

The Kronos Incident: Geospatial-Temporal Patterns of Life Analysis

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Data Science Capstone Term Project

01 Project Background

- In January, 2014, the leaders of GAStech are celebrating their new-found fortune as a result of the initial public offering of their very successful company.
- In the midst of this celebration, several employees of GAStech go missing. An organization known as the Protectors of Kronos (POK) is suspected in the disappearance, but things may not be what they seem.
- As an expert in visual analytics, you are called in to help law enforcement from Kronos and Tethys assess the situation and figure out where the missing employees are and how to get them home again

02 Project Task

GAStech provides many of their employees with company cars for their personal and professional use, but unbeknownst to the employees, the cars are equipped with GPS tracking devices.

- **Analyze movement and tracking data**
- **Identify suspicious behaviors**
- **Identify people and locations that law enforcement should investigate**

03 Available Dataset

Car Assignment



Credit Card Data



Shapefile



GPS Data



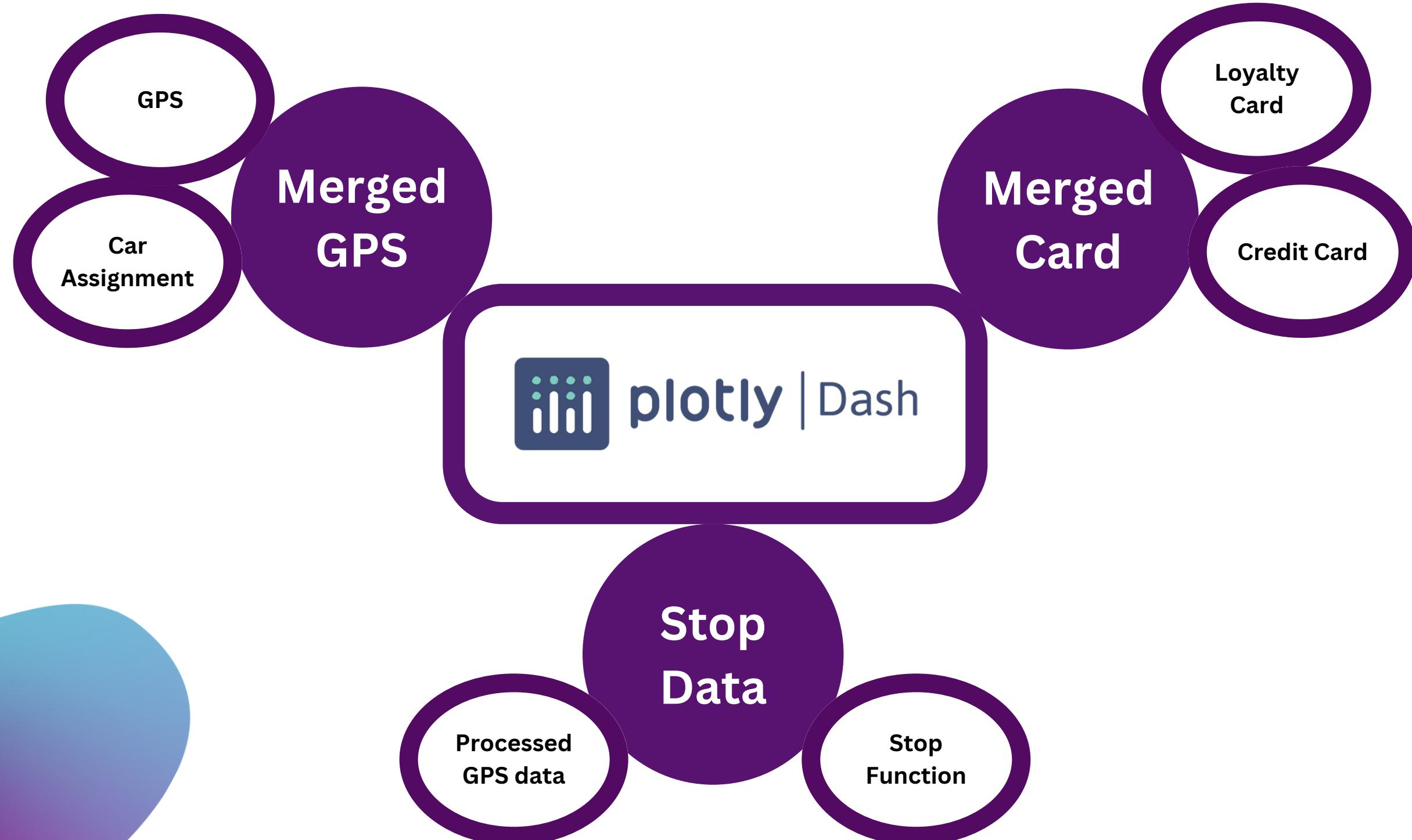
Loyalty Card Data



Map



04 Data Cleaning and Preprocessing





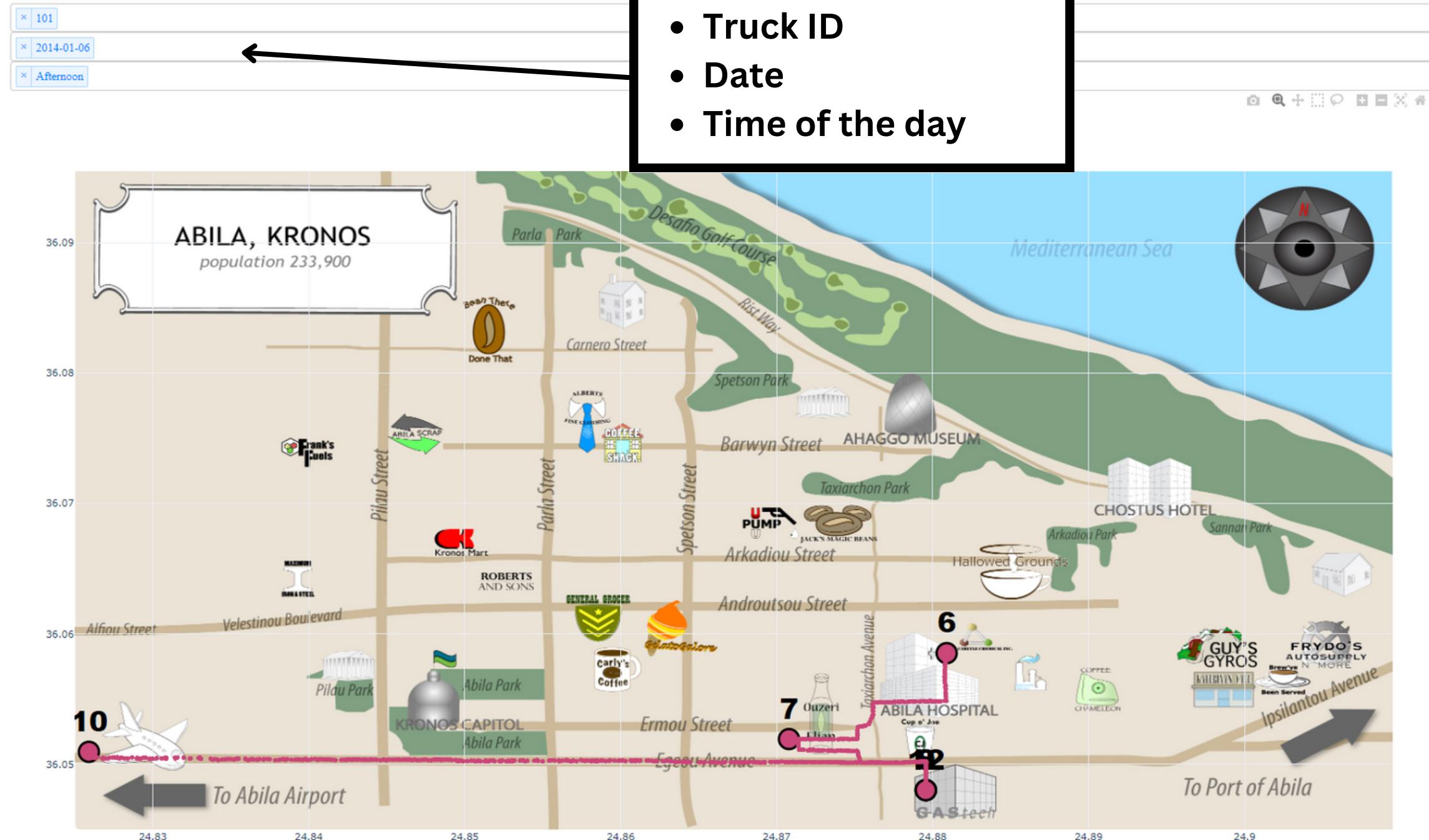
**Truck Driver
Movement**

**General
Employee
Movement**

**Individual
Employee
Movement**

Truck Driver Movement Tab

Truck Driver Map



timestamp_full	FullName	location	price
2014-01-06 11:57:00	Albina Hafon	Carlyle Chemical Inc.	3959.66
2014-01-06 15:14:00	Albina Hafon	Abila Airport	777.06

General Employee Movement Tab

General Employee Movement

Employment Type:

