7.0 INFRASTRUCTURE

7.1 STORMWATER

The proponent has carefully evaluated the impact of stormwater on the project site and is implementing several stormwater management measures and integrated management practices (IMPs) or best management practices (BMPs) to ensure that the adjacent canal system is sufficiently protected from the proposed activities.

7.1.1 LOW-IMPACT DEVELOPMENT AND INTEGRATED MANAGEMENT PRACTICES

As requested in the EENF Certificate and the DEP comments, the proponent has considered low-impact development (LID) techniques for the site design and stormwater management. The goals of LID can be summarized into seven categories:[1]

1. Reducing Imperviousness;
2. Conservation of natural resources and ecosystems;
3. Maintaining natural drainage courses;
4. Minimizing clearing and grading;
5. Reducing off-site runoff and ensuring adequate groundwater recharge;
6. Mimicking the watershed's natural hydrologic functions; and
7. Erosion and sediment control.

LID focuses on attempting to match pre-development and post-development site conditions to balance infiltration, exfiltration, and surface water storage. As a component of the stated goals, LID also focuses on IMPs that can be incorporated into a design to achieve the desired post-construction balanced hydrology within the watershed.

The site has been completely altered from its natural condition starting in the late eighteenth century and continuing into the early nineteenth century, through the construction of the canal system and the filling of the property to construct manufacturing facilities. Due to the lack of any natural features on the locus, implementation of LID techniques and hence IMPs poses a considerable design

[1] The Massachusetts Stormwater Handbook (February, 2008) references the Smart Growth Tool Kit; wwww.mass.gov/envir/sgtk.htm that references Low-Impact Development Design Strategies, and Integrated Design Approach prepared by the Prince George's County, Maryland Department of Environmental Resources, Program and Planning Division.

challenge. Implementation of LID techniques is further complicated due to the existence of contaminated soils throughout the site.

Because of the apparent global contamination of this site, groundwater recharge facilities cannot be considered in the design as required by the Massachusetts Stormwater Handbook, as it could cause further migration of the existing contamination on site.

The proponent is applying the LID design methodology and incorporated many of the BMPs, recommended in the Massachusetts Stormwater Handbook. These BMPs are more fully described in Section 7.1.3.

The following section provides a point-by-point explanation of how the site design will meet the LID goals to the extent practical and discusses the IMPs incorporated into the design.

REDUCING IMPERVIOUSNESS

A number of different strategies were pursued to reduce imperviousness for the project. A strategy incorporated since planning inception included reduced roadways widths. The design provides for 22'-wide traveled ways which are 2' less than the 24' width required by the city of Lowell Planning Board Rules and Regulations.

Reduction in impervious surface has also been achieved by decentralization of parking facilities and includes basement parking in several of the proposed buildings on Parcels 1, 2, 4, 8, 9, 10, 15, and 16, as well as a multi-level parking garage on Parcel 14. Other strategies include the implementation of green roofs on 30% of all rooftop areas. These BMPs are shown on the plans in figure 7-1, Conceptual Master Best Management Practices Plan.

CONSERVATION OF NATURAL RESOURCES AND ECOSYSTEMS, MAINTAINING NATURAL DRAINAGE COURSES, AND MINIMIZING CLEARING AND GRADING

As described above, there are no "natural" resources remaining on the site, and the property has been cleared and filled long ago. The site however, is bisected by three manmade canals that flow to the Merrimac River, which is approximately ½ mile down gradient of the locus. The use of the BMPs described in this report will contribute to the mitigation of potential impacts to the quality and quantity of stormwater flowing from this site and into the canals. This will provide for the protection of the groundwater on-site and the Merrimac River down gradient from the project.

