



Patagonia Waste Management

Season Two Assessment

**TTS BTF Laguna Capri
Piedra Negra Bivvy Site**



Acceso PanAm 2017

Table of Contents

Assessment Summary	3
Introduction	3
Description of Need	3
2017 season findings: TTS Toilet at Laguna Capri	4
Actions Completed at the TTS Unit at Laguna Capri	5
Measurable Results	6
Expected Long-Term Results	6
Recommended Maintenance Procedures	6
Photos	7
Piedra Negra - Site Evaluation	12
Summary of the 2017 season findings	12
Piedra Negra Climbing Base camp	12
Land Management at Piedra Negra	13
Actions Completed January - February 2017	13
Projected Goals from Site Overview	16
Expected Long-Term Results	16
Other Information	16
Project crew	16
Field work	16
Funding	16



Assessment Summary

The goal of this assessment is to outline the work done on the Laguna Capri TTS unit during the second season of the Patagonia Waste Management project as well as present the analysis of the Piedra Negra bivvy site.

Introduction

The Patagonia Waste Management project, a partnership between Acceso PanAm, Toilet Tech Systems, and Los Glaciares National Park, aims at creating human waste management solutions for Patagonia.

The first season was carried out December 2015 to March 2016. Four full time volunteers built one urine diverting vermi-composting test toilet in Laguna Capri using the Behind the Wall technology and a Toilet Tech unit. Capri is one of the most popular destinations in the park, if not the first one, because it is the closest attraction to town (4 km), and thus, it is both a day and overnight destination for hikers and backpackers.

The second season, with three part-time volunteers ran in January to February 2017. The goals of the second season were:

- Study the on-the-ground problem at Piedra Negra climbing basecamp and provide a solution to Piedra Negra Climbing Basecamp
- Continue to research the results of the first season / test toilet and make broader generalizations and recommendations for other areas in Patagonia.

The first part of this assessment covers the findings of the Laguna Capri TTS unit as well as the findings for Piedra Negra.

Description of Need

El Chaltén in Argentina is becoming increasingly popular to climbers, hikers, and tourists alike, especially after the pavement of roads and the growth of tourism infrastructure that includes many lodging options, restaurants, grocery stores, and even wi-fi. The increase in numbers of visitors has brought many benefits and challenges to the area. One of the biggest challenges the Seccional Lago Viedma of Los Glaciares National Park faces nowadays is human waste management in backcountry campgrounds and advanced basecamps.

Currently, all but one of the campgrounds either have a cesspool latrine (pit toilet), or an expectation of dispersed cat-holes. Due to the high number of visitors during the peak months of the year, this is not a sustainable situation without continued degradation of the environment,



water quality, and visitor experience. In fact, the lack of a waste management solution results in poor disposal methods or long-term cumulative effects, which has the potential to cause social and environmental impacts.

According to Park staff, at the main backcountry campgrounds, Poincenot, De Agostini, and Río Blanco it is becoming increasingly difficult to find suitable spots for new cesspool latrines because they keep running into old ones that have not broken down or decomposed. The staff has fewer and fewer options to dig new latrine holes. Additionally, visitors regularly complain of the inadequacy of the current latrine structures, as well as the odor of the cesspools.

However, the new urine diverting latrine at Laguna Capri, installed in February 2016, has been effective so far. Visitors have reported a better experience at the Capri latrine over the older style, as well as reduced odor.

2017 season findings: TTS Toilet at Laguna Capri

Upon arrival in January 2017, approximately eleven months after the unit was opened we found the unit to be functioning well. The critical systems in the toilet (plate, wiper and door) were working just as smoothly as the first day they were installed. We were excited to see the “floating plate” didn’t flex when the door was cycled and it was clean and wiping smoothly, proving the system had worked as expected.

During the first season, the construction work had caused some localized impact on the surrounding area of the unit. In 2017, we were able to confirm that the vegetation had grown back, and the trampling impact was hardly noticed anymore. To prevent further impact on the soil and vegetation and concentrate impact on a trail, the park had installed steps and a nice path to and from the toilet.

The odor was much worse than when we had left. This was due to the clogged urine trough, which caused urine to pour out of the rear of the trough. The solid waste and liquid waste were mixing and upon repair of the clog the unit diverted urine well.

The system works with standing and active piles of solid waste. The active piles receive fecal matter, while the standing pile is not receiving any new fecal matter and decomposition can begin. The active pile of solid waste was large and needed to be shoveled to the side to become standing pile. When the solid waste pile was moved significant amounts of urine were not visible and the smell was in line with what solid waste smells like without urine on it.

