

COMMONWEALTH ENGINEERS, INC.

August 2, 2001

Mr. Jeff Ban, City Engineer
1313 E. North Street
Crown Point, IN 46307

**RE: Fashion Terrace Lift Station
Estimated Flows**

Dear Jeff:

Per General Services Agreement Authorization No. 2001-1, this letter summarizes the flows estimated at the Fashion Terrace Lift Station over the next 20 years. The purpose of this analysis is to provide information for Edmund M. Burke Engineering, Ltd. to properly size proposed upgrades.

Anticipated flows over a 20-year planning period have been considered from the sources below. Obviously, it is not known if all the areas will be served by the City.

1. Ellendale Farms subdivision;
2. Dry weather flows from Hermit's Lake;
3. Areas to the west of Fashion Terrace Lift Station;
4. Areas to the south of Ellendale Farms;
5. Dry weather flows from Fashion Terrace subdivision;
6. Wet weather flow from Hermit's Lake and Fashion Terrace subdivisions.

Based on our information, design capacities of existing downstream facilities are as follows:

Table 1
Design Capacities of Existing Facilities

Item	Capacity	
	gpm	MGD
White Hawk Lift Station	Current Duplex	400
	Future Triplex	1,200
White Hawk 15" Trunk Sewer to Summit Street	1,570	2.26
Ellendale 12" Trunk Sewer Upstream of Fashion Terrace	750	1.08

It is planned that the new Fashion Terrace Lift Station discharge to the existing White Hawk trunk sewer at Summit Street and White Hawk Drive. The peak pumping rate from the Fashion Terrace station should not exceed the capacity of the downstream facilities. It appears in Table 1 above the White Hawk Lift Station would be the limiting factor, but we will consider the sewer's capacity of 2.26 MGD as the maximum. It is our understanding the lift station can be upgraded to pump at a significantly higher rate using the existing piping and force main.



Each potential area that could contribute flow is considered below. For reference, a map is enclosed showing the locations of the wastewater facilities being discussed. We are primarily concerned with peak rates coming to the station, since the pumps will need to be able to discharge at this rate to avoid surcharging out the top of the station. A summary of these flows and recommendations for the Fashion Terrace lift station are given at the end of this letter.

Ellendale Farms Subdivision

We reference a letter dated March 13, 2001 from Edmund M. Burke Engineering stating the land plan for the fully developed Ellendale Subdivision would create a flow rate of 392 gpm (0.56 MGD). It is reasonable to expect full development will occur within the 20 year planning period. It appears this is a peak rate, as previous information supplied by the developer put the population equivalent for full development at approximately 1,620 people. At a design average of 100 gpcd, this would be 0.162 MGD (113 gpm). Using 10-States standards, the recommended peak factor would be 3.66, which would yield a peak flow rate of 0.59 MGD, or 412 gpm. The supplied figure is reasonably close to this.

Dry Weather Flow from Hermit's Lake

Data from a 1989 flow analysis report on Hermit's Lake reported the average dry weather flow was 0.061 MGD. This corresponded to a per capita flow of 102 gpd. It is reported this number includes typical base infiltration during low groundwater periods. Assuming a factor of four, the peak dry weather flow rate would be 0.24 MGD (169 gpm). Without any additional data, we can only assume this is still valid. If any flows from Hermit's Lake are accepted by the City of Crown Point, it is recommended only dry weather flows be allowed. Flows beyond a certain rate would need to be equalized at Hermit's Lake, unless separation can remove all but an acceptable amount of infiltration and inflow.

It is suggested up to 200 gpm (0.28 MGD) be allowed from Hermit's Lake to account for a minor amount of I/I. This corresponds to the generally accepted ceiling of 120 gpcd as a reasonable amount of dry weather flow plus sustained groundwater infiltration.

Areas to the West of Fashion Terrace Lift Station

The 1994 Facilities Plan included providing sewers to portions of the planning area that were developed yet unsewered. A part of this area could flow to the Fashion Terrace Lift Station from the west. A sewer trunk was shown in the Facilities Plan running north along Whitcomb from 113th Street to US 231 and then turning east and discharging into the existing system. This trunk was to take gravity flow from "Area H". Other areas to the west were to flow to a sewer trunk located further west, which would run north to a new lift station near Clark and Summit Streets.

Since the writing of the Facilities Plan, a new lift station discharging directly to the WWTP has been constructed in the White Hawk subdivision. A 15" trunk sewer has been extended to Summit and White Hawk Drive, where the force main from the Fashion Terrace Lift Station will discharge. This approach has the advantage of keeping existing flows from the Fashion Terrace station and future flows from development out of the older portion of the sewer system.

