soil subgrades or SF-1 constructed over native soil subgrades prepared per the *Earthwork* report section requirements. Structurally design shallow spread foundations per the latest International Building Code (IBC) requirements, and the following criteria:

1. Allowable bearing pressure: 2,500 pounds per square foot (psf)
   a. Allowable bearing pressure may be increased by 33 percent for temporary loads such as wind or seismic forces.
   b. The allowable bearing pressure provides a minimum safety factor = 3.0 on bearing capacity failure.

2. Minimum frost protection embedment depth
   a. Perimeter foundations: 2.0 feet below finished exterior surface.
   b. Interior foundations: 1.5 feet below finished slab surface.
   c. Spread footings must maintain at least 0.3 feet of CS-1 between bottom of slab and top of footing.
   d. Where thickened-edge-slab footings are utilized, the propensity for cracking is increased at the transition between slab sections.

3. Estimated vertical settlement
   a. Total settlement: 1 inch
   b. Differential settlement: 0.7 inches in 30-foot, horizontal span.

4. Lateral load resistance
   a. Foundation base friction coefficient: 0.35 for foundations cast directly on compacted site soil or SF-1.
   b. Lateral passive resistance is available for conventional foundations and stemwalls backfilled with site soil of SF-1 at 300 pounds per cubic foot (pcf) where ¾ inches of lateral movement can be tolerated.

5. IBC Site Class (IBC Section 1613)
   a. Based on field exploration, it is recommended that Site Class D be used as a basis for structural frame seismic design.
   b. A site-specific seismic response study was not performed.

Concrete Slab-on-Grade Floors

Aggregate Support Section

Support slab-on-grade floors over a minimum 0.7-foot-thick aggregate support section comprising CS-1 per Table 1. Slabs will support concentrated loads from recreational vehicle loading, and therefore may require thicker support sections and/or additional reinforcing. We recommend that Knutzen incorporate the anticipated RV loads into structural design of the slab section where RV loads or other heavy loads will access slabs. Slab subgrades must be prepared per the *Establishing Subgrades* report section. CS-1 below slabs must be placed compacted to *Structural Fill* requirements. Based on correlations to field and laboratory test results and if the subgrade recommendations are followed, slab section design may utilize an allowable modulus of subgrade reaction (K) of 180 pounds per cubic inch (pci).

Subgrade areas that become soft, wet, or disturbed during slab subgrade preparations must be moisture conditioned and recompacted, or over-excavated to medium dense soil and replaced with CS-1. The slab's supporting aggregate course and any vapor retarders should be constructed once the majority of under-slab plumbing and utilities are complete.

Vapor Retarder

Interior floor slabs may be susceptible to moisture migration caused by subsurface capillary action and vapor pressure. Though floor coverings are not planned for interior space in the RV storage facility, slab moisture migration can impact stored property. Therefore, GPI recommends vapor retarders be placed beneath the planned slabs-on-grade, where stored property or other site features could be impacted by moisture vapor transmission.

Vapor retarders must consist of thick, puncture-proof polyethylene sheeting. An example of this material is Stego Wrap™, a 15-mil retarder. Knutzen plans to place vapor retarder between the CS-1 support layer and the concrete slab-on-grade floors. Vapor retarders may be covered with an additional 2-inch-thick layer of clean, coarse sand for protection against damage during slab construction. Form stakes, piping, or other sub-slab penetrations must never penetrate the vapor retarder. Carefully design and construct any vapor retarder penetrations to reduce vapor transport through such penetrations.

Even if these recommendations are used, water vapor migration through the concrete floor slab is still possible. Where vapor retarders are utilized, concrete slab contractors, as well as the plastic sheeting manufacturer, should be consulted regarding additional slab cure time requirements, latent slab moisture, and/or the potential for slab curling.

Asphalt Pavement Section Design

The following pavement section design recommendations are provided referencing the *American Association of State Highway and Transportation Officials* (AASHTO) *Guide for Design of Pavement Structures* (1993). GPI assumed traffic loading and design parameters based on our experience with similar commercial developments in the area, typical flexible pavement design criteria in the southeast Washington area, results from laboratory testing, and the subsurface conditions. We strongly recommend the design team for the future building review and validate these traffic loading assumptions, or provide actual traffic loading estimates so we can refine the estimates herein. The following tables present the preliminary design parameters and references, as well as resulting flexible pavement section design recommendations.

Table 4. Pavement Design Parameters

Design Parameter	Value Used	References
Reliability (R)	85%	Assumed
Standard Deviation (S)	0.45	AASHTO 1993
Initial Serviceability (PSIi)	4.2	Typical southeast Washington area values
Terminal Serviceability (PSIz)	2.2	Typical southeast Washington area values

Traffic Loading	145,000 ESALS[1]	Estimated Traffic Loading:
		• 12,000-lb GVW (service truck),
		  ○ 2 per day
		• 40,000-lb GVW (delivery truck/refuse, 2 axles),
		  ○ 3 per week
		• 6,000-lb GVW (passenger car, 2 axles)
		  ○ 10 vehicles per day, cycled 2x daily
		• 30,000-lb GVW (recreational vehicle)
		  ○ 37 RVs, cycled 3x per week

Design Life	20 years	Typical southeast Washington area value
Annual Growth Rate	5%	Typical southeast Washington area values
Resilient Modulus (Mr)	7,000 psi[2]	Based on Mr correlations to soil type
Asphalt Layer Coefficient (a1)	0.42	Figure 2.5 AASHTO 1993
Top Course Layer Coefficient (a2)	0.12	Figure 2.6 AASHTO 1993
Top Course Drainage Coefficient (m2)	0.9	Table 2.4 AASHTO 1993 for "fair" drainage, 5 percent saturation

1. Equivalent Single Axle Loads (ESALs)
2. Pounds per square inch (psi)

Based on the above pavement design parameters, Table 5 provides the flexible pavement design section recommendations.

Table 5. Flexible Pavement Design

Pavement Section Material	Recommended Thickness (feet)	Material Specifications
Asphalt Concrete	0.25	Hot-mix asphalt (HMA) conforming to *Section 5-04,* latest WSDOT Standards edition. HMA should consist of ½-inch to ¾-inch-minus nominal aggregate size.
Crushed Surfacing	0.75	Must conform to *Section 9-03.9(3) - Crushed Surfacing,* latest WSDOT Standards edition.

Note the pavement section design outlined above assumes *no construction traffic*. Significant pavement damage can occur after just a single pass with heavily loaded construction equipment.