In the end the unit had proved to be successful in urine diversion. The unit showed little wear from snow or winter conditions.

In March 2017, worms were added to the standing solid waste pile. The park did this after conducting its own independent study of urine diversion and vermi composting. Happy with the results, the park allowed worms to be included in the unit. The invertebrates greatly reduce the



volume, mass, and pathogens. They stabilize the material and do all the mixing. This will help to make this unit a low O&M, operationally safe high-use public toilet system.

Next year we will be able to test the standing pile and check on the pathogen destruction.

Actions Completed at the TTS Unit at Laguna Capri

Annual Unit Cleaning and Maintenance

Urine Trough Maintenance

- The urine trough had become clogged with feminine hygiene products and urine was pouring out of the back of the trough. The team created a specific tool to allow cleaning of the trough from afar.
- The funnel that takes the urine into the below ground drain had potential to become clogged. The team added stones larger than the opening to prevent blockages in the future. The stones will allow urine to pass through.
- The team poured a diluted bathroom cleaner down the below ground pipe to help prevent build up in the urine pipe.
- The trough was left in good operating condition.

Solid Waste Maintenance

- The APA team shoveled the “active” cone to the side, creating a “standing” cone. The amount of waste would have easily filled an average sized wheelbarrow. Which with a calculation of cubic yards roughly equates to 128 pounds of waste. The cone was about 90 cm (3 ft.) wide and 75 cm (2.5 ft.) tall.
- Shortly after the team left for the season, the APN approved the use of worms in the toilet. The park added worms, water and a sheet to the standing pile per Dr. Geoff Hill’s orders. Our expectation is that worms will greatly reduce the volume, mass, and pathogens.

Technical System Inspection

- An overview of the inter workings of the unit showed minor wear on the cord that runs the door-wiper system. The cord will continue working for the short term but to ensure smooth operation the cord will need to be replaced soon (assessment: Feb 2017).



Personal Protective Equipment (PPE)

- PPE was purchased and cashed at the Capri site for the park's staff. A painter's suit, rubber gloves, latex gloves and hand sanitizer. The park has its own rubber boots and eye protection.

Measurable Results

To measure the effectiveness of the TTS BTW unit installed in Capri, we used simple metrics:

- In 2017, according to on site our observations, there were less visible toilet paper seen in the surrounding area than in Jan 2016.
- In informal conversations with local guides in both seasons, they informed us they had understood the system enough to give interpretive information about it to clients. Furthermore, they reported they encourage their clients to use the unit.

Expected Long-Term Results

- Increased decomposition rate after the inclusion of worms in the standing pile.
- Less human waste (less actual bulk), since the invertebrates greatly reduce the volume, mass, and pathogens.
- Increased visitors awareness with an interpretive sign that is to be set in front of the toilet.
- Reduced level of pathogens in the byproduct that is left behind when compared with the case of the pit toilets, where the level of pathogens is extremely high, because there is no break down.
- The end product should be easy, low-volume, and light enough to be extracted for disposal after 10 years.

Recommended Maintenance Procedures

Annual Complete Unit Maintenance

- Shovel active pile to standing pile
- Pour cleaner in urine trough
- Check technical system (look at cables, cords and potential points of failure)

Once a month

- Use urine trough tool to clear trough
- Clear any debris that has collected on the urine collection funnel
- Pour 3 liters of water through the urine trough from the toilet seat

Once a week

- Collect garbage inside of the unit and surrounding area

- Clean the interior of the unit
- Cycle the door and pour water on the plate to keep the plate clean
- Note and report any changes in function or odor with the unit

Install a sign with information about the unit

- The suggested phrasing in Spanish has been emailed to the Park (March 2017)

Photos

1. Worms added to the unit



2. Active Pile on the left - Standing Pile Covered



3. Urine Diagram



4. Clearing urine trough



5. Shoveling solid waste pile



6. Point requiring repair



8. The path and steps created by the park going into the unit



Piedra Negra - Site Evaluation

Summary of the 2017 season findings

In January 2017, the PWM team was able to make two site visits to Piedra Negra. During these visits, the team was able to identify the number of sites most commonly used and the most frequented bathroom sites. For future management of human waste, other general findings included site considerations, such as avalanche concerns if a structure was to be built, stones that could be challenging to work with, lack of level ground in areas beyond tent platforms, distance from road, steepness of the trail, site use and users.