We consider it unlikely the trunk sewer shown constructed to the west in the Facilities Plan will be built within the next 20 years. It is possible some of the areas that were to be served by the trunk sewer could instead be sent east to the Fashion Terrace Lift Station, but this is also

unlikely. However, "Area H" could be served by gravity sewers and discharged to the Fashion Terrace station. If this occurs, it will be relatively easy to extend sewers north along Whitcomb up to U.S. 231.

For this analysis, it will be assumed only the area shown in the Facilities Plan as "Area H" and Whitcomb Road from U.S. 231 to 113th Street will discharge to the Fashion Terrace Lift Station. This would amount to a total peak flow of around 50 gpm, or 0.07 MGD. It is noted that constructing a gravity sewer or force main along South Street between the Fashion Terrace station and the areas to the west will be somewhat difficult due to the wetlands.

Areas to the South of Ellendale Farms

The area to the south of Ellendale Farms Subdivision could be served by the 12" sewer trunk installed through the subdivision, or by the South Branch of the East Side Sewer. Since the East Side Sewer handles significant amounts of wet weather flow, and is already committed to provide flow for development to the east and south of the City, we will assume at least a portion the area south of Ellendale will be served by the 12" sewer and/or the Fashion Terrace Lift Station. According to Edmund M. Burke Engineering, the 12" sewer has a total capacity of 750 gpm (1.08 MGD), of which 392 gpm will be used by Ellendale subdivision. The remaining capacity is 358 gpm, but 200 gpm of this capacity must be used to carry flow from Hermit's Lake. This leaves only 158 gpm for development to the south.

Approximately 800 undeveloped acres exist south of Hermit's Lake to 133rd Street between Clark Street and Marshall Street. Using the assumption that approximately 60% of the total area will be developed, and that 75% of that will be residential with the other 25% commercial, average flow rates could reach up to 0.28 MGD, with a peak rate of around 0.98 MGD (680 gpm). This assumes approximately 2,800 population equivalents, including 900 homes. We assume approximately 20% of the projected wastewater would be generated in the first 20 years. This would be a peak flow rate equal to around 136 gpm (0.2 MGD).

Flows from both Hermit's Lake and the area to the south would need to be pumped over the drainage division line separating the Lake Michigan basin from the Kankakee River Basin. Rather than discharging all of the flow to the Ellendale sewer, one or more of the force mains from Hermit's Lake and the area to the south could be pumped directly into Fashion Terrace Lift Station or its force main. This would preserve a portion of the capacity in the 12" sewer and allow wastewater from additional development beyond what is estimated. Alternatively, if no flows are accepted from Hermit's Lake additional wastewater from this area could be discharged to the Ellendale sewer.

Dry Weather Flow from Fashion Terrace Subdivision

Flow metering data from May and June of this year indicates the average dry weather flow from the Fashion Terrace subdivision is approximately 0.02 MGD (14 gpm). The peak flow rate is around 0.07 MGD (50 gpm).

Wet Weather Flow from Hermit's Lake and Fashion Terrace Subdivisions

As discussed above, we do not recommend accepting any wet weather flow from Hermit's Lake. Any agreement between the City and Hermit's Lake should limit the flow at a certain rate, and should require Hermit's Lake to eliminate I/I and/or construct equalization facilities of some kind.

However, if equalization facilities were constructed, it might be necessary to accept equalization basin return flows at a specified rate beyond the normal dry weather peak rate.

Fashion Terrace subdivision already contains an equalization basin for storing wet weather flows. Our flow monitoring indicates even a small rain event can cause sewage to overflow to the basin. The amount of rain that will trigger a discharge depends largely on the groundwater table and soil moisture. When the soil is wet and the groundwater is high, a very small event will send flow to the basin. This means that during wet periods, such as the spring, the basin may receive flows on a near continuous basis. Consequently, there may be times the basin must be emptied at a constant rate over a long period.

Wet weather also dramatically increases the flows in the sewer lines to the existing lift station. The largest rain event during the modeling was a 1.28-inch rain on May 26. Preceding this were six days of light rain totaling 0.28 inches. The peak rate from the sewers upstream reached 0.72 MGD (500 gpm). This was not the highest recorded flow, however. During a 1.16-inch rain over the night of June 11 and 12, the flow reached 1.55 MGD (1,076 gpm). It will not be possible to pump this additional wet weather flow from the Fashion Terrace subdivision. Flows beyond what the lift station can pump will still have to be sent to the equalization basin.