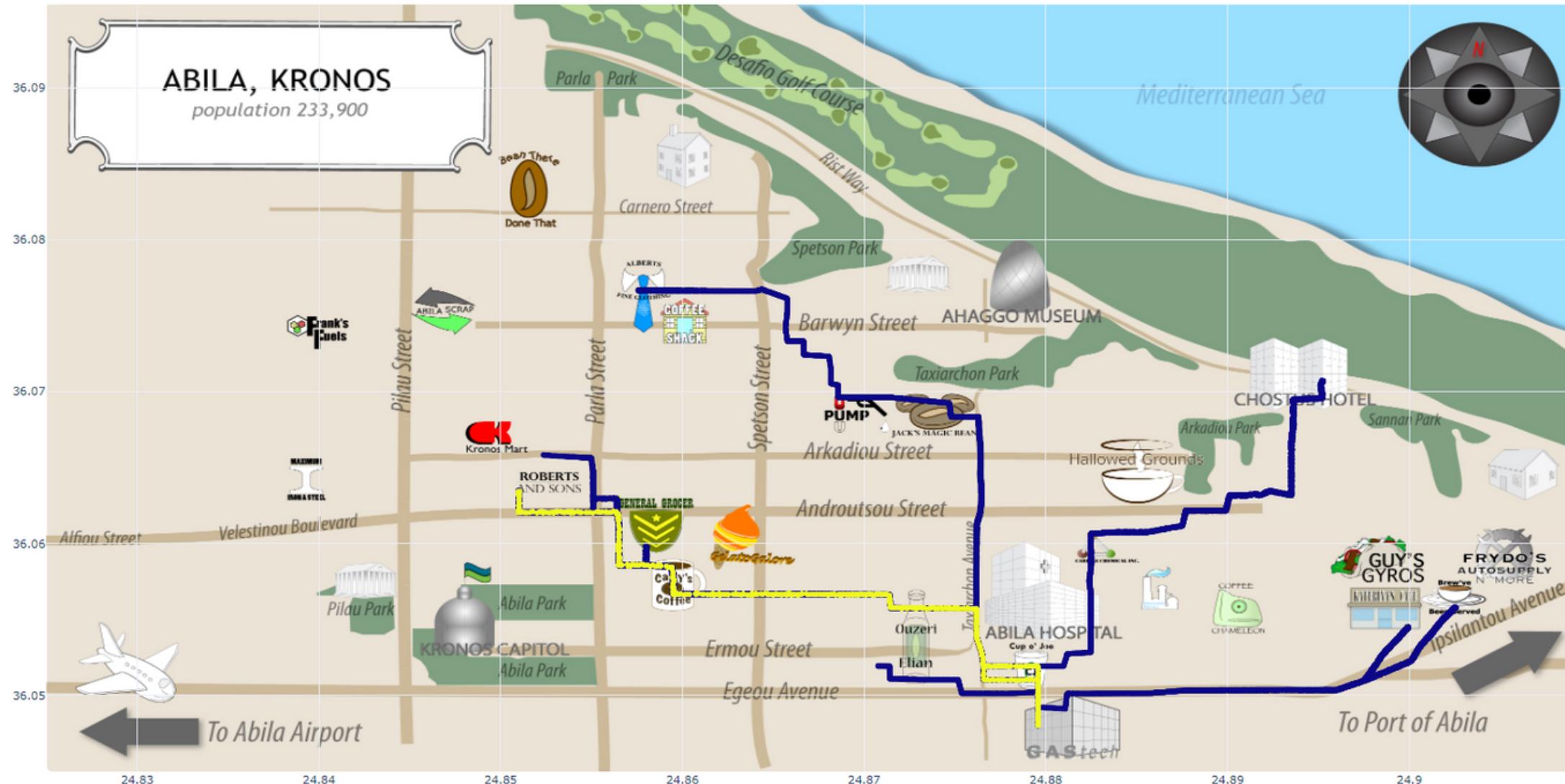
Engineering Executive |

Time of the Day

Afternoon

Weekend

True False



Timestamp	id	FullName	CurrentEmploymentType
2014-01-06 12:22:01	35	Willem Vasco-Pais	Executive
2014-01-06 12:22:01	35	Willem Vasco-Pais	Executive