Pavement Maintenance

Surface and subgrade drainage are extremely important to the performance of the pavement section. Therefore, the subgrade, CS-1, and asphalt surfaces are recommended to slope at no less than 2 percent to an appropriate stormwater disposal system or other appropriate location that does not impact adjacent buildings or properties. The pavement's life is dependent on achieving adequate drainage throughout the section and especially at the subgrade. Water ponding at the pavement subgrade surface induces heaving during the freeze-thaw process, which can readily damage pavement.

Tim Bush should annually review pavement surface conditions and performance to help identify and address any pavement maintenance issues. Crack maintenance should be accomplished on all pavement surfaces every 3 to 5 years to reduce the potential for surface water infiltration into the underlying pavement subgrade. Slurry seal applications are a common maintenance procedure for owners of asphalt pavement systems. If desired for pavement maintenance or preservation, we provide recommendations for slurry seal applications in the following items.

1. Cleaning: Ensure that cracks are thoroughly clean, dry, and free of all loose and foreign material when filling with crack sealant material. Use a hot compressed air lance to dry and warm the pavement surfaces within the crack immediately prior to filling a crack with the sealant material. Do not overheat pavement. Flame dryers are not allowed.

2. Sand Slurry: For cracks greater than 1 inch wide, fill with sand slurry by thoroughly mixing the components and pour the mixture into the cracks until full. Add additional CSS-1 cationic emulsified asphalt to the sand slurry as needed for workability to ensure the mixture will completely fill the cracks. Strike off the sand slurry, flush with the existing pavement surface, and allow the mixture to cure.

3. Hot Poured Sealant: For cracks less than 1 inch in width, fill with hot poured sealant by applying the material in accordance with these requirements and the manufacturer's recommendations. Confine hot poured sealant material within the crack. Clean any overflow sealant from the pavement surface.

Site Drainage

Surface Drainage

We expect most of this site to be paved with asphalt, and surface slopes established to direct water away

from buildings towards civil-designed stormwater collection, treatment, and disposal facilities. We concur with this approach, and offer the following recommendations to aid civil design.

Any runoff from precipitation, snowmelt, seeps, or springs must not be allowed to infiltrate foundations, pavement, and/or slab subgrades. Water must not be allowed to collect around building perimeters, or be allowed to infiltrate soil beneath the buildings. Implementing aggressive surface drainage to direct water away from site features will be critical during construction and the long-term performance for site improvements. Runoff or water migrating along the ground surface must be conveyed away from slopes and structures by ditches, swales or other surface water management procedures established by Knutzen.

The ground surface outside structures must be sloped at least 5 percent away for a minimum of 10 feet in other areas to rapidly convey surface water or roof runoff away from foundations. Slope remaining landscapes at least 2 percent away from structures. Where required at entrances or building access walkways, flatten surface grades as necessary to meet *Americans With Disabilities Act* (ADA) requirements. Provide roof gutters connected to downspouts and connect them to solid pipes placed away from the structure.

Infiltration Considerations

GPI accomplished infiltration testing in test pit TP-21020A-1 referencing the "Single Ring Infiltrometer" method outlined in Appendix 6B of Ecology's SMMEW. To perform the test, a steel cylinder (i.e. infiltration ring) measuring 1 foot in diameter was driven into the exposed soil at the test surface approximately 0.5 foot. Water was added to the infiltration ring to soak the soil at depth in the test pit. After an approximate 30-minute pre-soak period, water was added to the infiltration ring to maintain an approximate 1.5-foot constant head within the ring for a period of 2 hours. After the 2.0-hour constant head period, water flow was ceased, and GPI observed the falling head infiltration rate in the infiltration tube. We performed the test approximately 4 feet below the ground surface in the alluvial silty sand encountered in the explorations. The infiltration test yielded an unfactored infiltration rate of 2.5 inches per hour.

The infiltration rate measured at the site is relatively low. Prudent engineering judgment must be used when selecting an infiltration rate for designing stormwater disposal facilities. Knutzen should apply a factor of safety (FOS) to the measured infiltration rate, based on their engineering judgment and design intent. FOS for infiltration facilities in various regional central Washington municipalities typically range from 3 to 6. We recommend using a FOS of at least 4 on field-measured infiltration rates due to the inherent variability of soil conditions.

Neither groundwater nor infiltration limiting layers such as bedrock or caliche were encountered during exploration and are not expected within the depths explored. However, based on well data and proximity to the Yakima River, groundwater within 20 feet of the ground surface is likely and this should be factored into infiltration facility design to meet the WDOE stormwater disposal to groundwater separation requirements. Referencing SMMEW Table 5.6.1 and based on our site observations and laboratory test results, our opinion is the silty sand soil at the site maintains "high" vadose zone treatment capacity. Per SMMEW requirements, this treatment capacity requires a minimum of 10 feet of separation between the stormwater disposal facility invert and the highest known groundwater table. Single depth drywells appear to meet minimum WDOE separation requirements, but is it likely that this requirement will preclude the use of double depth drywells. Alternatively, infiltration galleries or subsurface chambers, such as StormTech™ Chambers, can be installed at shallower depths. Stormwater should be disposed at least 20 feet from buildings and downgradient from pavements, adjoining properties, and foundations.

Our experience is that infiltration facility performance is highly dependent on construction procedures. Extreme care must be taken to prevent construction traffic from traversing infiltration facility subgrades, or fine-grained soil (i.e. silt and clay) from contaminating subgrades. Compacting or "plugging" infiltration facility subgrades with fines will greatly reduce or preclude their ability to allow infiltration. Further, GPI recommends performing an infiltration test using design head elevations and the ring infiltrometer method at the conclusion of construction to verify design infiltration rates are achieved.

ADDITIONAL RECOMMENDED SERVICES

Geotechnical Design Continuity

We base this report's information on our exploration results, observations, and communications with Mr. Tim Bush and Mr. Paul Knutzen, P.E. The final site layout, building configuration, floor elevation, loading conditions, drainage measures, and many other aspects are not known at this time. Changes to the planned construction described in this report can significantly alter our opinions and design recommendations. Reliance on the design criteria is specific to the project concept defined herein. Therefore, we recommend that GPI be retained to provide geotechnical continuity throughout final planning and design for the proposed development as individual aspects become available during design development phases.

Geotechnical Observation During Construction

We recommend Mr. Bush retain GPI to provide continuity through construction observation and testing to document that our report recommendations have been followed. Providing these services during construction is a critical part of completing the design process. Having GPI staff review earthwork and foundation construction will help to identify potential problems, thus allowing the contractor to proactively remedy them and reduce the potential for errors and omissions.