REDUCED OFF-SITE RUNOFF

The drainage design as shown in Figure, 7-1 Conceptual Master Best Management Practices Plan and Figure 7-2, Conceptual Master Drainage Plan, balances the overall

stormwater flows and volumes of runoff generated for the project site for all storm events (i.e. 2, 10, and 100 year storm events). As detailed in the Stormwater Analysis and Calculations Report and the Stormwater Management Report, the site design utilized two (2) design points representing stormwater flows at critical areas throughout the site. At each design point, a balance of peak stormwater flows has been achieved. Due to the existing contamination of on-site soils, the implementation of groundwater recharge facilities could result in exacerbating groundwater contamination. Therefore, BMPs promoting groundwater recharge cannot be utilized on this site.

MIMIC THE WATERSHED'S NATURAL HYDROLOGIC FUNCTIONS

The watersheds natural hydrologic functions include water balance between runoff, groundwater infiltration, storage, and evapo-transpiration. As outlined in the section above, a balance between existing runoff and groundwater infiltration will be achieved through a reduction in overall imperviousness of the site together with the introduction of BMP's outlined below. The volume of runoff at the assigned design points associated with the resource areas has been mimicked for frequent 2-year storm events. Storage and evapo-transpiration have been mimicked in 3 ways: 1) the introduction of cisterns into the design will capture and store stormwater runoff during the storm events. This water will then be used to irrigate on-site landscaping to promote evapo-transpiration; 2) the use of the filtering bio-retention/raingarden areas will result in storage and evapo-transpiration; and 3) the use of green roofs will also promote storage and evapo-transpiration.

EROSION AND SEDIMENT CONTROL

Erosion and sediment controls have been incorporated into the project design from its inception and will continue to be utilized throughout the life of the project. The details of this are outlined in the Inspection and Maintenance Program.

7.1.2 PRE AND POST RUNOFF ANALYSIS

The proponent has evaluated site hydrology. A detailed report, "Stormwater Analysis and Calculations" can be found in the DEIR. The following section provides general information regarding the analysis.

The objective of the calculations is to design a stormwater management system in conformance with 2008 Massachusetts Stormwater Handbook that will both lower pollutant loads in the stormwater runoff and reduce the peak post construction rate of runoff below the existing conditions peak level at the selected design area. The analysis is separated into existing and proposed conditions for ease of comparison.

For the purpose of analyzing existing and proposed development stormwater runoff, two (2) design points have been selected.

EXISTING CONDITION DESIGN POINTS

The Lower Pawtucket Canal is the central design point #1 for the project and is located approximately 13 feet lower than the other canals. It is the lowest area of the site and receives runoff from the upper island (except the parking lot for the National Park Service) and the majority of the lower island between the Lower Pawtucket and Hamilton canals.

Design point #2 is defined as the Total Pawtucket Canal. The Total Pawtucket Canal is comprised of the two (2) canals which meet at the Swamp Locks (the Hamilton Canal and the Merrimack Canal). The two (2) canals function as a single hydraulic unit and are therefore modeled as such. For ease of description, the two (2) canals and contributing areas are described below:

The Merrimack Canal receives stormwater from the National Park Service parking lots. The bridge over the Merrimack Canal also directs stormwater into the existing subsurface drainage system and to the canal.

The Hamilton Canal receives direct stormwater discharge from the existing subsurface drainage system in Jackson Street. Stormwater is also directly discharged into the Hamilton Canal overland from the area located at the point of the Hamilton Canal and Pawtucket Canal split.

PROPOSED CONDITIONS OVERVIEW AND DESIGN POINTS

The proponent is proposing a redevelopment project that will introduce a multi-use community district to the city. There are 17 main parcels proposed consisting of mixed use commercial, retail, restaurants, residential, parking, and public green space areas. Revere Street will extend onto the property and become the main access drive connecting Jackson and Dutton Streets. Side streets are located off this main roadway as well as a potential trolley extension line for access to the site. King Street will be relocated easterly, closer to Revere Street and will bound parcel #1; allowing space for the location of the new trial court.

