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Date: January 27, 2009
To: Mary Lou Gilman
Missoula City-County Health Department

By: Colin Lane

Attn: Mary Lou Gilman

Copies to: File, Julie Stiteler/homeWORD, Matt Smith/PCI

Project: Equinox
Project #: 06.035

RE: Graywater variance application

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Copies	Date	Description
1		Graywater variance application
1		check #1091 for \$650

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Comments:

Mary Lou,

Please find attached our graywater variance application for the Equinox project. Please let me know as soon as possible if we need any additional information in our application. Thanks!

Colin Lane



VARIANCE REQUEST

EQUINOX

GREYWATER IRRIGATION SYSTEM

JANUARY 1, 2009

homeWORD, Inc.
MMW Architects
PCI

127 N Higgins #307
125 W Alder St
3115 S Russell St

Missoula MT 59802
Missoula MT 59802
Missoula MT 59801

Variance Request
EQUINOX
Gray Water Irrigation System
January 22, 2009

1. Applicants Name and Address

homeWORD, Inc., general partner of
Equinox Development Limited Partnership
127 N Higgins #307
Missoula, MT 59802

2. Specific provision or provisions of the Code from which a variance is requested.

Regulation 1:

I.C - Connection to Public System: "No person owning real property with a structure that generates sewage shall be issued a permit to install or replace a wastewater- treatment and disposal system when public sewer abuts the property"

V.B-(2) – Floodplain or flood-prone areas: "Subsurface wastewater treatment and disposal systems shall not be permitted within 100 feet of a floodplain or flood-prone area or in a drainageway, natural or manmade intermittent watercourse."

V.C-(1) – Location of Systems: Minimum horizontal setback distances:

Table 1

9 (c). Floodplain or flood prone area: 100 feet

3. Legal Description or address where variance is requested.

Tract 1 of Certificate of Survey 3463, the NE 1/4 of Section 20 Township 13 North, Range 19 West in the City of Missoula.

The address is 1515 Liberty Lane (formerly 601 N. Russell Street). The property is located on the former Liberty Lanes bowling alley site at the corner of West Broadway and Russell Street. The size of the lot is approximately 3.2 acres.

The property is bordered on the south by the Clark Fork River, on the east by Russell Street, to the north by Liberty Lane and to the west by commercial property and an apartment complex. The property is currently served by Mountain Water's public water supply and the City of Missoula's sewer.

4. Detailed and accurate description of the proposed project or circumstances under consideration.

Introduction

homeWORD has a long-standing, holistic approach to affordable housing that grew out of the simple notion that you cannot build for the future by destroying the environment. All homeWORD projects include strategies for smart land use, resource and energy efficiency, waste reduction, and community sensitive design. homeWORD's values demonstrate a belief that achieving sustainability through green building techniques means paying attention to social equity, environmental conservation, and strengthening the local economy.

With homeWORD's purchase of the former Liberty Lanes bowling alley, many opportunities arose that further expanded homeWORD's vision. Chief among these were opportunities to improve water quality and reduce water usage. The riverbank along the edge of the property was formerly a natural floodway, but in the late 1960s was filled with large, unattractive slabs of concrete and asphalt rip rap. Heavy use of the bank was beginning to erode the steep bank. Makeshift shelters and litter were scattered across the bank. As part of their project, homeWORD, with support from the Missoula Redevelopment Agency, will remove the concrete rip-rap, return the bank to a more natural slope, plant native species, and construct a public bike/ped trail for the city's trail system. homeWORD also found opportunities to better filter stormwater on site. A parking garage was designed into the project, reducing the amount of impermeable surfaces on site. A raingarden will be planted that naturally filters much of the remaining parking lot runoff. Roof runoff will also be recycled into irrigation. homeWORD even took their water-sensitive design inside the building, specifying low-water plumbing fixtures, including dual flush toilets.

One of homeWORD's goals with this project is to install a gray water irrigation system. This system, by using recycled water from specific plumbing fixtures, will provide landscape irrigation for a large portion of the site. Water use will significantly be reduced, and the impact on the City's sewer treatment facilities will be minimized. The gray water irrigation zone will be located in the center of the project, and will contain grassy plants to create an open recreation area for the project's residents and visitors. In the center of the green space will run a dry 'stream bed' designed to mimic a natural watercourse. This dry stream bed will be lined with rocks and native plantings frequently found in area watercourses.

