Introduction

The intent of this report is to determine the source of water, the domestic consumption and fire protection for the The Villages at Okanagan Landing, owned by the Hesperia Development Corporation.

This development permits up to a maximum of 1485 dwelling units.

A secondary intent of this report is to size the reservoir expansion required in the upper pressure zone of the development.

There is an existing water system called the Claremont Water Utility that has a water main running through the site with a reservoir immediately south of the Hesperia property. Discussions with the Water Utility and Greater Vernon Services, Water (GVS Water) indicate that this system will remain intact. For the purposes of the predesign of The Villages at Okanagan Landing, these users have not been included. It is recommended though that during detailed design provision be made to provide these users with City water in the event it may be required in the future.

Water System Description

Water will be supplied to the site by GVS Water. As seen in Figure 2, the water supply for Phase 1 of the development will be provided by extending a water main along Okanagan Avenue to the site and then into the site itself. Southerly portions of Phase 1, which are at higher elevations than the current 425m pressure zone can supply, will need to be serviced by extending water from Phase 3.

However, at the time of development, fire flow requirements may be mitigated through building design as well as a covenant on the properties indicating that higher pressures will be available in the future at the time of Phase 3 development.

Small, local pressure pumps may also be considered to supplement the pressure and allow for development of the higher elevations in Phase 1 in the interim period until Phase 3 is developed. This solution will depend on its cost effectiveness as well as support from GVS Water and the City of Vernon.

GVS Water has confirmed that there is sufficient pressure on the lower portion of Phase 1 and sufficient volume available for all of Phase 1. When the development proceeds to Phases 2 and 3, there are two servicing options available for water.

Option 1:

- An extension of the water main from Okanagan Avenue for the lower portion of Phase 2;
- To serve the higher areas in Phase 2, create a second pressure zone by expanding the existing reservoir to the west (Beverly Hills Reservoir) and adding pumping capacity to the existing water pump station near Okanagan Landing Bench Row Road;
- To meet the total demands for Phases 2 and 3 and to provide sufficient pressure and volumes as those phases build out, construction of a water main from the west to the Hesperia site will ultimately be required.

Option 2:

- Skip the initial step of extending the water main from Okanagan Avenue as noted in Option 1
- Immediately proceed to create a second pressure zone by expanding the existing reservoir to the west (Beverly Hills Reservoir) and adding pumping capacity to the pump station near Okanagan Landing Bench Row Road.
- Construct a water main from the west as outlined in Option 1. The portion of Phase 2 that would have been serviced by the water system from Okanagan Avenue, in Option 1, would be serviced from Phase 3 through local pressure reducing stations.

The choice of which option to use will be based on cost and timing. It may be more cost effective to utilize only the second pressure zone and not further extend the water main on Okanagan Avenue. This will depend on whether or not other developers have been required to increase system capacities prior to Hesperia needing them, whether the City has extended the Eastside Connector Road (complete with a new water main) immediately to the west of the Hesperia site, and finally, on the rate of development of the Hesperia site itself. As Phases 2 and 3 are several years away, it is intended to carry these options forward, knowing either one is suitable for water service.

GVS Offsite Water Model

GVS Water policy is such that for a small fee, they will perform a water demand model with their current water system. This was performed in August 2009 and it was determined that water for the lower pressure zone (425m) was able to be supplied by extending the existing 300mm water main within Okanagan Avenue to the site. It was also determined that it was also possible to service some of the proposed Phase 2 development within the lower zone by extending the water main from Okanagan Landing Road up the west side of the development.

Water within the upper pressure zones is to be supplied by upgrading the pumping system that supplies the Beverly Hills water reservoir. It was determined there is no spare capacity within that reservoir and that there is only fire protection of 60 l/s for a 2 hour period.

Piping from the Beverly Hills system will also require the installation of 2,300m of 250mm water main as well as the installation of pressure reducing stations.