EVALUATION LIMITATIONS

General

This report is prepared to assist the planning, design, and construction for the planned Bush RV Storage Facility located north of the Wellhouse Loop and Wyman Street intersection in Richland, Washington.

Our scope does not include an engineering evaluation for deep foundations, shoring, underpinning, retaining walls, dewatering systems, concrete section design, landscaping, or soil nutrient analysis. Variation in subsurface conditions may exist between or beyond our explorations, which can necessitate changes to the geotechnical recommendations in this report. Also, GPI made considerable assumptions regarding future building plans. If the improvement plans change from those described herein, we must be notified so that we can make modifications to our recommendations with respect to the changed improvements. If improvements do not align to the assumptions described, then the design criteria outlined herein cannot be used for the planned development. If GPI is not retained to observe conditions exposed during construction, we cannot be responsible for project impacts associated with varying site conditions, or extrapolations of the information in this report.

This report was prepared for the exclusive use of Mr. Tim Bush, Mr. Paul Knutzen, and the design team specific to the project concepts outlined herein. GPI cannot be held responsible for unauthorized duplication or reliance upon this report or its contents without written authorization. The geotechnical recommendations provided herein are based on the premise that an adequate program of tests and observations will be conducted by GPI during construction in order to verify compliance with our

recommendations and to confirm conditions between exploration locations. If a firm other than GPI is selected to perform these observations during grading or construction phases, we recommend that firm issue Mr. Bush or the owner a letter stating they will implement the recommendations herein as the geotechnical engineer retained for construction.

Subsurface variations may exist between exploration locations described herein. Test pit exploration allows observation of only a small portion of the site's subsurface conditions. Such variations may not be apparent until construction. Notify GPI immediately if subsurface conditions vary from those described herein. Once notified we will make necessary revisions to our recommendations and assist Knutzen with evaluating necessary construction or design changes. This acknowledgment is in lieu of all warranties either express or implied.

The following plates and appendices accompany this report:

Plate 1: Exploration Map
Plate 2: Foundation Construction Schematic

Appendix A: Unified Soil Classification System (USCS) and Exploration Logs
Appendix B: Laboratory Test Results

LEGEND

- Test pit location as observed by GPI on February 26, 2021
- * Infiltration test location

N

EXPLORATION MAP
Bush RV Storage Facility
Wyman Street & Wellhouse Loop
Richland, Washington

GeoProfessional Innovation.

PU21020A	PLATE 1

Reference: Base image from Google Earth, July, 2018. No Scale Intended

Foundation Drain Construction

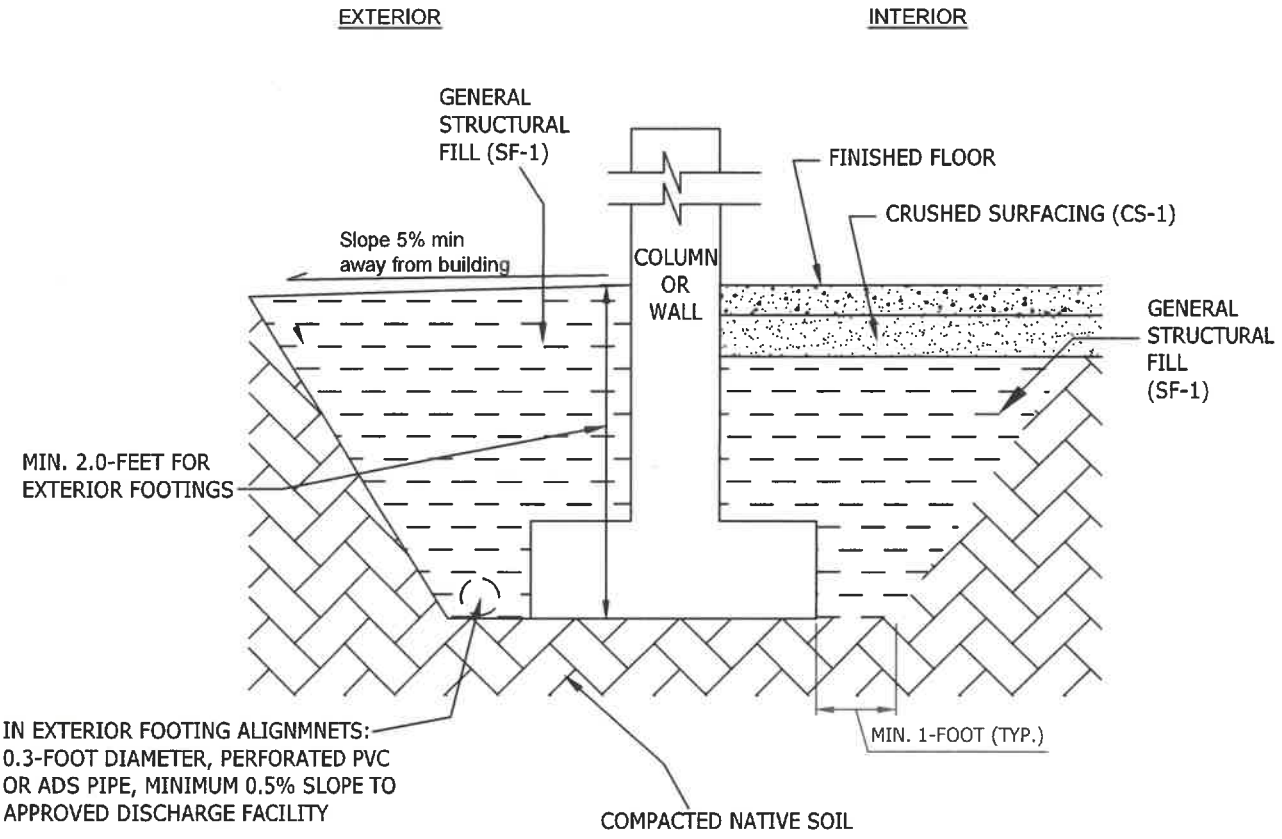
A. Excavate the subgrade to the planned foundation bearing elevation to expose native soil.

B. Prepare the exposed subgrade referencing the *Earthwork* report requirements. Geotechnical engineer retained for construction to verify subgrade preparation.

C. In exterior (perimeter) foundation alignments, place 0.3-foot diameter, fabric wrapped, perforated PVC or ADS pipe at lowest possible elevation to maintain gravity drainage, with positive slope towards daylight or approved discharge facility.