Project description

Two buildings will be constructed on the property. The first building, Equinox, is currently under construction. Equinox consists of 35 affordable housing units, comprised of studio, one-bedroom, and two-bedroom units. With Equinox's 35 units, homeWORD will own 110 affordable housing units in Missoula. Equinox is included in Phase 1 as noted on the attached site plan (Appendix B). The second building, shown as Phase 2 on the attached site plan, is a planned mixed use building and will

include homeWORD's offices, additional office space, and residential units. At this time, homeWORD is in the pre-development stage of Phase 2.

Current designs for the site include a large landscaped area between the two buildings. homeWORD would like this area to be irrigated using gray water and are seeking approval for a gray water irrigation system from the Missoula City-County Health Department. This large landscaped area will be constructed during Phase 2 of the project (this area includes the gray water drip irrigation system). The gray water tanks, filtration system, and building plumbing system will be constructed during Phase 1. In this application, homeWORD is seeking approval for the entire gray water system, including all components in both phases of the projects.

In the fall of 2008, Montana DEQ published a working draft of the state's gray water rules. This system meets all of the state's requirements in the draft rules. These rules are included for reference under Appendix D. Until these draft rules become finalized, however, the Missoula City-County Health Code Regulation 1 is applied to our project. Because Phase 1 construction is well under way, and because funding already obtained for the gray water system is time sensitive, homeWORD is seeking approval of the gray water system as soon as possible.

Gray Water System Design Criteria

When designing gray water irrigation systems, the amount of gray water available for irrigation must be balanced with the amount of land area and type of landscaping to be irrigated. Because homeWORD already owns many affordable housing units in the Missoula area, the occupancy rate for their properties is fairly predictable. When the occupancy rate is more predictable, the amount of gray water available for irrigation is also more predictable. The total amount of gray water expected to be produced from the building is approximately 1,071 gallons per day. This amount is based on other homeWORD projects that are similar in building type, unit size, and plumbing fixture type. The total landscaped area proposed to be irrigated with gray water is approximately 11,838 square feet.

We have included gray water supply calculations and irrigation demand information in Appendix C of this report. This was completed with the assistance of Chris Webb P.E., a licensed engineer from the state of Washington, who has assisted with the design of several LEED Certified Projects that use gray water for irrigation.

Gray Water Sources

Phase 1 (Equinox) will provide the sole source of gray water to the irrigation system. The second building to be built (Phase 2) will also generate gray water available for irrigation, but adequate gray water is already being generated in Phase 1 and additional gray water irrigation is unnecessary. Plumbing fixtures that will connect to the gray water system include kitchen sinks, bathroom lavatories, showers/tubs, and clothes washing machines. Floor drains, toilets, roof drains, and janitor's mop sinks

will not connect to the gray water system. No dishwashers, laundry tubs or drinking fountains are included in this project.

Gray Water Tanks

In order to equalize the flow and ensure no solids will be going through the system, an initial settling basin of 500 gallons will be installed at the head end of the system.

Gray water will flow from the settling basin into a 2000 gallon storage/dosing tank. Both the 500 gallon pre-settlement tank and the 2000 gallon storage/dosing tank will be provided with a Biotube filter designed to further reduce the amount of solids entering the drip irrigation system. The total amount of storage available in the 2000 gallon tank and the pre-settlement basin is approximately 1.5 times the amount of gray water generated per day. Unlike standard septic tanks, gray water should not be given a large amount of retention time, as anaerobic activity in the tank generates foul odors. Usually the water going into the tank should come out of the tank within 24 hours. However, this needs to be balanced with the flow rate into the tank and the amount of gray water required for an irrigation zone.

The gray water tank design is included in Appendix F of this report.

Gray Water Irrigation

From the storage/dosing tank, the gray water will be pumped out to the irrigation drip system. We have provided an overflow drain at the high water level of the tank. This overflow will drain back to the City of Missoula's wastewater treatment system during times when there is no requirement for landscape irrigation and the gray water system is taken out of service.

