composition of the ecosystem fixed in the biofilm changes from zone to zone, gradually adapting to localized conditions as the organic and nutrient concentrations vary, as well as dissolved oxygen content. The end result is a specially- adapted ecosystem in each zone, acclimatized to the specific conditions to maximize treatment efficiency. The proposed wastewater reclamation process generally involves the following steps:

1. Pretreatment
2. Biological Treatment
   - FCR multi-zone reactor with 6 zones in each reactor train (**See**: Figure 29)
3. Secondary Phase Separation
   - Coagulation
   - Flocculation
   - Secondary clarifier or filtration
4. Tertiary Treatment
   - Tertiary filtration
   - UV disinfection
5. Solids Management
   - Sludge storage tank
   - Sludge thickening and dewatering
6. Reuse and Disposal
   - R-1 storage
   - R-1 pump station
   - SAT basin

Wastewater Collection and Transmission System

The Project's wastewater collection system improvements would include 8- and 12-inch sewer lines. The system would also include a pumpstation and sewer manholes. The wastewater collection system would be situated within various parcels and roadways within the project area.

Reuse of Treated Wastewater and SAT Basin

The wastewater reclamation facility will be designed to meet the R-1 recycled water quality standards pursuant to HAR State DOH, Chapter 62, Title 11 Wastewater Systems. Accordingly, tertiary treatment (filtration) and disinfection is included in the design. The WWRF will generate 0.65 MGD of R-1 recycled water upon full build out of the project. Using a conservative estimate of 4,500 gallons of water required to irrigate each acre per day, it is estimated that approximately 139 acres of agricultural land will be required to utilize the entire volume of 0.65 MGD of recycled water during dry weather years. R-1 quality recycled water may also be used for the irrigation of common areas and parks. The use of recycled water for agricultural irrigation will be done in the areas defined as "unrestricted" per the DOH Reuse Guidelines.

Also, since DOH regulations require a back-up disposal system, in the event that the effluent does not meet R-1 recycled water standards, an infiltration basin, located adjacent to the WWRF, will be used for disposal of non-compliant effluent. Figure 28 is a preliminary site plan that shows the location of the proposed SAT basin.

This basin would serve as a soil aquifer treatment pond for the wastewater effluent and provide the DOH-required back-up disposal system. Excess R-1 recycled water, along with effluent that does not conform to R-1 recycled water quality standards, would be discharged into this infiltration basin for disposal. The infiltration basin is expected to only contain water or effluent following significant storm events or when a processing problem is encountered with the treatment plant where the effluent cannot be processed as normally planned and/or cannot be discharged for reuse or for agricultural or open space irrigation. The SAT Basin would be designed so that it will typically take between two to three days for the water to infiltrate into the ground. The preliminary required total basin area has been established at 5.6 acres ideally situated on site and/or adjacent, however, there will need to be geotechnical evaluations during the design phase to determine the actual final system size and exact location.

SAT basins are the preferred alternative disposal means as they provide additional buffer and further polish the water through slow percolation and reduce the possibility of contaminating the underlying aquifer when compared to injection wells. SAT has been used as a means of effluent treatment and groundwater recharge for hundreds of years throughout the world and is still a common methodology used in municipal and industrial applications.

Biosolids Stabilization, Dewatering and Disposal

The waste activated sludge (WAS) solids will be pumped to an aerobic digester. The biosolids in the digester will have a solids retention time of 20 days to meet the Federal requirement to produce Class B sludge for land disposal. From the aerobic digester, the stabilized biosolids will be pumped to a mechanical solids dewatering unit to remove as much water from the biosolids as possible before being hauled off site. The mechanical solids dewatering unit will be located in its own solids handling room sized to accommodate future build-out. The solids handling room will be equipped with a ventilation system to remove any foul odors and to direct it to the centrally located odor control unit.

Biosolids (sludge) removed from the WWRF will be hauled to Maui EKO Systems located at the Central Maui Landfill. The Applicant will contract with Maui EKO Systems to process the biosolids into a usable soil amendment. The Environmental Protection Agency (EPA) currently oversees biosolids for Hawaiʻi. However, Hawaiʻi plans to seek authorization of EPA's program in the future. Hawaiʻi State Department of Health (DOH) places biosolids conditions in NPDES permits and tracks compliance through its wastewater branch.