The Stormwater Management Program has been designed to include surface and subsurface BMPs to comply with Stormwater Management Regulations. Stormwater quantity and quality will be controlled by the strategic placement and performance of the BMPs. A detailed outline of BMPs is described in Section 7.1.3 of this narrative.

The proposed condition design points correspond to those listed in the existing conditions section. The project utilizes a subsurface drainage system to treat stormwater and direct excess flow to the design points.

CONCLUSION

Based upon calculations provided in the stormwater analysis, the peak stormwater flows have been met or reduced for the 2-year, 10-year, and 100-year storm events. No adverse impacts or downstream flooding is anticipated with the completion of this project. In addition, the design provides for the required TSS removal rate as required by the DEP Stormwater Management Requirements.

7.1.3 BEST MANAGEMENT PRACTICES

This proposed site design includes both conventional and LID strategies and BMPs into the stormwater management system. Incorporated in this design are green roofs, filtering raingardens, rain water harvesting facilities, vortex (Stormceptor) units, and deep sump catchbasins for treatment and mitigation of stormwater.

FILTERING RAINGARDEN (BIORETENTION AREAS)

Raingardens or bioretention areas are shallow depressions filled with soil media topped with a thick layer of mulch and native vegetation utilized to control and treat stormwater before it is infiltrated or discharged. Systems provide pollutant removal of suspended solids, metals, nitrogen and phosphorus through filtration, microbes, and uptake by plants. Studies show 30%-90% removal of phosphorous and nitrogen, 40%-90% metals, and 90% TSS. Peak discharge rates and total runoff volume are reduced. The proposed raingardens are designed with impervious barriers and underdrains to collect treated stormwater and direct into the on-site drainage system in order to protect contaminated soils and groundwater below. The TSS removal design rate is 90% according to Massachusetts Stormwater Handbook. Raingarden areas are proposed for this project on Parcels 6, 11, and 13 (see Figures 7-1 and 7-2, and a typical cross section sketch in Appendix E). Each raingarden will collect runoff from the surrounding hardscape of adjacent park areas.

GREEN ROOFS

Green roofs are permanent rooftop planting systems containing live plants in a lightweight engineered soil medium designed to retain precipitation where the water is taken up by plants and transpired into the air. This will result in a reduction of stormwater runoff from the roofs compared to conventional rooftops for small storms. Green roofs will cover a minimum of 30% of all roofing for this project or about 3.5 acres. See Figure 7-1, Conceptual Master Best Management Practices Plan for locations of the proposed green roofs.

Green roofs will also reduce the heat absorbed from the sun and therefore reduce the heat island effect, typical in many urbanized areas (or similar).

RAIN WATER HARVESTING FACILITIES

Four (4) cisterns are proposed onsite, located on Parcels 4, 7, and 11. These cisterns will collect and store roof runoff from adjacent buildings. The stored runoff will then supplement water used to irrigate landscaping on site. This will promote the natural evapo-transpiration process.

The cisterns are sized to handle 1" of roof runoff as required in the Stormwater Management Handbook. As part of Phase One, the cisterns on Parcel 4 have been designed as 12,000 gallon tanks for Buildings 6 and 7. Remaining cisterns will be designed as Phase Two of the project is developed.

VORTEX UNIT (STORMCEPTOR)

A Stormceptor is an inline treatment structure that consists of a precast concrete unit with a plastic weir and drop pipe that separates the top chamber and bottom sediment holding chamber. Incoming stormwater is diverted down through the drop pipe into the lower sediment chamber, where suspended solids are removed and settled. The cleaned runoff then can move up through the outlet pipe and back into the drainage system. This BMP has been designed to achieve a total suspended solids (TSS) removal rate of 77%. Eight (8) Stormceptors are proposed, located off of Jackson Street, within street E, within proposed Street D, off of Street F on Parcel 11 off of the proposed parking area on Parcel 17A within Street G, off of proposed Street G on Parcel 14, and on Parcels 15 and 16. The locations of the proposed Stormceptors are shown on Figures 7-1 and 7-2. The revised plans depict three models of Stormceptor Units, the STC 3600, STC 1800, and STC 900. Typical details for the Stormceptors are included in Appendix E. Calculations supporting the Stormceptor sizing including the STEP Fact Sheet #4 for Stormceptors are in Appendix E.