D. Backfill over-excavations with *General Structural Fill* (SF-1), placed and compacted referencing the *Structural Fill* report section.

This drawing is intended for shallow foundations supporting isolated columns or walls. Foundation stemwall height will vary. This is not a structural detail.



FOUNDATION DRAIN SCHEMATIC
Bush Wellhouse RV Storage
Wellhouse Loop and Wyman Street
Richland, Washington

GeoProfessional Innovation.

NOT TO SCALE

PU21020A	PLATE: 2
DRAWN BY: AMC	CHECKED BY: AJA

APPENDIX A

Unified Soil Classification System (USCS) and Exploration Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE GRAINED SOIL	GRAVEL	CLEAN GRAVEL		GW	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURES.
				GP	POORLY-GRADED GRAVEL, GRAVEL-SAND MIXTURES.
		GRAVEL WITH FINES		GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURES.
				GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURES.
	SAND	CLEAN SAND		SW	WELL-GRADED SAND, GRAVELLY SAND.
				SP	POORLY-GRADED SAND, GRAVELLY SAND.
		SAND WITH FINES		SM	SILTY SAND, SAND-SILT MIXTURES.
				SC	CLAYEY SAND, SAND-CLAY MIXTURES.
FINE GRAINED SOIL	SILT AND CLAY LIQUID LIMIT LESS THAN 50%			ML	INORGANIC SILT, SANDY OR CLAYEY SILT.
				CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAY.
				CL-ML	INORGANIC MIXED CLAY AND SILT.
				OL	ORGANIC SILT AND CLAY OF LOW PLASTICITY.
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	INORGANIC SILT, MICA- CEOUS SILT, PLASTIC SILT.
				CH	INORGANIC CLAY OF HIGH PLASTICITY, FAT CLAY.
				OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY.
				PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS.

BORING LOG SYMBOLS

STANDARD 2 INCH OD SPLIT SPOON SAMPLE

CALIFORNIA MODIFIED 3 INCH OD SPLIT SPOON SAMPLE

ROCK CORE

SHELBY TUBE 3 INCH OD UNDISTURBED SAMPLE

TEST PIT LOG SYMBOLS

GRAB BAG SAMPLE

BG

BULK SAMPLE

BK

RING SAMPLE

RG

GROUNDWATER SYMBOLS

GROUNDWATER AFTER 24 HOURS

GROUNDWATER AT TIME OF EXPLORATION

GROUNDWATER AT THE END OF EXPLORATION

GeoProfessional Innovation®

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks Note: BGS = Below Ground Surface
TOPSOIL - SANDY SILT, (ML) brown, loose, moist	0.0	ML								Moderate vegetation and organics encountered to 0.7-feet BGS.
ALLUVIUM - SANDY SILT, (ML) brown, loose to medium dense, moist				RG			3.2			
	2.5			BK	35.0					Silt content decreased with depth.
	5.0	ML								
	7.5									
Test Pit Terminated at 10.0 Feet.	10.0									Test pit loosely backfilled with site soil.

Client: Tim Bush	**Test Pit Number:** TP-21020A-1	GeoProfessional Innovation.	**EXPLORATORY TEST PIT LOG**
Project: PU21020A	**Date Excavated:**		
Backhoe: Zaxis 135	**Bucket Width:** 2'		
Depth to Groundwater: N.E.	**Logged By:** BCC		Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 4/8/21 11:09 - V:\ENGINEERING\GINT FILES\2021\210226 PU21020A - BUSH WELLHOUSE RV STORAGE.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks Note: BGS = Below Ground Surface
TOPSOIL - SANDY SILT, (ML) brown, loose, moist	0.0	ML								Moderate vegetation and organics encountered to 0.7-feet BGS.
ALLUVIUM - SANDY SILT, (ML) brown, loose to medium dense, moist				BG			7.5			Silt content decreases with depth.
	2.5									
	5.0	ML								
	7.5									
Test Pit Terminated at 10.0 Feet.	10.0									Test pit loosely backfilled with site soil.

Client: Tim Bush	**Test Pit Number:** TP-21020A-2	GeoProfessional Innovation.	**EXPLORATORY TEST PIT LOG**
Project: PU21020A	**Date Excavated:**		
Backhoe: Zaxis 135	**Bucket Width:** 2'		
Depth to Groundwater: N.E.	**Logged By:** BCC		Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 4/8/21 11:09 - V:\ENGINEERING\GINT FILES\2021\210226 PU21020A - BUSH WELLHOUSE RV STORAGE.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks Note: BGS = Below Ground Surface
TOPSOIL - SANDY SILT, (ML) brown, loose, moist	0.0	ML								Moderate vegetation and organics encountered to 0.7-feet BGS.
ALLUVIUM - SANDY SILT, (ML) brown, loose to medium dense, moist	2.5									Silt content decreases with depth.
	5.0	ML								
	7.5			BG	25.7		6.6			
Test Pit Terminated at 10.0 Feet.	10.0									Test pit loosely backfilled with site soil.

Client: Tim Bush	**Test Pit Number:** TP-21020A-3	GeoProfessional Innovation.	**EXPLORATORY TEST PIT LOG**
Project: PU21020A	**Date Excavated:**		
Backhoe: Zaxis 135	**Bucket Width:** 2'		
Depth to Groundwater: N.E.	**Logged By:** BCC		Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 4/8/21 11:09 - V:\ENGINEERING\GINT FILES\2021\210226 PU21020A - BUSH WELLHOUSE RV STORAGE.GPJ

USCS Description	Depth (ft)	U.S.C.S. Class	Symbol	Sample Type	% Passing No. 200 Sieve	Dry Density (pcf)	Moisture Content (%)	Pocket Pen. (tsf)	Atterberg Limits LL PI	Remarks Note: BGS = Below Ground Surface
TOPSOIL - SANDY SILT, (ML) brown, loose, moist	0.0	ML								Moderate vegetation and organics encountered to 1.0-foot BGS.
ALLUVIUM - SANDY SILT, (ML) brown, loose to medium dense, moist	2.5			RG		78.3	3.6			
	5.0	ML		BG	25.5		8.0			Silt content decreases with depth.
	7.5									
Test Pit Terminated at 10.0 Feet.	10.0									Test pit loosely backfilled with site soil.