Energy Efficiency

The FCR treatment system itself utilizes approximately 30 percent less energy than conventional treatment systems. In addition, the Applicant intends to implement other energy saving measures in the WWRF design. Such measures are planned to include: 1) installation of energy efficient motors; 2) installation of variable frequency drives (VFDs) on all blowers and pumps to allow the equipment to operate more efficiently at lower flows; and 3) installation of a photovoltaic system to provide at least a portion of the energy required for the treatment facility. The treatment facility would also be designed in phases to allow the capacity of the process equipment to better match actual wastewater flows. This would minimize the energy inefficiencies that can result from process equipment operating significantly below their design capacity. In addition, an energy management program at the treatment facility would be developed to promote energy efficiency and minimize operating costs.

Education Facility

A key component of any successful wastewater treatment system and water reuse program is proactive public education. The proposed education center will be utilized by the WCT community and the general public to learn how wastewater is treated and how recycled water is beneficially reused.

Operation and Maintenance

The water and wastewater infrastructure constructed to serve WCT will operate under the ownership of a water company established by the Applicant. The water company will provide the management and operations of both the water and wastewater systems. The water company is expected to be regulated by the Hawaiʻi Public Utilities Commission and adhere to the Hawaiʻi DOH standards and Water Reuse Guidelines. Daily operations of the water company will be performed by State of Hawaiʻi certified operators as required by DOH. The utility operations team will be selected prior to commissioning.

Standard procedures for the operation and maintenance for the WWRF and associated collection system improvements would be implemented by the Applicant. Efforts will mostly revolve around the issue of preventing leaks and leak detection. Treatment tanks will be located aboveground and will be visually inspected for leaks. For the gravity sewer lines, the lines will be tested after the completion of construction (and prior to operation) to confirm that there are no leaks in the system. Proper installation of these sewer lines will minimize the potential for any future leaks.

For the sewer force mains (pressurized), the pump station run-time and flow will be monitored. If there are any significant or unusual changes in the pump operation time and/or flows, the line will be tested for leaks. In the event that the pump station and/or force main would have to be taken off-line for repairs, the flows would be bypassed around the pump station. The pump station will be designed to allow for it to be bypassed in the event of repairs. Maintenance procedures will also be implemented for the treatment plant's SAT basin. The basin will be maintained to keep it vegetation free, which will also render it relatively unattractive habitat for any listed waterbird species. The Applicant will also have the basin inspected on foot twice a day whenever there is water present within it to ensure that no waterbirds are sick, dying or dead within this basin. If any such birds are found, the operator will immediately contact the Maui DOFAW district office and will work closely with DOFAW biologists to search for and retrieve any potentially infected birds, and to retrieve and dispose of any dead birds found within the area under DOFAW direction.

Organica FCR facilities are highly automated with minimum operator intervention required. Equipment and basic principles of operation are similar to conventional wastewater treatment. In selecting the technology Mana Water carefully examined the operator sophistication required to operate this type of facility to ensure that the level of sophistication, at minimum, does not exceed that required at conventional WWRFs on Maui. Generally, the level of sophistication required is significantly lower than a membrane bioreactor (MBR) and comparable to a conventional activated sludge (CAS) plant. It is anticipated that operation of the WWREF will require the following personnel: Plant Superintendent; two operators; one part-time maintenance personnel; and one part-time electrical maintenance personnel.

Odor and Noise Control

The WWRF is being located to the southeast of the WCT's urban development, within the Agricultural Preserve. The facility's location places it downwind of the WCT and the County's proposed baseyard and regional park. The WCT's elementary school would also be located downwind about one mile to the north of the facility. The WWRF is committed to reducing the H2S concentration at the fence line to at or below 5 ppb to eliminate off-site odors. This concentration is well below the State air requirement for instantaneous concentration of hydrogen sulfide of 25 ppb or less. The sewage intake and headwords equipment is to be housed in a contained pre-treatment building equipped with air filters. Proven and reliable technologies will be incorporated into the planned odor mitigation. Noise control is mitigated by machinery (blowers, scrubbers) being confined to the enclosed pre-treatment area. Minimal noise associated with off haul and/or pumping of sludge is to be limited to 1-2 times per week and scheduled during normal business hours.