Individual Employee Movement Tab

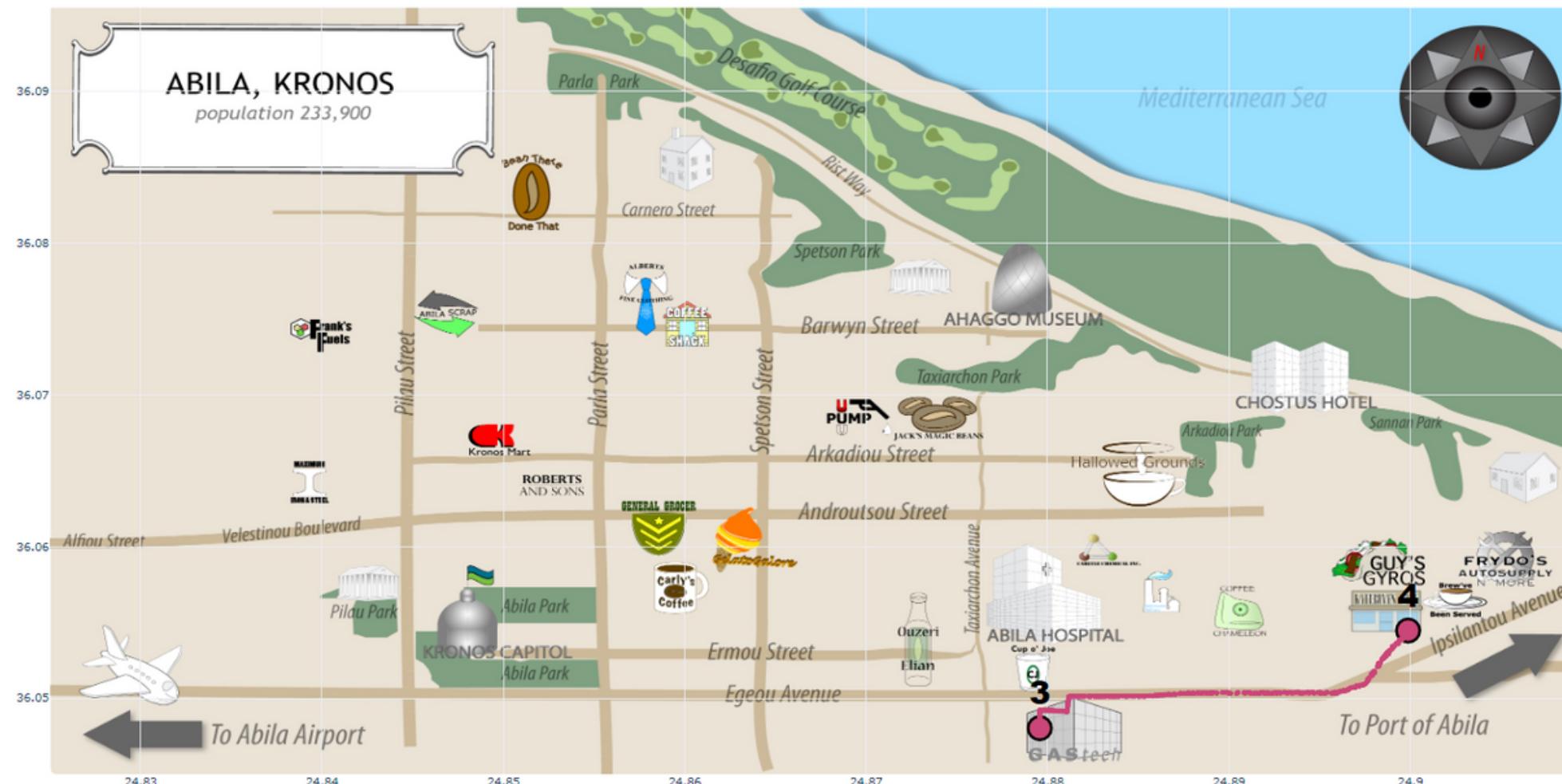
Individual Employee Movement

Employee Name:

Date

Select All

Time of the Day



Card Transaction Table

timestamp_full	FullName	location	price
2014-01-06 12:00:00	Ada Campo-Corrente	Brewed Awakenings	4.35
2014-01-06 12:56:00	Ada Campo-Corrente	Katerina's Café	13.68

Project Analysis

- The life of a typical GAStech employee
- Anomaly