Client: Tim Bush	**Test Pit Number:** TP-21020A-4
Project: PU21020A	**Date Excavated:**
Backhoe: Zaxis 135	**Bucket Width:** 2'
Depth to Groundwater: N.E.	**Logged By:** BCC

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EXPLORATORY TEST PIT LOG

Sheet 1 Of 1

GPI TEST PIT - STRATA.GDT - 4/8/21 11:09 - V:\ENGINEERING\GINT FILES\2021\210226 PU21020A - BUSH WELLHOUSE RV STORAGE.GPJ

APPENDIX B

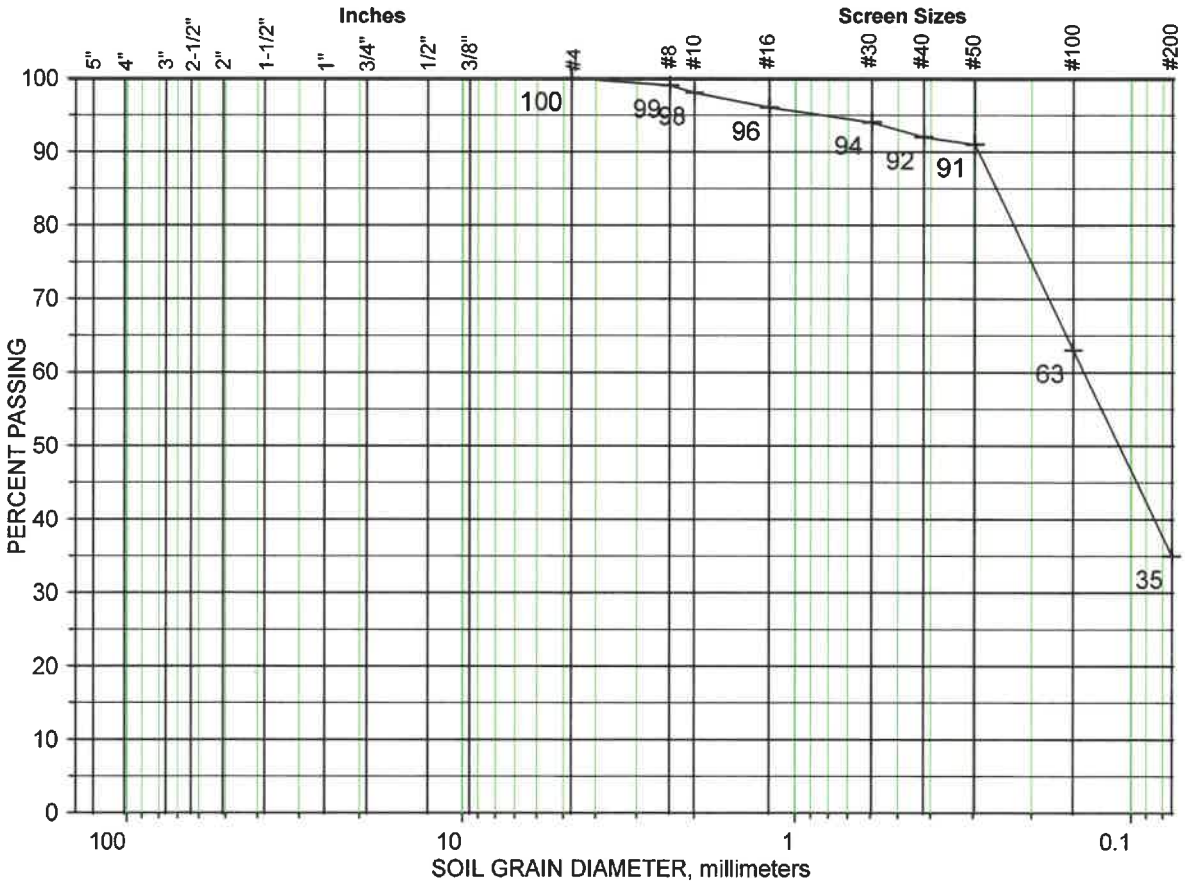
Laboratory Test Results

GRADATION ANALYSIS

ASTM D6913

Project: Bush Wellhouse RV Storage
Client: Tim Bush
File: PU21020A
Sample No: PUL21-0043B
Sample Location: TP-21020A-2 @ 4.0 - 5.0 feet BGS
Sample Classification: Silty Sand (SM)
Date tested: 3/23/21 By: BCC

Cobbles	Gravel		Sand		
	Coarse	Fine	Coarse	Medium	Fine



Reviewed by: _____

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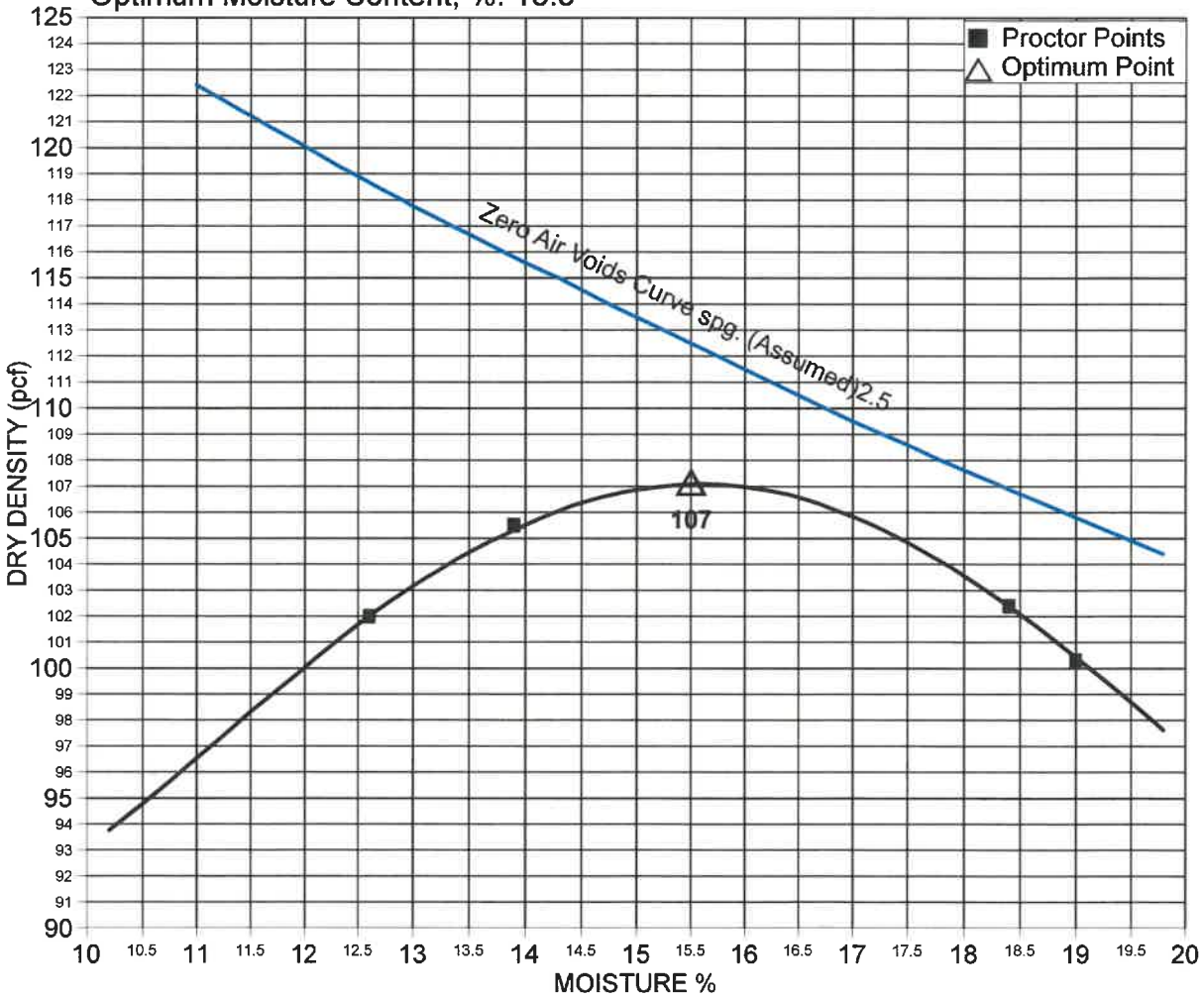
MOISTURE-DENSITY RELATIONSHIP CURVE
ASTM D 1557
Method C