Fire Flow and System Demand Used

The proposed development proposes multifamily shared wall buildings. Figure 2 also shows the proposed fire flow for each building type. We will use the guides that include multi family (MF) units and commercial units. This has led to three different levels of fire flow:

MF Units	= 90 l/s
MF Units (Higher Density)	= 120 l/s
Commercial and Apartments	= 150 l/s

Domestic demand is based on a Maximum Day Demand (MDD) per capita consumption of 1,800 l/d, and an Average Day Demand (ADD) per capita consumption of 700 l/d and an occupancy rate of 2 persons per MF unit.

Commercial development primarily included high density MF units as well as a multi-purpose facility.

This system will be designed to accommodate Maximum Day Demand (MDD) plus Fire Flow (FF).

Fire Flow, Pressure Performance and Piping Velocity

Fire flow for the development varies with a proposed peak fire flow of 150 l/s. There may be areas throughout the system that can achieve greater fire flow performance once built out.

Pressure performance and piping velocity complexities are basically impossible to completely eliminate unless there is an inordinate use of Pressure Reducing Valve (PRV) stations. The best solution is to provide areas with higher pressures and equip individual building with PRV's. This is particularly practical when servicing MF units which tend to have one water service for all units included. For this project we propose that pressures range between 44psi during peak hour condition and 130psi during static no-demand conditions. Minimum water pressures under fire flow situations will not be less than 20psi.

Velocities will be evaluated with a model. All pipe velocities are proposed to be less than 2 m/s and 4 m/s during fire flow.

Beverly Hills Pumping Requirements

It is undetermined by GVS Water what improvements will be required to the pumping system that feeds the Beverly Hills water reservoir. Based on GVS Water design requirements, the system must be able to pump peak hour demand.

Peak Hour Demand = 1.5*MDD
= 1.5* 1800 l/c/d * 1225 units * 2 people/unit / 24hrs/day / 3600 s/hour
= 77 l/s

Reservoir Performance and Sizing

Phase 1 within the lower 425m pressure zone will see 264 units within the existing water system. With a total planned development of 1485, worst case is the upper pressure zone and remaining phases will see 1221 units serviced from the Beverly Hills reservoir.

Upgrades to the Beverly Hills reservoir will require added total volume. This reservoir expansion is based on the GVS Water Reservoir capacity formula which includes fire storage, equalization storage and emergency storage.

Total storage required = A + B + C
A= Balancing storage = max day demand for 6 hours
= 1800 l/cap/day * 1225 units * 2 people/unit * 6hours/24 hours/day
= 1.103 Ml water
B = Fire Storage = 150 l/s less 60 l/s existing = 90 l/s
= (90 l/s * 3600 s/hr * 3 hour fire) + (60 l/s * 3600 s/hr * 1 hour)
= 1.19 Ml water
C = Emergency Storage = 25% of A + B
= 25% of (1.103 Ml + 1.19 Ml)
= 0.573 Ml
Total Storage Required = A+B+C = 1.103 Ml + 1.19 Ml + 0.573 Ml

= 2.87 Ml (2,870 M3)

Observation Summary

- Water supply assumptions have been based on GVS water supplying the system
- Preliminary assumptions have not included the existing Claremont water utility.
- System MDD demand is based on a per capita consumption of 1,800 l/d
- There will be an average of 2 people per multifamily unit.
- There will be 264 units in the lower pressure zone (425) fed from existing reservoirs with surplus capacity
- There will be 1221 units in the upper pressure zone (469) fed from the Beverly Hills pumping system
- Beverly Hills Reservoir will require 2,870 m3 storage expansion.
- Existing pumping systems will require 77 l/s additional pumping capacity to the Beverly Hills Reservoir to meet maximum day demand.

Over the past few years there have been several examples, recommendations and a desire to reduce water consumption. The GVS Water Utility has carried out several programs and are proactive which has resulted in per capita daily consumption decrease.

It is recommended that this reduction in per capita consumption be monitored. It is also recommended that as development proceeds water system design be reviewed on a regular basis using measured per capita consumption in the developed area. This could lead to a reduction in pump sizes, reservoir sizes and main trunk sizes to improve water quality.