The Stormceptor Unit located along Jackson Street has not been sized. Final design of the Courthouse and other off-site improvements contributing stormwater to this unit has not been completed. The consulting engineer shall size the unit when the scope of off-site improvements outside the FEIR is completed after the submission of the FEIR.

DEEP SUMP CATCHBASIN

Deep Sump Catchbasins are used throughout the site and similar to an ordinary catchbasin but fitted with a plastic hood over the outlet to promote separation of floatables such as oil, grease, trash, and debris. They also have a four-foot deep sump that acts as a small retention system and promotes settling of suspended solids. A TSS removal rate of 25% is achieved by this BMP.

7.1.4 STORMWATER MANAGEMENT

The Stormwater Management System for the proposed project has been designed to include structural and non-structural BMPs to comply with the Stormwater Management Policy. Water quality standards and TSS removal will be achieved through the use of deep sump catchbasins with gas trap hoods, vortex units, filtering raingardens (bio-retention areas as it is referred to under the LID design), and green roofs, which will result in a TSS removal rate for each basin meeting or exceeding the 80% requirement. The proposed stormwater management facilities will attenuate post-construction runoff rates and will mimic but not exceed pre-construction conditions. The Stormwater Management System has been designed in conformance with DEP Stormwater Management Regulations. The ten (10) standards have been adhered to during the design as outlined below.

STANDARD 1: NO UNTREATED DISCHARGES

No stormwater will be directly discharged into wetlands or waters without treatment. The proposed project has been designed to utilize the following BMPs: raingardens (Bioretention Area), vortex units, and deep sump catchbasins to remove the required amounts of sediments and suspended solids in order to adequately protect groundwater and surface water.

Stormwater discharged from the raingardens and vortex units flow directly to existing penstocks and raceways prior to reaching any waters.

STANDARD 2: PEAK RATE ATTENUATION

For the purpose of analyzing pre and post-development stormwater runoff, two (2) design points have been selected as depicted on the drainage plans. The pre and post- drainage subcatchments direct stormwater to each of the design points that have been established based on the topography and placement of BMPs within the site. The storm events that were used to calculate peak runoff rates for pre and post-construction conditions are compiled from the Soil Conservation Service Technical Report No. 55 and the U.S. Department of Commerce Technical Paper No. 40. Full detail of peak rate attenuation along with supplemental stormwater calculations utilizing HydroCAD can be found in the supplemental report entitled "Stormwater Analysis and Calculations for Hamilton Canal District, Lowell, Massachusetts" as prepared by MAI.

STANDARD 3: RECHARGE

This existing site has been classified as a 21E site. DEP also recognizes that on some sites, there is a risk that infiltrating the required recharge volume may cause or contribute to groundwater contamination. Consequently, DEP requires infiltration only to the maximum extent practicable on the following sites: sites where recharge is

proposed at or adjacent to an area classified as contaminated. Information regarding this classification is as follows:

Parcels 6, 7, 8, and 9 are located within the limits of the former 307 Jackson Canal (Appleton Mills). This property is the site of three (3) MCP releases. The releases have not been fully assessed and closed-out with an MCP Response Action Outcome as of the date of this filing. Available data indicates the presence of rubble fill containing brick, wood, metals, and other debris in soil at the site. In addition, available data indicates that chlorinated solvents, PCBs, and chemicals related to petroleum, asphalt, and coal are present in soil and groundwater at concentrations exceeding MCP risk-based standards.