GRADING ANALYSIS

SCREEN SIZE	% PASSING	AS TESTED
No. 4	100	100

Project: Bush Wellhouse RV Storage
Client: Tim Bush
File Name: PU21020A
Lab Number: PUL21-0043B
Sample Location: TP-21020A-2 @ 4.0-5.0 feet BGS
Sample Classification: Silty Sand (SM)
Date Tested: 3/23/21 By: BCC
Rammer Type: Manual

Maximum Dry Density, pcf : 107.0
Optimum Moisture Content, %: 15.5



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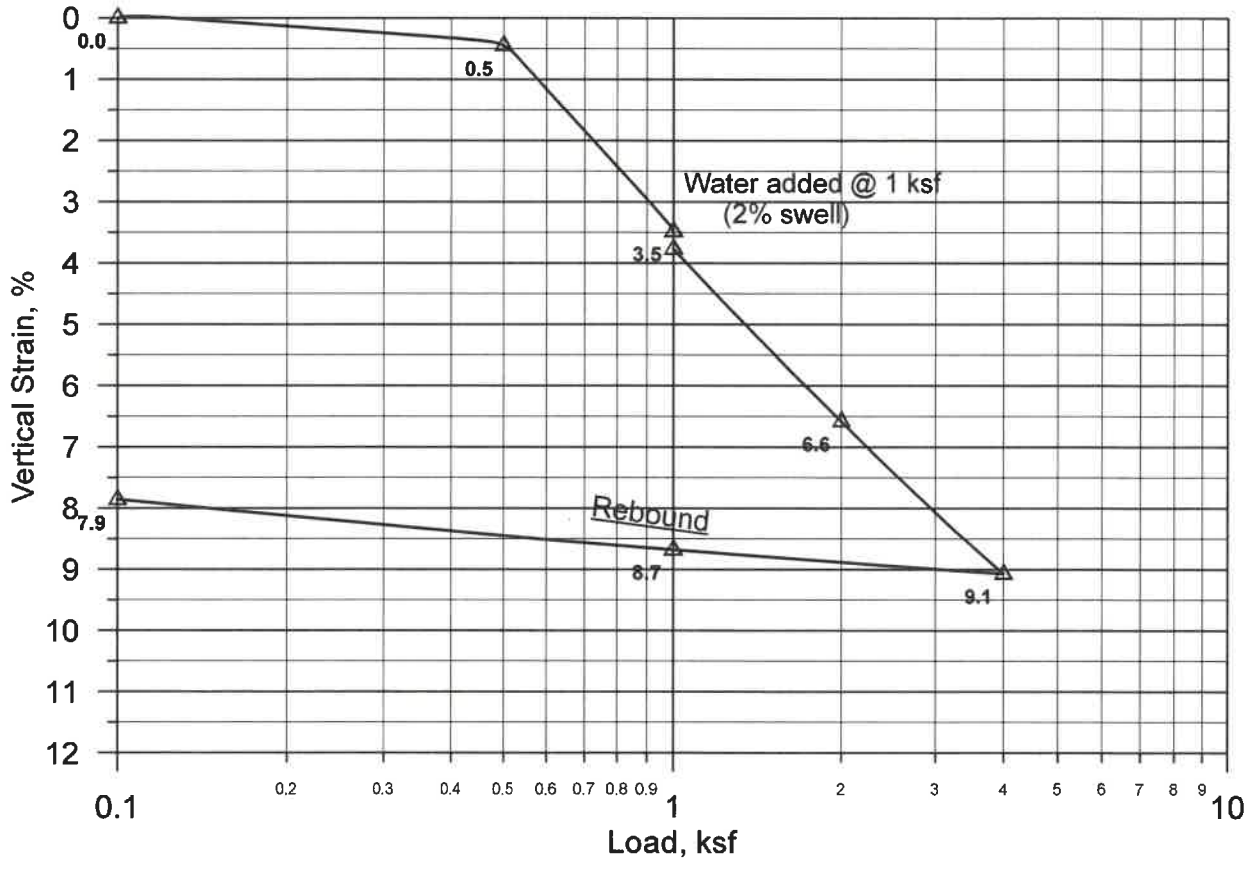
CONSOLIDATION TEST RESULTS
ASTM D 2435 (Method A)

Project: Bush Wellhouse RV Storage
Client: Tim Bush
File Name: PU21020A
Lab Number: PUL21-0043F
Sample Identification: TP-21020A-4 @ 4.0-4.5 feet BGS
Sample Classification: Sandy Silt (ML)
Sample: In-Situ Tube (Condition: Good)
Date Tested: 3/15/2021 By: JBM
Sample Dry Unit Weight: 78.3 pcf
In-Situ Moisture Content: 3.6%
Atterberg Limits: Non-plastic