With the current configuration between the lift station and the basin return structure, the wet well must surcharge to a certain level before the return flow from the basin is cut off and the basin is forced to fill. Filling is through surcharging of the sewers upstream of the lift station in the Fashion Terrace subdivision *and the station wet well*, which allows sewage to spill over to the relief sewer and fill the basin. Only after flows subside at the station can flow exit the equalization basin. *This situation will also continue to force the Ellendale Farms trunk sewer to surcharge during wet weather. It is beyond the scope of this evaluation to determine if surcharging of the Ellendale Farms trunk sewer will cause problems within the subdivision or upstream of it.*

The peak rate from the basin reached 0.4 MGD (278 gpm) for a short period during the May 26 event. We recommend the Fashion Terrace Lift Station be able to handle twice this flow, or a minimum constant rate from the pond of 0.8 MGD (556 gpm). This will allow for times of continuous wet weather and would drain a completely full pond in approximately 2 to 3 days (assuming no additional inflow and an estimated volume of around 2 million gallons).

Note that the wet weather flow returned from the basin is largely clear water and will rob capacity from the Fashion Terrace and White Hawk lift stations, the White Hawk trunk sewer, and the Wastewater Treatment Plant. *A 556 gpm rate of return from the basin is roughly equivalent to the wastewater from a development 1-1/2 times the size of Ellendale Farms. It is strongly recommended that an effort be made to significantly reduce infiltration and inflow from the Fashion Terrace subdivision. This can be accomplished over several years as development occurs since wastewater flows will not be as high in the short term.*

Summary of Estimated Flows

The table below summarizes the estimated flows from the above sources and where the discharge location is assumed to be.

Table 2
Summary of Estimated Flows

Source	Estimated Peak Rate from Source (gpm)	Discharge Location	Cumulative Total in Ellendale Sewer (gpm)	Cumulative Total at Lift Station (gpm)
Ellendale Farms Subdivision	392	Ellendale Sewer	392	392
Dry Weather Flow From Hermit's Lake	200	Ellendale Sewer	592	592
Areas South of Ellendale Farms (20 Year Period)	136	Ellendale Sewer	728	728
Areas West of Fashion Terrace Lift Station	50	Fashion Terrace Lift Station	728	778
Dry Weather Flow From Fashion Terrace	50	Fashion Terrace Lift Station	728	828
Equalization Basin Flow From Fashion Terrace	556	Fashion Terrace Lift Station	728	1,384

The total peak flow expected in the Ellendale Farms sewer, assuming any required lift stations in Hermit's Lake or the area south of Ellendale Farms discharge to it, would be 728 gpm (1.05 MGD), slightly below its capacity. Based on our assumptions of wastewater flow, the Ellendale Farms trunk sewer appears adequate during the 20-year planning period.

Total peak flows for the Fashion Terrace station are estimated to be 1,384 gpm (1.99 MGD). When added to the estimated flows within the White Hawk subdivision discharging to the White Hawk trunk sewer (146 gpm, 0.21 MGD), its 2.2 MGD capacity will be reached. Therefore, the Fashion Terrace Lift Station should not pump at a higher rate than 1,384 gpm.

Lift Station and Force Main Recommendations

Two approaches could be taken in design of the lift station and force main. One is to design the station piping and force main for the future flow rate of 1,384 gpm and use a pump and control configuration that would maintain required velocities in the piping at current flow rates. This could be accomplished by simply pumping at or near the future rate now and sizing the piping accordingly. Alternatively, slightly smaller piping could be used. Lower rate pumps could be used now with the understanding that future higher rate pumps would have to discharge at higher velocities and heads.

The other approach would be to use two different sized force mains so that the head conditions are nearly the same now and in the future. The pumps would be sized to handle much smaller rates now and would use the smaller force main. In the future, the pumps would be replaced and the larger main would be used. The larger main could be installed at the same time as the smaller, or in the future when actually needed.

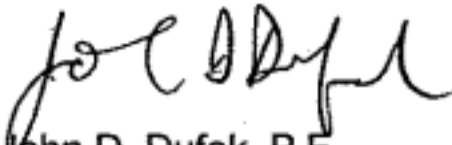
The minimum peak rate the lift station should be capable of pumping now is the sum of Fashion Terrace and Ellendale Farms peak flows, which is 998 gpm. The likely minimum daily average

current service area. Potentially, the interceptor sewer shown in the 1994 Facilities Plan west of Lane Street may need to carry flow from a larger service area than planned and pump the flow directly to the WWTP. It is not expected this will be an issue in the next 20 years.

We hope this analysis will be useful in the design of the Fashion Terrace station and in future planning. Please call with any questions or comments. Note this correspondence has already been copied to Van Calombaris of Edmund M. Burke Engineering.

Sincerely,

COMMONWEALTH ENGINEERS, INC.



John D. Dufek, P.E.
Project Engineer

pc: Honorable James D. Metros, Mayor
Mr. Van Calombaris, Edmund M. Burke Engineering, Ltd.

Crown Point Fashion Terrace
S01085-01