

Copper Corridor Bio-waste

GOLD: Jacob, Kelsey, Bridgette, Allie, Susie

GREEN: Brady, Anna, Zach, Shelby, Kaela

MAROON: Kelly, Rohan, Sawyer, Amanda, Vivian

} Super Group

Budgeting

Part 1

Our process...

We broke down the grant proposal for the budget into several sections

- Goal
- Analysis
- Vision
- Strategy

Goal:

Create a process utilizing Miami WWTP byproduct & green waste that can be used for land remediation or general purposes

- WWTP waste is too wet for use so it's landfilled (~ 1,772 wet tons per year)
- Green waste is also landfilled (~ 91.5 tons per year)
 - Green waste estimation "is likely low" - Town Manager Joseph Heatherly
- Landfill is quickly running out of storage space
 - Unsure of rate, but makes the solution time sensitive

Analysis:

Find a viable process for WWTP
byproduct & green waste for
Miami

- Option 1: Build New Treatment Plant
 - Uncertain jurisdiction collaboration; expensive; long-term
- Option 2: Upgrade Current Treatment Plant
 - Expensive; long-term
- Option 3: Compost Program
 - Inexpensive; short-term

Vision:

The future of Miami's
composting process

Composting is an inexpensive process that utilizes both WWTP byproduct and green waste quickly. This composting process will decrease landfilling & create a biosolid product & a green waste recycling program. Mining companies, farmers, & residents may use the biosolids for land remediation or fertilizer.

Strategy:

Where the bulk of our work on this section of the grant proposal was

- Cost of Equipment
 - Maroon team
- Cost of Receiving Waste Streams (composting & green waste program)
 - Green team
- Cost of Composting Process
 - Gold team
- Cost of Compost Storage
 - Gold team

Cost of Equipment

Maroon team

Three Composting Methods:

- In-Vessel Composting
 - High capital cost
 - Slight weather effect
 - Moderate energy
- Aerated Static Composting
 - Moderate capital cost
 - High weather effect
 - Moderate energy
- *Aerated (Turned) Windrow Composting (Recommended)*
 - *Low capital cost*
 - *High weather effect*
 - *Low energy*



Tub Grinder for Green Waste

- Tub Grinders are used
 - to reduce the volume of green waste material
 - To minimize the consumption of expensive landfill air space
 - To reduce trucking costs and save on fuel and dump or tipping fees
- The prices range depending on the desired specs.
 - 2003 Morbark 1300 Electric Tub Grinder with Grapple
 - **For Sale Price: USD \$350,000**
 - 1999 Morbark 1300 750HP CAT 3412 13,000 Frame hours with rebuilt engine -- ECM report & machine shows a very easy life.
 - **For Sale Price: USD \$87,500**



Compost Turner

- Compost turners introduce oxygen into the compost pile, which helps speed up the decomposition process
 - Composts 3 times faster than a bucket loader
 - High speed flails improve material breakdown
-
- Backhus 21.55 (A55) Compost Turner
 - Price: \$315,000
 - Wildcat FX700 Windrow Turner
 - Price: \$15,000



36" Stainless Steel Temperature Probe:

- Used to monitor the compost temperature.
- Comes with color coded temperature zones
- Stainless construction ensures durability

Cost: \$99

*Note: Temperature largely determines whether the product will be Grade A - quality.



Screening Machine

- Used to help separate materials, depending on size.
- Raw material is loaded into the hopper, which feeds material to shaker bed.
- Shaker bed vibrates raw material, filtering fine particles from large materials.