Reviewed By: _____

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APPENDIX E
Well Log

3956

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 032305

Water Right Permit No. A

OWNER: Name Murry Thorson Address Valley View

(2) LOCATION OF WELL: County Benton NE¼ NE¼ Sec 15 T. 9 N., R. 28 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ ☐ Irrigation ☐ Test Well ☐ Other ☐ ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)

Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 205 feet. Depth of completed well 205 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from -1 ft. to 37 ft.
Welded ☒ Liner installed ☒ 5 " Diam. from 20 ft. to 205 ft.
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used Torch
SIZE of perforations ¼ in. by 6 in.
73 perforations from 193 ft. to 205 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 26 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 43 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal./min. with ft. drawdown after hrs.
Airtest 150 gal./min. with stem set at 150 ft. for 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Ash	0	20
Redish Broken Basalt	20	32
Hard Black Basalt	32	126
Blue clay	126	147
Hard Black Basalt	147	190
Broken Black Basalt water Bearing	190	205

RECEIVED
AUG - 1 1990
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

ENTERED

Work started 6/26/90, 19. Completed 6/27, 1990

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME ST Hazelton Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 701 SIXTH AVE

(Signed) Pete E. Hazelton (WELL DRILLER) License No. 0483

Contractor's Registration No. 601-021B-715 Date 6/27, 1990

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 3

APPENDIX E
USGS Maps

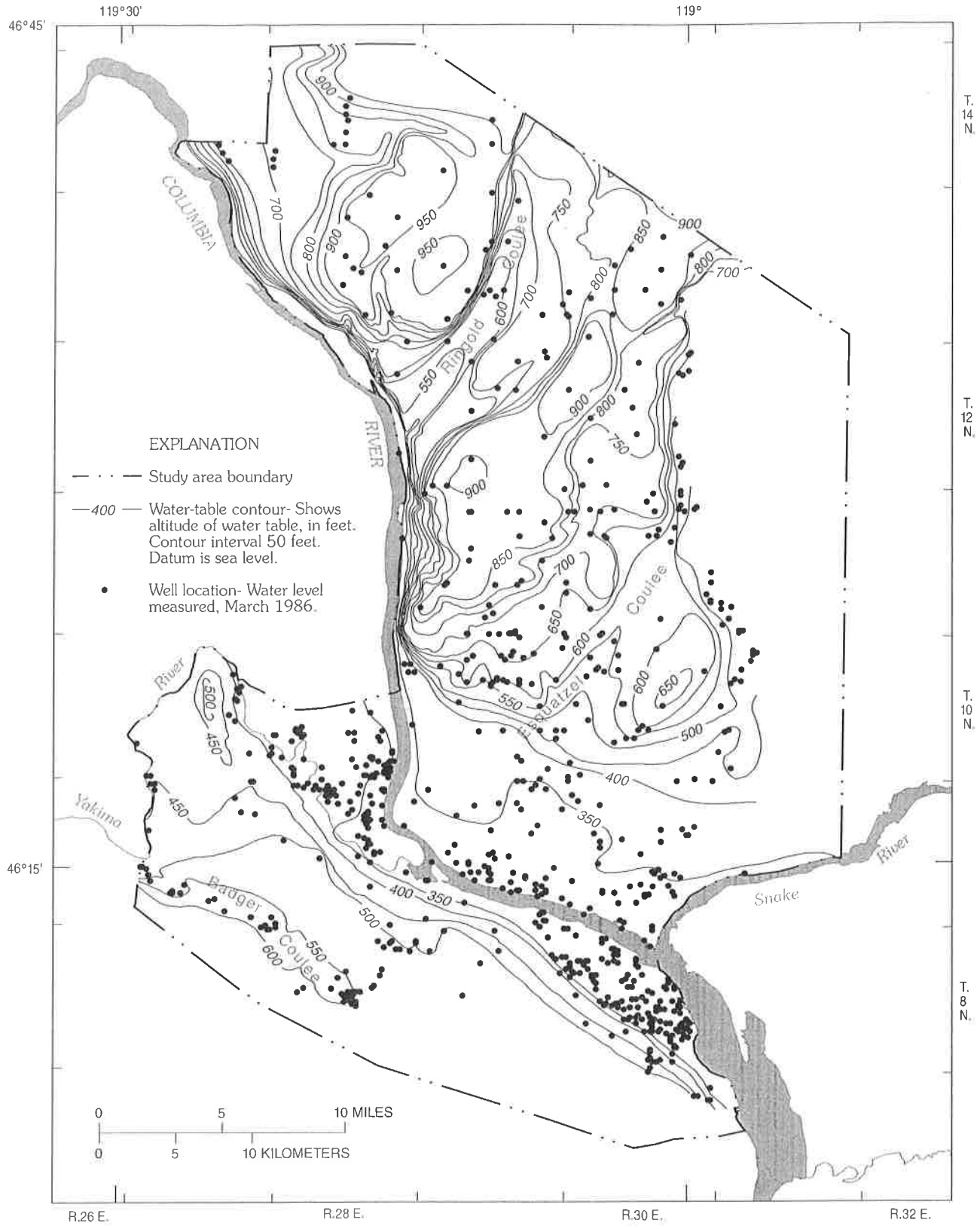

Figure 26.--Water-table altitude, March 1986.