Parcels 11, 12, 13, and 14 are located within the limits of the former 221 Jackson north of the Lower Pawtucket Canal (Freudenburg Nonwovens property). The property is the site of the former Building 8, which was associated with MCP Release Tracking Number 3-25687. The release has not been closed out with an MCP Response Action Outcome as of the date of this FEIR. Available data indicates the presence of fill containing debris and ash. In addition, available data indicates that petroleum-related chemicals, as well as arsenic and lead are present in soil and/or groundwater and concentrations exceeding MCP risk-based standards.

For either area, fill containing brick, debris and ash, as well as MCP-reportable releases, appear to preclude the areas for use of groundwater recharge facilities.

In accordance with the Massachusetts Stormwater Handbook, for purposes of Standard 3, "to the maximum extent practicable" means that:

- The applicant has made all reasonable efforts to meet the Standard;
- The applicant has made a complete evaluation of all possible applicable infiltration measures, including environmentally sensitive site design that minimizes land disturbance and impervious surfaces, low impact development techniques, and structural stormwater best management practices; and
- If the post-development recharge does not at least approximate the annual recharge from pre-development conditions, the applicant has demonstrated that s/he is implementing the highest practicable method for infiltrating stormwater.

Due to the global contamination as outlined above, infiltrating the required recharge volume may cause or contribute to groundwater contamination. Therefore, recharge facilities are not practical for design on this project.

CLASSIFICATION OF SOILS

Limits of hydrologic drainage classes used for calculations were established based on soil maps provided by Natural Resources Conservation Service Web Soil Survey for Middlesex County. The sole hydrologic group delineated for the project site is group C for Urban Land.

STANDARD 4: WATER QUALITY

The stormwater management systems have been designed to remove a minimum of 80% of the average annual post-construction load of Total Suspended Solids (TSS). Filtering raingardens (Bioretention Areas), vortex units, and deep sump catchbasins are proposed as stormwater treatment methods to reduce discharge rates and total runoff volume.

TSS Removal Calculation Worksheets are included for each of the proposed BMP treatment train. Each BMP of the treatment train controls flow rates and retains contaminants to ensure that the cumulative effect of the train removes a minimum 80% of the annual average TSS load as required.

A Pollution Prevention Plan entitled, "Inspection and Maintenance Program for a Stormwater Management System" is included in Appendix E. Suitable practices for source control and long term pollution prevention have been identified and shall be implemented as discussed.

STANDARD 5: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLS)

Stormwater Standard 5 is applicable to this project. The proposed development will subject the site to higher potential pollutant loads as defined in the MA DEP Wetlands and Water Quality Regulations due to the anticipated vehicle trips per day exceeding 1,000 at full build out.

LUHPPLs are identified in 310 CMR 22.20B(2) and C(2)(a)-(k) and (m) and CMR 22.21(2)(a)(1)-(8) and (b)(1)-(6), areas within a site that are the location of activities that are subject to an individual National Pollutant Discharge Elimination System (NPDES) permit or the NPDES Multi-sector General Permit; auto fueling facilities, exterior fleet storage areas, exterior vehicle service and equipment cleaning areas; marinas and boatyards; parking lots with high-intensity-use (1,000 vehicle trips per day or more); confined disposal facilities and disposal sites.

STANDARD 6: CRITICAL AREAS

Stormwater Standard 6 is not applicable to this project given that proposed stormwater is to discharge neither in nor near critical areas. Critical areas include Outstanding Resource Waters and Special Resource Waters as designated in 314 CMR 4.0, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing

beaches as defined in 105 CMR 445.000, cold-water fisheries and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

STANDARD 7: REDEVELOPMENTS AND OTHER PROJECTS SUBJECT TO THE STANDARDS ONLY TO THE MAXIMUM EXTENT PRACTICABLE

This project meets the definition of a "Redevelopment" as stated in Volume 2, Chapter 3 of the Massachusetts Stormwater Handbook. The proposed mixed-use redevelopment includes the development of a phased project on a previously developed site, which will result in no net increase of impervious area. The project utilizes LID techniques and stormwater BMPs, which will improve existing, conditions and meet required standards to the maximum extent practicable.