Piedra Negra Climbing Base camp



Piedra Negra is to the north of the Fitz Roy Massif, near Paso del Cuadrado. The approach is marked in red. From: <https://albinger.files.wordpress.com/2012/10/fitz-roy-map.jpg>



Piedra Negra is a climbing base camp located to the north of the Fitz Roy range. That is the bivvy site for what is probably the most popular route in the range: the Fonrouge-Comensana route on Guillaumet. It is also the basecamp for all other routes in this peak, plus several routes on Mermoz, a neighboring peak, and a few routes on Fitz Roy. Day hikers also pass by in their way to Paso do Cuadrado viewpoint.

The approach to this base camp skirts through the Rio Electrico valley for about 10 km until it reaches Piedra del Fraile, a private mountain hut. From there, a very steep trail of about 4-5 km with 1,000 meters of elevation gain leads to the basecamp. A moderate hiker probably takes about 5-6 hours to reach the base camp from the road.

Piedra Negra is located on a lateral moraine, where there is almost no organic material in the soil. There are bivouac site for about 20 tents. The water source for the bivvy site runs through the tent areas and later joins the creek that flows down from the lake to Rio Electrico. During a good weather window, the area sees about 50 people per day, most of them climbers.

Right now, there is no human waste management at Piedra Negra. Climbers walk around to dig their catholes but many times the chosen location is not that far from the water source and tent sites. Another challenge comes from the hard soil, which makes digging difficult and may lead to poor waste disposal methods. The potential for impacts include pollution of water sources, social issues like someone finding it, smell, and toilet paper.

We have selected Piedra Negra due to its volume of use - one of the most popular climbing advanced base camps in the El Chaltén Massif - and geographic location to a water source. The location in a moraine also poses some challenges of disposal, social impacts, and possibly environmental impact as well.

Land Management at Piedra Negra

Even though there are a few controversies about land ownership, the most accepted approach and what is being considered as correct nowadays is that Piedra Negra is located just outside of the boundaries of Los Glaciares National Park on private land.

The past years have seen serious negotiations for purchasing the area and designating it part of Los Glaciares National Park. This potential is very dynamic and uncertain, but at the time of the study, the sway towards becoming National Park was significant.

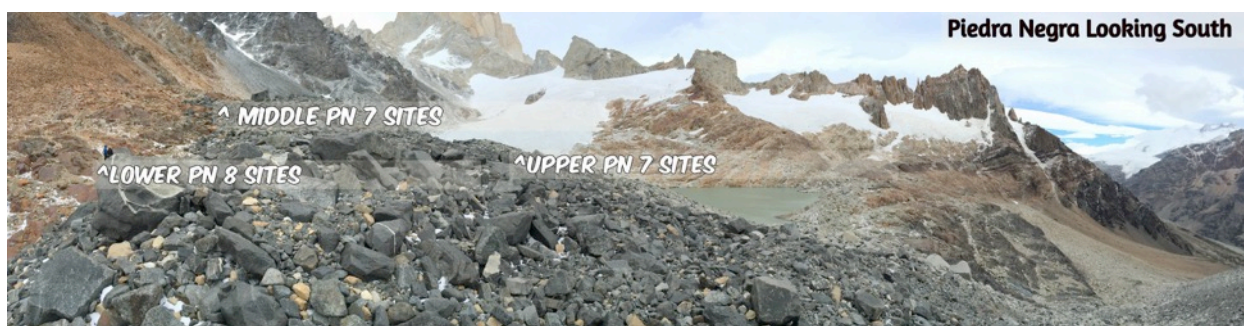
The PWM project will continue to follow the negotiations as this will sway our future decisions on management of this site.

Actions Completed January - February 2017

1. Located and counted number of tent platforms: a total of 22 tent sites were identified

Date	Number of Established Sites	Sites in use at time of survey
1/17/17	22	20
1/24/17	22	4*

* This was a bad weather window, which reflected on the number of people heading up to try to climb anything.