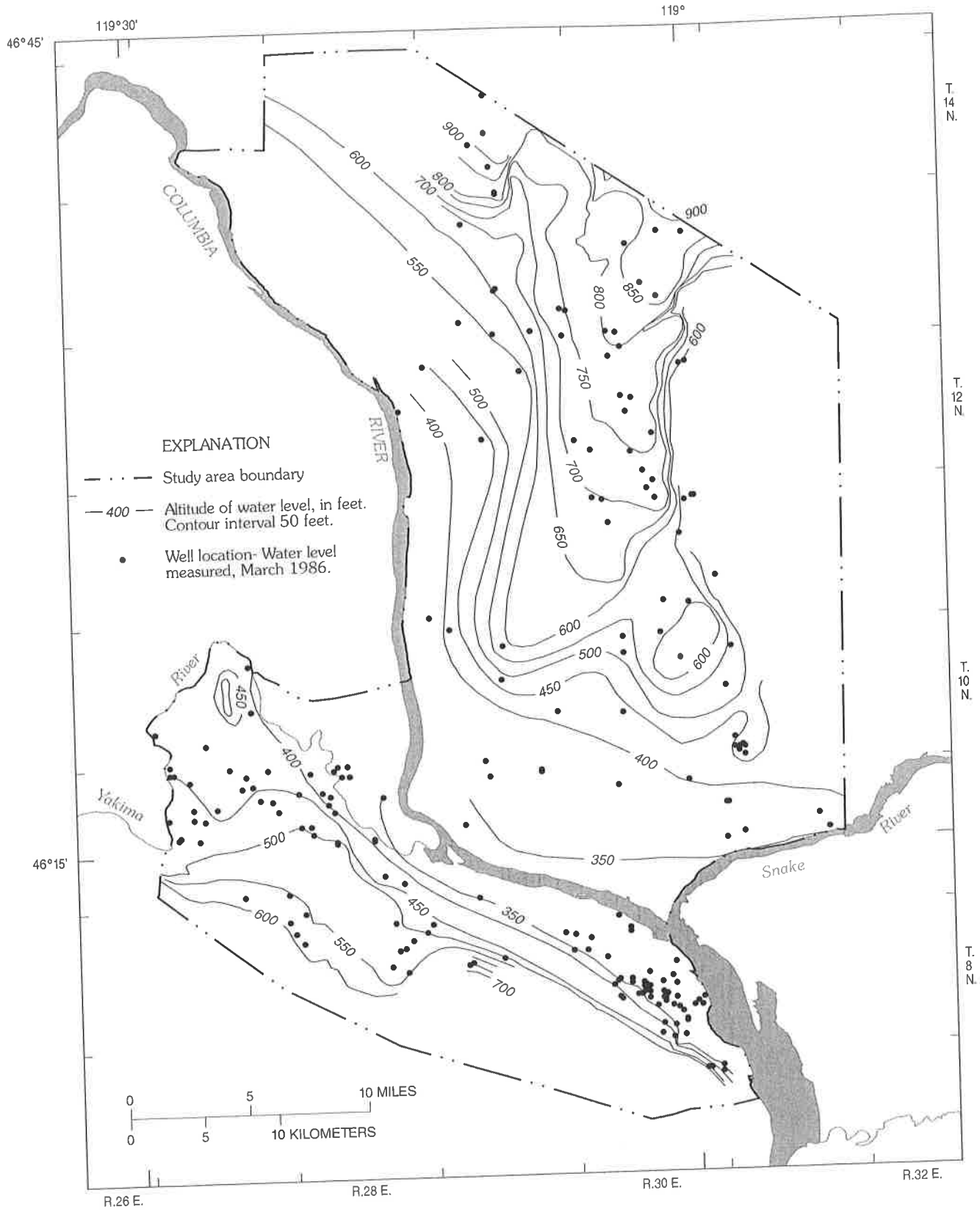

Figure 27.--Water-level altitudes in the Saddle Mountains Basalt, March 1986.

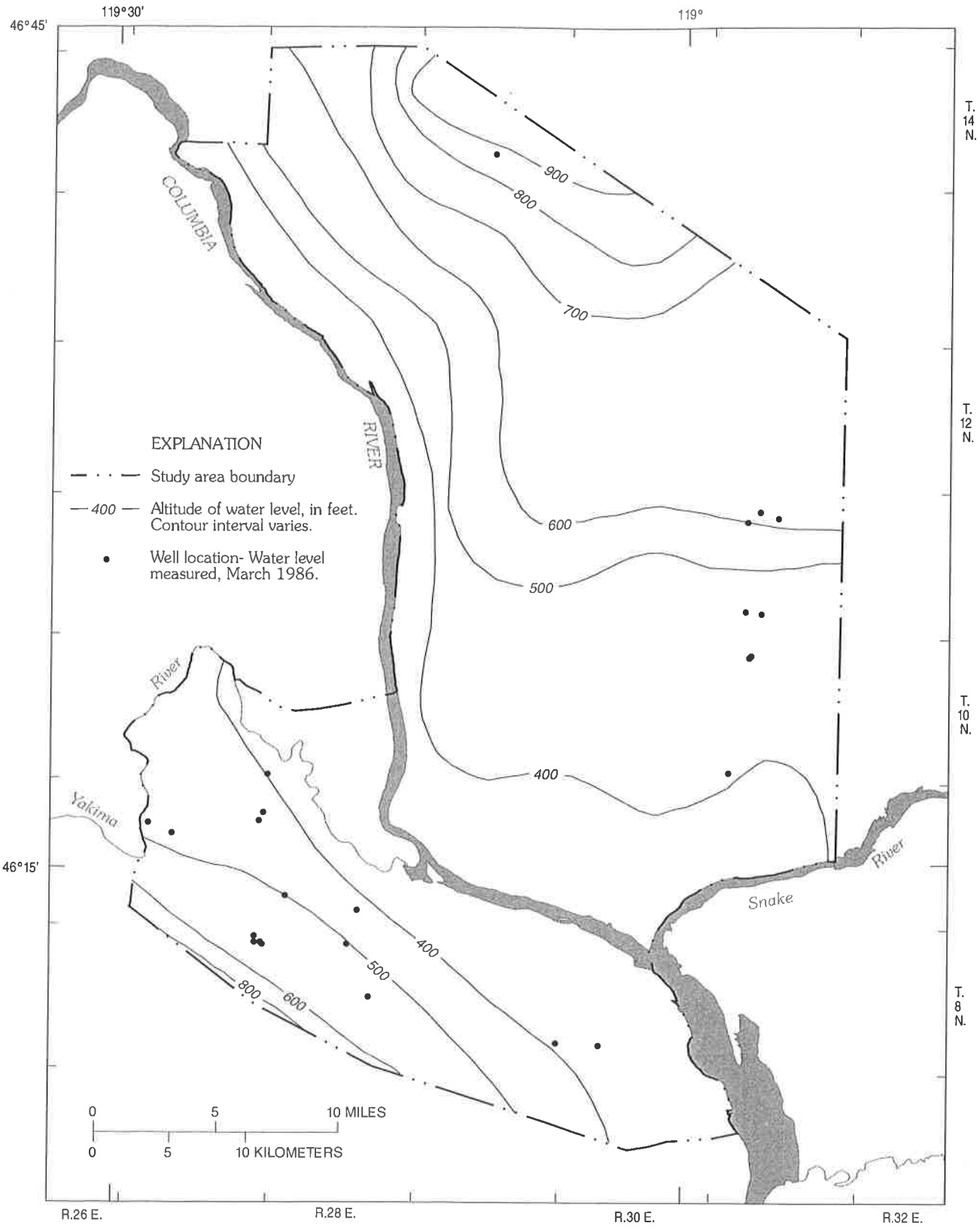

Figure 28.--Water-level altitudes in the Wanapum Basalt, March 1986 (Modified from Bauer, Vaccaro, and Lane, 1985).