The irrigation system is a commercially available drip irrigation system specifically designed for gray water. This system is manufactured by Geoflow, Inc. The system will be a looped system that drains back to the tank upon completion of the irrigation cycle. Geoflow provides everything for the irrigation system, including the control panel. The pump will be on a dose/timer. Once adequate gray water is available, a float switch activates the timer to begin running through the irrigation cycles. The timer will not start the pump unless there is adequate water to run through a cycle.

All of the irrigation heads will be installed below the surface of the ground in order to minimize potential for contact with animals and humans. The drip irrigation system is designed to be placed approximately 4 inches below the soil surface and immediately next to a plant. This allows water being emitted by the irrigation system to be used by the plants.

In the gray water irrigation area, a backup system with potable water will not be installed. If the gray water system is not operable, the existing drip irrigation system can be readily modified to connect to the potable irrigation system installed in other areas on site.

Location of Gray Water Tanks and Irrigation

According to the minimum horizontal setback distances in the Missoula County Health Code, the gray water disposal must occur at least 100 feet away from the Clark Fork River and 100 feet away from the 100 year floodplain. As noted on the attached Floodplain Site Plan, the gray water irrigation zone is proposed to have a minimum 100 foot setback from the river's ordinary high water mark. The attached Site Plan (Appendix B) also shows the location of FEMA's 100 year floodplain line. Unfortunately, FEMA's 100 year floodplain line does not reflect the actual contours of the property. As such, we are proposing to vary from the setback requirements from the floodplain line.

System Maintenance

Maintenance of the system will be provided by the owner, homeWORD. In addition to a full-time staff member dedicated to Asset Management, homeWORD has a long-term maintenance agreement with the Missoula Housing Authority to provide maintenance services. This site, as with homeWORD's other sites located in Missoula, will have dedicated, full-time, experienced maintenance personnel. For Equinox, the maintenance personnel will be responsible for operating and maintaining the gray water system. After completion of the project, Operations & Maintenance manuals will be provided that will include specific instructions to maintenance personnel for the gray water system.

In addition, each tenant in the building is required to go through a "training session" prior to moving in. During this meeting, the tenant will be informed about the gray water system and what is allowed to be placed in that system. Additional tenant questions will be addressed by the maintenance personnel. homeWORD will also make available their full-time Asset Manager to answer any tenant questions. If tenants have any waste material that cannot be disposed of through the gray water system (or the City sewer system), maintenance personnel will assist the tenant in collecting this material and will dispose of it in a proper manner. By making this type of assistance available to tenants, we believe that a significant amount of harmful waste will be diverted not only from our gray water system, but also from the City's sewer system.

5. Written explanation addressing each criteria under section VI(E)(1) and (2).

- a. Special Circumstances exist which are:
 - i. peculiar to the applicant's property or situation and
 - ii. not caused by the applicants action or inaction; and
- b. Substantial undue hardship would result from requiring strict compliance to the provision or pro vision from the variance is sought by:

- i. creating an unreasonable financial burden on the applicant; and
- ii. depriving the applicant a right commonly enjoyed by other persons similarly situated under terms of the Code.

homeWORD's affordable housing projects utilize a number of different funding sources, both private and public. Affordable housing projects of this type rely on up-front funds for construction, and include both public and private funding sources. Tenant rents are then set based on a number of different factors, including tenant incomes and ongoing project maintenance costs such as utility fees and maintenance costs. Unlike tenants of typical market-rate housing, homeWORD's tenants do not always have the same ability to afford increases in rents due to higher utility and water costs. Because homeWORD receives project construction funds up front, it is possible to direct initial funds to many cost effective features in order to maintain low tenant rents over the long term. These features include providing additional insulation, installing solar panels, and installing a gray water system.

The additional cost for this gray water system has already been provided through a private grant. Adding a gray water system to the project furthers homeWORD's sustainability goals, provides a better working relationship with grant donors and could help to secure more money for future affordable housing projects.

Protection of Water Quality

- c. Additional Criteria are required for a variance from Regulation 1. The Board may approve a variance from regulation I only if it finds, in addition to all elements required in section VI (E)(1) and (2) above, the following:
 - i. the system that would be allowed by the variance will not cause pollution of state waters in violation of 75-5-6 05, MCA; and
 - ii. the granting of the variance will protect the quality of water for public water supplies and domestic uses, and will protect, the quality of water for other beneficial uses, including those uses specified in 76-4-101, MCA.