The redevelopment project will improve existing conditions in accordance with Massachusetts Stormwater Management Handbook by incorporating new stormwater controls, which will result in a reduction in pollutant loads from the site as well as reducing peak runoff from the site. The sole standard, which will not be met in the redevelopment of this site, is Standard #3 Recharge. As described earlier, the locus property is a 21E site where global site contamination prevents the use of recharge facilities which may contribute to groundwater contamination.

STANDARD 8: CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL

As discussed in Section 5.1, the proponent expects to complete response actions at MCP sites during construction to address soil contamination and to address potential ongoing sources of groundwater or surface water contamination within the project boundary in accordance with MCP standards.

An *Inspection and Maintenance Program for a Proposed Stormwater Management System* is included in the Stormwater Report. The Short-Term Planned Erosion and Control Measures (During Construction Activities) section of the program details the construction period operation and maintenance plan and sequencing for pollution prevention measures and erosion and sedimentation controls. The Site Plan of Land for the Hamilton Canal District in Lowell provided by Meridian Associates, Inc. illustrates the proposed construction and site details and specifications for the erosion control BMPs. An inspection and maintenances schedule, as well as a log form, have also been included in this report.

Excavation and handling of contaminated soil, as well as dewatering and discharge activities, would be conducted per the requirements of a Release Abatement Measure (RAM) Plan and soil management plan prepared in accordance with the MCP, as well as any existing Activity and Use Limitations which have been implemented to date. Dewatering and discharge activities would also be conducted per the requirements of an EPA Remediation General Permit (RGP) or other dewatering permit as applicable.

The RAM Plan would address known contamination, prevention of drainage and runoff from stockpiles by storage on impermeable surfaces and covering of stockpiles, collection and treatment of drainage and runoff from stockpiles, control of dust generation from soil stockpiles, handling and disposal of soil from stockpiles, handling and disposal of built-up sediment removed from hay bales and sedimentation basins, worker exposure during excavation, and dust monitoring and action levels for applying dust suppression.

Built-up sediment removed from the sediment basin and hay bales that is generated prior to final cover and during the RAM will be handled, stored, and disposed of in accordance with the RAM Plan and soil management plan.

Excavated soil stockpiles will be placed on impermeable surfaces, protected from rainfall infiltration, runoff, and erosion, and inspected and handled in accordance with the RAM Plan and soil management plan.

The name of the responsible party for plan compliance has been provided.

The Project is required to obtain coverage under a NPDES Construction General Permit issued by the EPA and a copy of the SWPPP is included in the Stormwater Report.

STANDARD 9: OPERATION AND MAINTENANCE PLAN

An *Inspection and Maintenance Program for a Proposed Stormwater Management System* is included in the Stormwater Report. The Long Term Inspection and Maintenance Measures (Post Construction) section of the program provides details and the schedule for implementation of routine and non-routine maintenance tasks. Figure 7-1, Conceptual Master Best Management Practices Plan illustrates the location of the proposed BMPs. An inspection and maintenance schedule as well as a log form has been included in this report.

The name of the responsible party for plan compliance has been provided.

STANDARD 10: PROHIBITION OF ILLICIT DISCHARGES

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, de-chlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. All other illicit discharges are prohibited.

To prevent illicit discharges to the stormwater management system, the following good housekeeping policies shall be followed.

- Stencil catchbasins with "no dumping"
- Provisions for storing materials and waste products inside or under cover
- Vehicle washing controls
- Requirements for routine inspection and maintenance of stormwater BMPs
- Spill prevention and response plans
- Provisions for maintenance of lawns, gardens, and other landscaped areas
- Requirements for storage and use of fertilizers, herbicides, and pesticides
- Pet waste management
- Provisions for operation and management of septic systems
- Provisions for solid waste management
- Snow disposal and plowing plans relative to Wetland Resource Area
- Winter road salt and/or sand use and storage restrictions
- Driveway sweeping schedule

Each provision is described in the Long Term Inspection and Maintenance Measures section of the Inspection and Maintenance Program for a Stormwater Management System.