Development Schedule and Construction Costs

In order to most economically construct and commission the WWRF, it is possible to synchronize certain aspects of the treatment process with the build out of WCT. While it is necessary to maintain the full treatment and redundancy requirements, not all phases of the treatment process need to be completed to 100 percent of expected final capacity. For this reason, the preliminary WWRF design is a two train reactor system in order to allow for commissioning of each train in sync with the two phase build-out of WCT. By phasing WWRF construction in tandem with WCT build-out, significant upfront capital cost savings can be realized in equipment such as headworks, limited secondary treatment commissioning, tertiary filtration, UV disinfection channel, aeration diffusers etc. The total estimated cost of the plant is $25.84 million. Figure 30, A-B shows conceptual illustrations of the proposed WWRF.

9 ~~7~~. Infrastructure and Public Facility Development Plan

As noted, the WCT will be implemented in two five year phases through 2026 as shown in Figure No. 27 ~~25~~, "Conceptual Phasing Plan" and Figure Nos. 31 ~~26~~, 32 ~~27~~, 33 A-B and 34 ~~29~~ "Roadways", "Wastewater", "Water" and "Drainage Phasing Diagrams" and Tables 17 ~~11~~, 18 ~~12~~ and 19 ~~16~~. Table No. 20 ~~17~~ summarizes the work, project phasing and order of magnitude costs associated with development of the Project.

Table 20 ~~17~~: Conceptual Order of Magnitude Cost Estimates

Infrastructure Description	Phase I (Makai)	Phase I (Mauka)	Phase II (Mauka)	Phase II (Makai)
General Work Includes activities such as grubbing and grading of the site, staging of construction, and implementation of on-site construction phase mitigation.	$4,200,000	$4,400,000	$3,075,000	$4,995,000
Roadways Includes construction of all internal roadways including residential and collector streets, curbs, gutters and sidewalks. (**See**: Figure No. ~~26~~ 31)	$6,678,400	$8,129,000	$3,104,000	$9,200,000
Offsite Roadways This work includes	~~$800,000~~ $1,900,000	----	$400,000	----

Infrastructure Description	Phase I (Makai)	Phase I (Mauka)	Phase II (Mauka)	Phase II (Makai)
construction of off-site roadway and intersection improvements to mitigate project impacts as described in the TIAR.				
Sewer System[8] Includes developing the on-site sewer system, which includes developing a package wastewater treatment plant and on-site collection system. (**See**: Figure No. 32 ~~26~~)	~~$5,880,000~~ $23,880,000	$5,610,000	~~$4,409,000~~ $12,409,00	~~$52,717,500**~~ $7,717,500
Potable Water System Includes developing potable and non-potable on-site wells and transmission infrastructure. (**See**: Figure No. 33A ~~27~~)	$14,028,000	$4,687,000	~~$10,585,000~~ $10,785,000	$8,890,000
Non Potable Water System (See: Figure No. 33B ~~27~~)	$3,345,000	$2,497,000	$2,140,000	$3,588,000
Drainage System Includes developing on-site detention basis and transmission infrastructure. (**See**: Figure No. 34 ~~29~~)	~~$10,980,000~~ $11,980,000	~~$10,700,000~~ $11,700,000	~~$9,832,000~~ $10,832,000	$12,480,000
~~**Offsite Sewer**~~ ~~Off-site sewer improvements include upgrades to transmission system along Lower Main Street, Waiko and Wai`ale Roads.~~	~~$3,477,000~~	~~-----~~	~~-----~~	~~-----~~
TOTAL COST[9]	**$66,211,400***	**$37,023,000***	**$42,745,000***	**$46,870,000***

[8] Cost estimate includes a private wastewater treatment plant servicing the WCT.

[9] Does not include underground electrical, telephone and cable TV