- 2005 Wildcat 5x16 Trommel Screen - Western
 - Price Range: \$35k- \$80k. (depending on model year, engine hours, etc.)
- ZYFY compost vibrator screening machine
 - Made in China
 - Price Range: \$1k-\$6k /Set



John Deere 6130M:

- 130hp Engine
- Essential Piece of equipment
- Will be used to transport Green Waste, both pre and post compost
- Cost Range: \$40k-\$100k+ (depending on model year, engine hours, etc.)
- Operating Costs Vary

Grant Money

Table 2. Factors Used in Calculating Costs.

| | | |
|-----------------------|---------|---------------------|
| Purchase price | 85% | of list price |
| Interest rate | 7.0% | of remaining value |
| Insurance and housing | 1.0% | of remaining value |
| Diesel fuel | \$3.75 | per gallon |
| Lubrication cost | 10% | of fuel costs |
| Tractor hours | 300 | per year |
| Years of life | 10 | years |
| Labor charge | \$14.50 | per hour |
| Labor time | 1.10 | times tractor hours |



 11

2017 JOHN DEERE 6130M

2017 6130M, MFWD,WARRANTY TILL SEP 9 2019, 620R SELF LEVELING LOADER, STANDARD CAB, 16/16 POWERQUAD PLUS TRANSMISSION, LH&RH MIRRORS, PANORAMA WINDSHIELD, DUAL REMOTES, 540/1000 REVERSIBLE PTO, CAST WHEELS, 460/85-34 REAR RUBBER, 380/85-24 FRONT RUBBER, PTO REMOTE, Configuration: Standard, Rear ...

Hours: 70

Drive: MFWD

Horsepower: 130

Serial Number:

1L06130MEHH876102

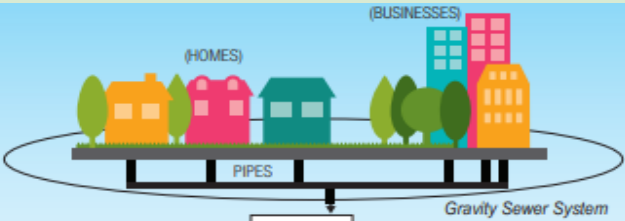
For Sale Price: USD \$92,900

Cost of Receiving Waste Streams

Green team

MIAMI WASTEWATER TREATMENT PROCESS

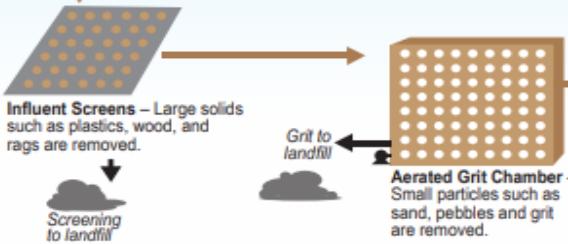
The continuous delivery of excellent and reliable wastewater services in compliance with all regulatory requirements.



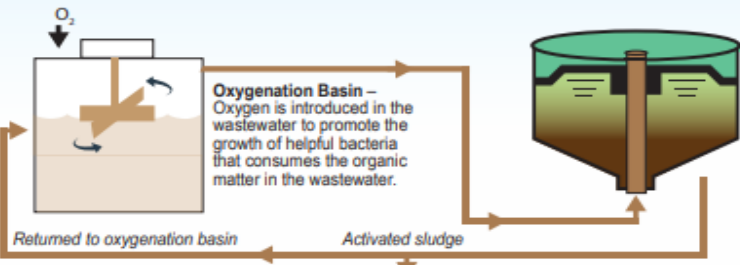
Pump Station – Wastewater is pumped long distances to the wastewater treatment plants (WWTP).

PRE-TREATMENT

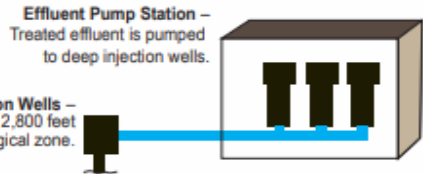
Upon arriving at the WWTP, the water enters the pretreatment process.