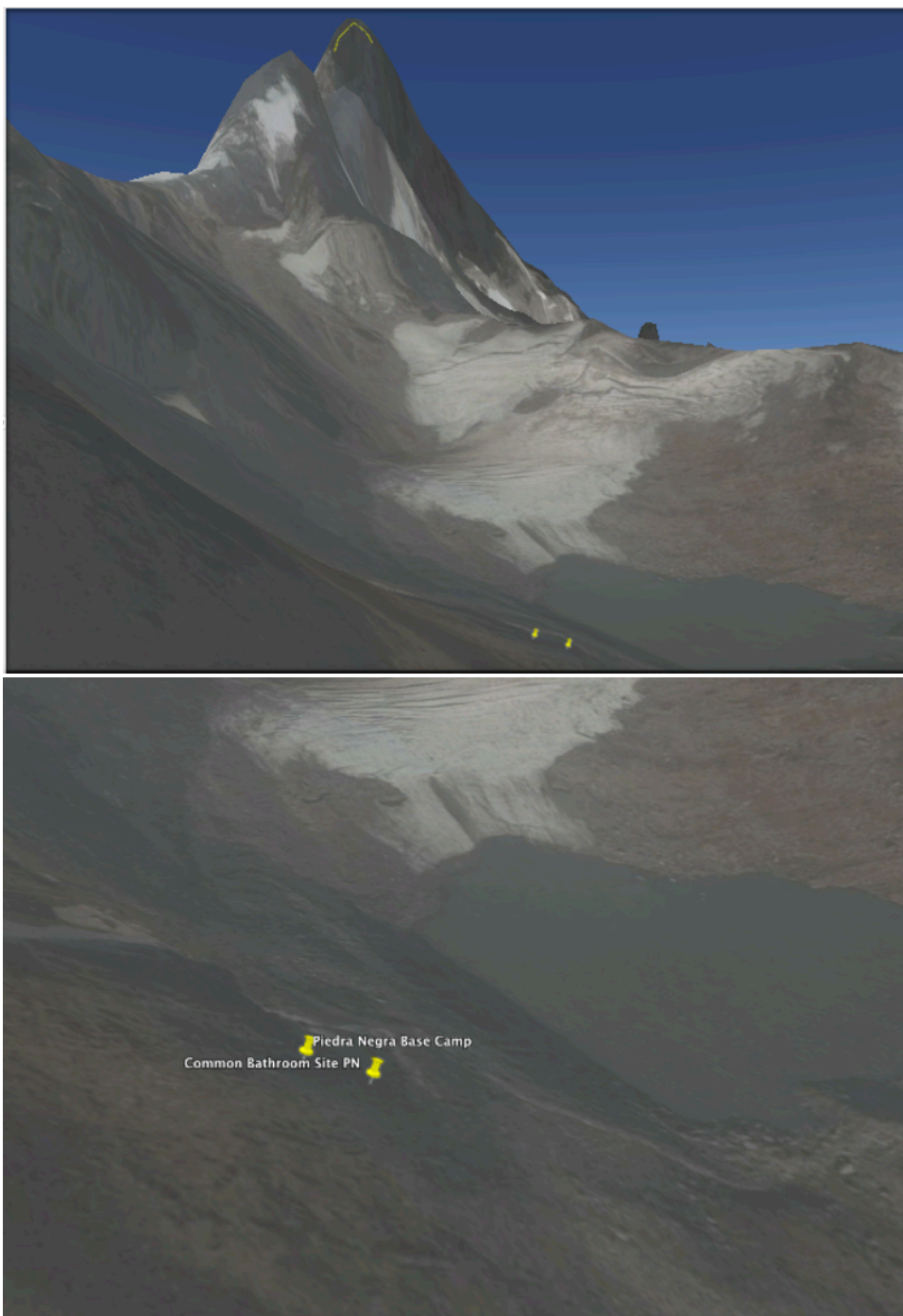


2. Located common toilet site: a 10 m x 10 m site located downhill to the north of the tent sites and water source



3. Localized count of human waste sites

Documented Piedra Negra Site Overview With Common Waste Site and Waste Count (i.e. number of turds on the ground, pile of toilet paper under rocks):





Projected Goals from Site Overview

- Properly implement a solution with considerations to specific environmental concerns at the site. Rock surface, limited level ground, avalanche concerns.

Expected Long-Term Results

- Reduced human waste
- Reduced environmental impact
- Improved recreational experience

Other Information

Project crew

- Steffan Gregory (Project Manager)
- Kika Bradford
- Geoff Hill

Field Crew

- Steffan Gregory
- Ethan Newman
- Andy Stephen

Other volunteers

- Rolando Garibotti
- Juli Speranza
- Paula Chaparro
- Alan Thorne

Field work

January 08, 2017 - February 10, 2017

Funding

Patagonia Environmental Grant