Steve Kilbreath has reviewed the proposal for the gray water irrigation system and supports the project. DEQ has also agreed to act as the project's technical sponsor.

The gray water system proposed will protect water quality and will not cause pollution of state waters for the following reasons:

- Adequate setbacks from the Clark Fork River
- Appropriate landscaping which utilizes all available gray water
- Separation between groundwater and irrigated gray water
- Prevention of overland flow between gray water and the Clark Fork River

Adequate setbacks from the Clark Fork River

Because this site is adjacent to the Clark Fork River, the gray water irrigation system has been carefully located. The system is not located within the floodplain area as recommended by the DEQ draft gray water rules (see Appendix D). The draft gray water rules also do not require a specific setback from surface water (see proposed modifications to ARM 17.36.323 in Appendix D). Missoula County Health Code's requirement for a 100 foot setback from surface water (Regulation 1 V.C-(1), Table 1) has been met with the proposed system design. This application is requesting a variance from the health codes requirement for a 100 foot setback from the floodplain area. As shown on the attached site plan (Appendix B), the current floodplain area as defined by FEMA does not consider the actual riverbank elevations. The 100 year flood event will not follow the line as defined by FEMA (by elevation, the 100 year flood event would occur roughly along the edge of the riverfront bike/ped trail). We believe that the system as located is adequately set back from the river, even during unusual high water conditions.

Appropriate landscaping

The plantings used in the gray water irrigation zone are designed to use all of the gray water during irrigation. This water is placed within the root zone of plants through a drip irrigation system. The water will be available for the plants during the growing season. During other times of the year, the gray water system will be shut off and gray water will be routed to the City sewer system. The system is designed to provide only the amount of water required by the plants. No excess water should be required.

Groundwater separation

The area of gray water application will be planted with grasses and shrubs specifically selected to use the gray water amounts that are applied. Significant amounts of gray water are not expected to drain down beyond the plant root zones. Also, the depth to groundwater in the area proposed for gray water irrigation is over 8 feet below the ground surface, and gray water seepage into groundwater is not expected to occur. The attached geotechnical report describes the testing for groundwater that was performed on this site. As part of the soils investigation work, groundwater was periodically tested during the high water of spring and summer of 2007. No groundwater was encountered at any of the borings. The geotechnical information also indicates that the groundwater in the area adjacent to the Clark Fork River occurs below the level of the adjacent river.

Prevention of overland flow

In addition, the configuration of the site does not allow gray water to overland flow into the river. The gray water application zone is located behind a riverbank bike/ped trail, which is located 3 feet above the lowest point in the gray water application zone. This trail will act as a dam for any surface gray water and surface graywater occurring at all is highly unlikely given the underground drip irrigation system. If surface gray water does accumulate, the system will be shut down.

Given the amounts of gray water provided by Equinox (see Appendix C), all gray water provided is expected to be used by plants. The attached geotechnical report (Appendix J) and geotechnical letter (Appendix H) demonstrate that the soils on this property are dense soils which are resistant to lateral movement of water from the gray water irrigation area into the Clark Fork River.

6. **A list of the names and address of all adjacent property owners. Failure to provide a complete and accurate list may result in delay or denial of the variance.**

See attached Appendix N.

7. **Any further relevant information which the department determines will assist the board in making its decision and which is reasonably obtainable by the applicant.**

The following appendices have been attached to this application.

Appendix A- Project Conceptual Renderings	1
Appendix B- Gray water Site Plan (11x17)	1
Appendix C- Grey Water Supply Calculations	1
Appendix D- DEQ Draft Grey Water Reuse Rules (October 10, 2008)	7
Appendix E- DEQ Grey Water System Definitions	6
Appendix F- Utility Plan and Gray water System Plan (11x17)	2
Appendix G- Site Landscape Plan	1
Appendix H- GMT Letter dated March 3, 2008	2
Appendix J- Geotechnical Investigation Report	25
Appendix K- information from the manufacturer of the gray water irrigation system, Geoflow.	
Appendix L- letter from the MDEQ in support of this project	
Appendix M- Operations and Maintenance Manual	
Appendix N- Adjacent property owners	

Professional Consultants, Inc.



Matthew S. Smith, P.E.