Employees Living Area



Engineers

Executives

Security + Engineers

Employees Activity

Morning

Get a morning coffee then go to the office building. Typically employees bought coffee from coffee shop that is near to their home

Afternoon

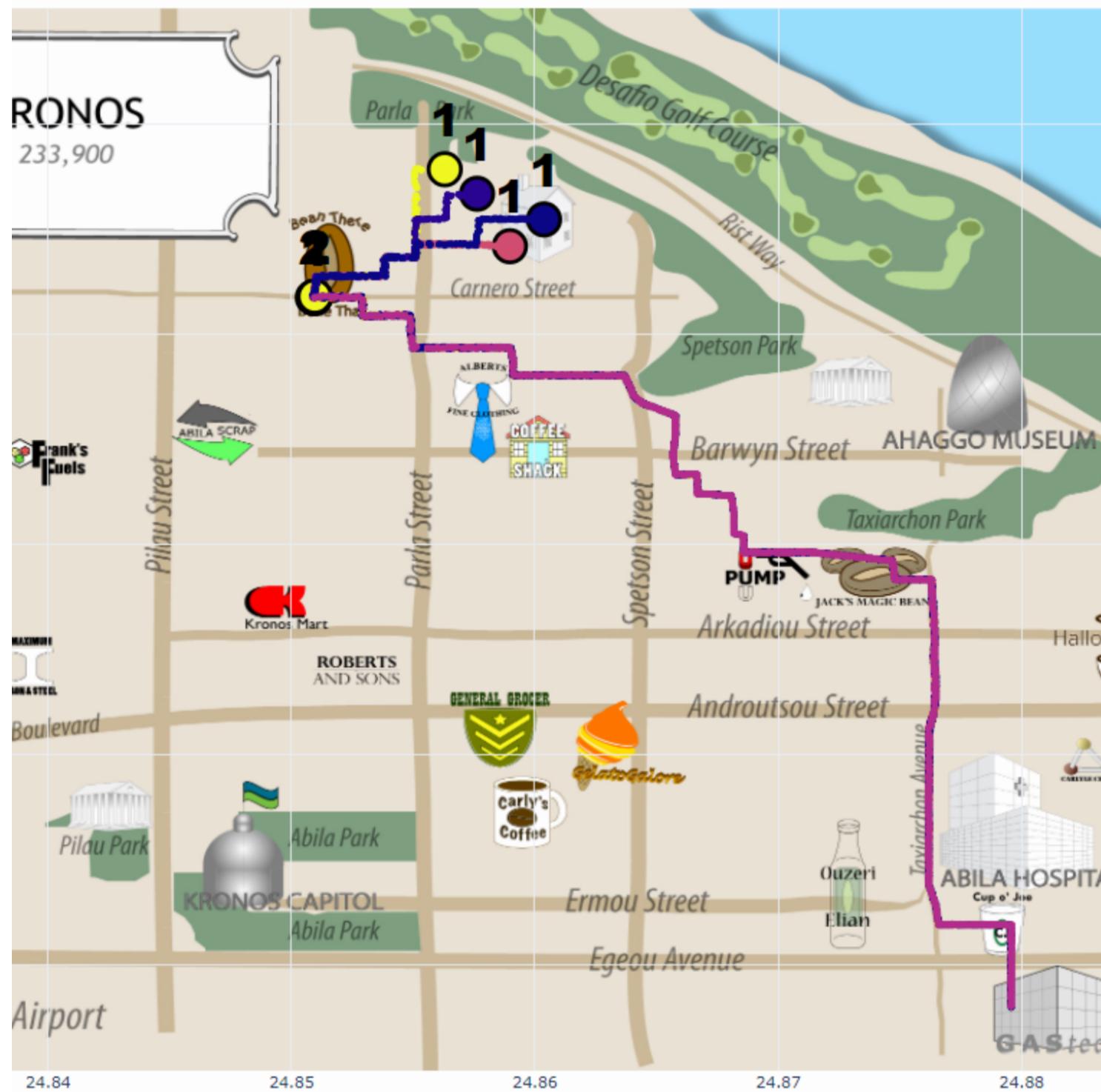
Generally getting lunch, but it varied from person to person. There are some employees that get groceries or buying clothes