SECONDARY TREATMENT



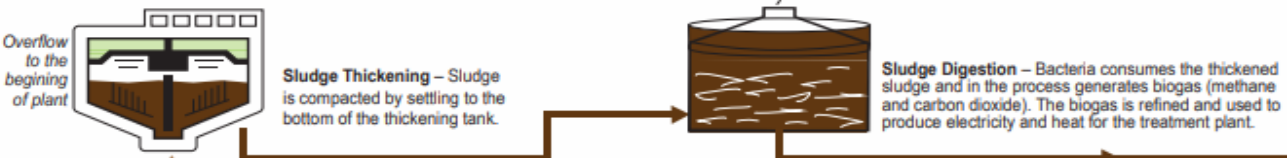
EFFLUENT DISPOSAL



TERTIARY TREATMENT



SOLIDS HANDLING

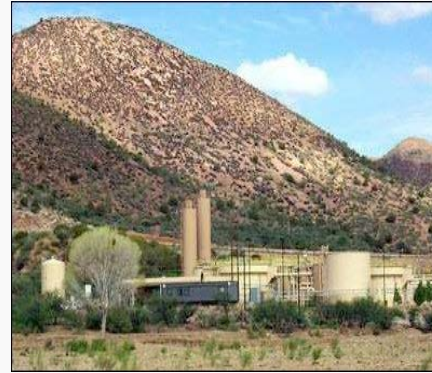


Dewatering Centrifuge/Disposal – Treated sludge is drained into a soil-like material. The material is then processed and used as a soil conditioner or compost fertilizer.

Cost of Receiving Waste Streams

One of the biggest factors that determines the cost of receiving wastewater is the type of technology used.

- Facilities use technology for services such as:
 - PH stabilization
 - Chemical clarification
 - Metals removal
- Without these services, wastewater being processed by a treatment plant will contain many of the following contaminants:
 - Pollutants (organic compounds)
 - Nutrients
 - Acid and Alkalis
 - Metals
 - Solids
- Solids discharged with a waste stream may settle immediately at the discharge point or may remain suspended in the waster. Settled solids cove the bottom-dwelling organisms, causing disruptions in population and building a reservoir of oxygen-consuming materials. Suspended solids increase the turbidity of the water, thereby inhibiting light transmittance.



The average cost per cubic meter of wastewater treated is roughly **\$0.11**

Cost of Receiving Waste Streams

There are various different costs associated with handling and transporting solids.

In order to make the handling process easier and more efficient, several processes need to be conducted. These processes include:

- Sludge *thickening*
- Sludge *digestion*
- Sludge *dewatering*

The average cost for these processes varies based on the amount of wastewater being processed on a daily basis.

These processes will recover some energy from the sludge, which can be used to power the treatment plant. Additionally, the processes create a beneficial product that can be used as fertilizer, or for soil conditioning..

The average cost per cubic meter of wastewater treated is roughly **\$0.11**

When transporting the biosolid sludge, Miami and most of the CAG region bring it to the Gila County landfill located to the east of the town.

On average:

200 tons of biosolid material get transported per-trip to the landfill.

At approximately \$47/ton, that equates to **\$9,000-10,000** in transportation expenses on every trip.



Recommended action: work with Freeport-McMoRan, Capstone, and BHP to find a transactional solution to the transportation issue.

Similar example: Phoenix 91st Ave. WWTP + Synagro Technologies partnership

Cost of Receiving Waste Streams

- Laborers
 - \$40,446.16 - \$57,075.20/yr
- Storage cost
 - Installed cost \$4,500 / 3,000 gal tank,
 - Installed cost \$9,500 / 12,000 gal tank
- Equipment operators
 - \$46,758.40 - \$62,940.80/yr
- Management team
 - Safety: \$52,330 - 110,553/yr
 - Accountant: \$61,427 - 92,976/ yr
 - Supervisor: \$71,38 - 102,523/yr



Cost of Composting Process

Gold team

Windrow: Operation and Maintenance Costs

- O&M \$150 - \$200 per dry ton per day
- Per year \$265,800 - \$354,400
- This includes Miami and Globe
- Adaptable to changing properties, saving money