7.2 WASTEWATER

The proponent has designed and submitted plans and supporting documentation for the proposed South Station Sewer Lift Station along Street D with DEP and awaits final approval. The North Station Sewer Lift Station has been designed and is currently being reviewed by the City prior to submittal with DEP.

No existing wastewater infrastructure is intended to be used as part of the redevelopment site and replace the combined sewer system with separate storm and sanitary sewers. The removal and/or abandonments of any combined sewer/drainage system on site will reduce the infiltration and inflow from existing combined sewer overflows or any failing infrastructure from the project site.

7.2.1 TITLE V SEWER FLOWS

Each system has been designed based on Title V estimated flows for each parcel. The following tables list the sewage flows for each parcel contributing to the South and North Stations.

Table 7-1: Sewage Flows per Title V Regs - South Station

Parcel	Type of Unit	SF or # Units	# Bedrooms	Gallons Per Day	Dividers	Totals
						(gpd)
2	residential	75	1.5	110		12,375
		units		(per br)		
	retail	6000		50	1000	300
		sf		(per 1,000 sf)		
4	residential	169	1.5	110		27,885
				(per br)		
	retail	5000		50	1000	250
		sf		(per 1,000 sf)		
5	theatre	450		3		1,350
		seats		per seat		
6	residential	46	1.5	110		7,590
				(per br)		
	gallery	2566		18	1000	46
				(per 1,000 sf)		
7	residential	115	1.5	110		18,975
	lofts			(per br)		
8	residential	62	1.5	110		10,230
				(per br)		
	residential	11	1.5	110		1,815
	lofts			(per br)		
9	residential	63	1.5	110		10,395
				(per br)		
	residential	14	1.5	110		2,310
	lofts			(per br)		
10	office	51300		75	1000	3,848
		sf		(per 1,000 sf)		
				Grand Total		**97,369**

Table 7-2: Sewage Flows per Title V Regs- North Station

Parcel	Type of Unit	Sf or # Units	# Bedrooms	Gallons Per Day	Dividers	Totals
						(gpd)
11	residential	58	1.5	110		9,570
				(per br)		
	residential	10	1.5	110		1,650
	lofts			(per br)		
14	retail	10000		50	1000	500
		sf		(per 1,000 sf)		
	restaurant	4000	180	35		6,300
		sf	seats	(per seat)		
15	office	105612		75	1000	7,921
		sf		(per 1,000 sf)		
	retail	14800		50	1000	740
		sf		(per 1,000 sf)		
16	office	91800		75	1000	6,885
		sf		(per 1,000 sf)		
	retail	7000		50	1000	350
		sf		(per 1,000 sf)		
17	office	6500		75	1000	488
		sf		(per 1,000 sf)		
				Grand Total		**34,403**

The City of Lowell will own the two (2) sewer lift stations after completion of construction. The South Station will be constructed as part of Phase I of the project and is located along Street D within Parcel 7. The North Station will be constructed during Phase II of the project development and is located along Street G within Parcel 11.

7.2.2 LIFT STATION EQUIPMENT

The South Station has been revised and approved by the City and has been submitted for approval through DEP. The City prefers that a portable generator purchased and stored at the Lowell Regional Wastewater Utility (LRWWU) provide back-up power to the station on an as-needed basis. The generator would be transported to Street D when grid power to the lift station is interrupted. Specifications for equipment to support remote monitoring of the lift station are being developed. Equipment would include a programmable logic center and radio to communicate with the LRWWU remote control center located at the wastewater treatment facility. Design of this

equipment as well as similar equipment for the north station will be finalized prior to construction of the lift stations through coordination with the City and Project Engineers.