Disclaimer

Based on 2017 volumes

Does not include: wood products, construction materials

Lower C.C., More labor intensive



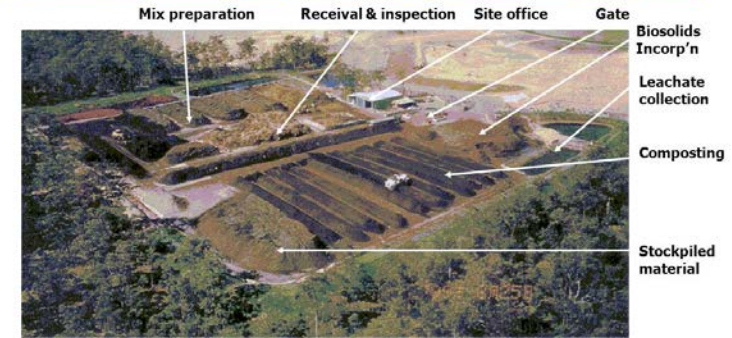
*End-product compost can sell for \$5 - \$10 per cubic yard, or
\$10 - \$20 per ton (aiding O&M costs)*

Case: Casper Regional Landfill

Costs:

- Labor for designing, constructing, and operating the composting system
- Labor to treat biosolids (mixing in wood chips, aerating & turning, and assisting with hauling)
- Cost of all necessary equipment
- Electric cost to run the system (turners, etc)
- Water cost

Site layout – Windrow composting facility, Wyong



www.recycledorganics.com



Cost of Compost Storage

Gold team



Cost is dependent on several variables:

- Policies
- Zoning
- Type of building
- Type and quality of compost

Policy Limitations

- Distance from public or semi-public water sources
 - Must be stored at least 1000 feet away unless justified and approved by ADEQ
- Distance from public-right-of-way or private property line
 - Must be stored at least 1000 feet away unless permission from the land owner or lessee is obtained.
- Distance from dwellings
 - Must be stored at least 1000 feet away unless permission from dwelling owner or lessee is obtained, if the owner/lessee changes, permission needs to be given by the new owner/lessee.

**COMPOST:
NATURE'S
WAY OF
RECYCLING**



Zoning

- Under the Gila County “General Stipulations and Provisions” document properties must be cited properly and under the correct zone stipulation. In the case that storage facility is in any of the following: residential, commercial, or industrial districts the correct protocol must be followed. Examples of keeping the storage facility in the correct protocol in an industrial district such as providing controls to minimize air pollution, radiation, and/or explosion dangers.
- According to the “General Stipulations and Provisions” document; “No property or use shall be operated or maintained in such a manner as to be a fire and/or explosion hazard; no property or use shall be allowed to emit toxic fumes or generate toxic waste; neither shall there be emitted into the atmosphere smoke, soot, dust, radiation, odor, noise, vibration, heat, or glare to such an extent as to constitute a nuisance; no property or use shall be operated or maintained to store junk or in such a manner as to be deemed a junk yard, unless permitted within a specific zoning district.” So there would need to be a meeting within a specific zoning district in order to legally store biosolid waste on site.



Type of building

- Butler Buildings Compost Structure
 - \$10-\$15 per ft²
 - Moderate potential for contamination and odor.
- PVC or Fabric covered structures
 - \$6-\$7 per ft²
 - Lower potential for contamination and odor.
- Concrete slab
 - ~\$1.50 per ft²
 - Higher potential for contamination and odor.
- Leasing of an area
 - Recycled City leases 11 acres of land for around \$1000/month



Type and quality of compost

- Proposed compost product will fall under class A biosolids according to EPA guidelines.
 - Virtually undetectable levels of pathogens
 - Strict standards for metal, odor, and VAR (vector attraction reduction)
 - Can legally be utilized as fertilizer on farms, vegetable gardens, and can be sold to homeowners.
 - Higher quality product might take a longer time investment up front, but it is much easier and inexpensive to store.



Q + A