Evening

Get dinner or buy groceries before going home.

The life of a typical GAStech employee

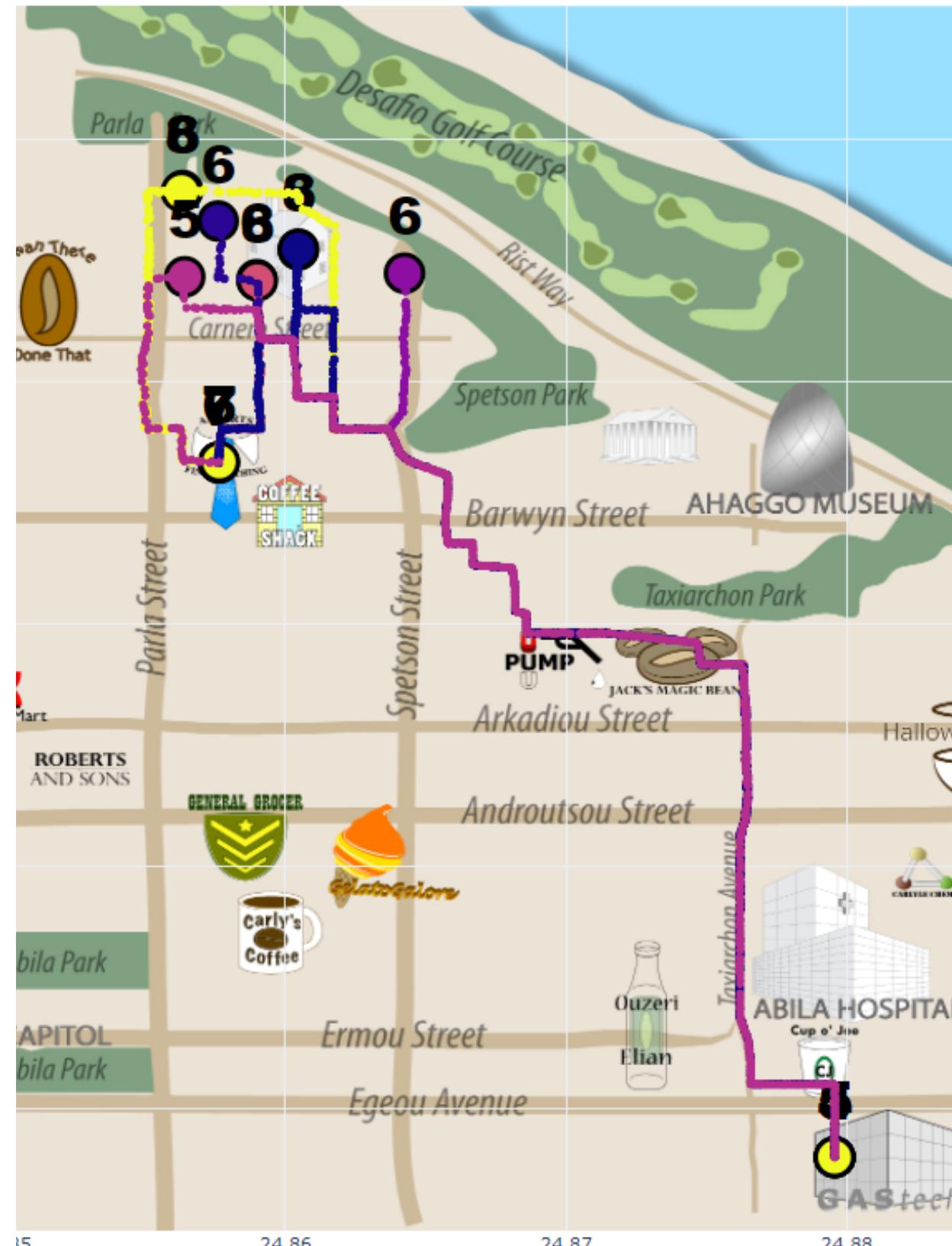
Morning Coffee



Lunch Time



Evening



15

24.86

24.87

24.88



24.88

24.89

24.9

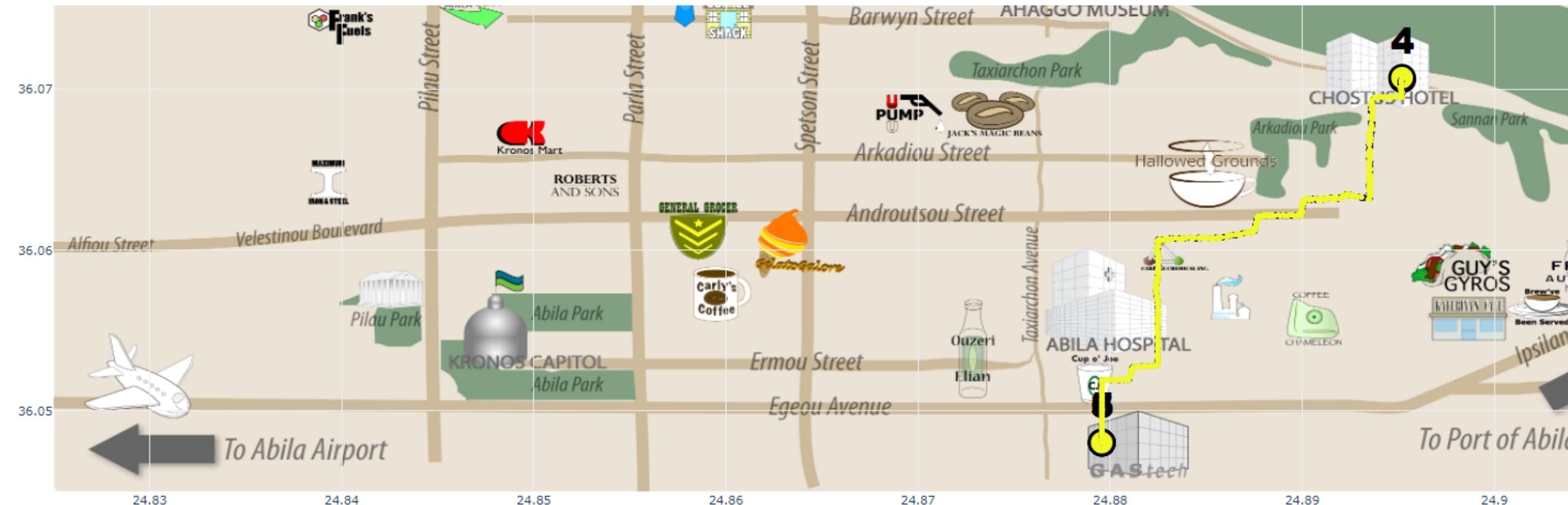
Truck Driver Daily Routines

Truck ID	Operating Day	Day	Driver	Description
101	Mon,Tu,Thu,Fri	Mo	Albina Hafon	
		Tu + Thu	Benito Hawelon	
		Fri	Claudio Hawelon	Not Operating on 17th
104	Mon-Thu		Henk Mies	Only Airport
105	Tue-Thu		Valerie Morlun	
106	Tue-Thu	Tue+Thu	Dylan Scozzese	
		Wed	Adan Morlun	
107	Mon-Fri		Cecilia Morluniau	Morning - Lunch
		7,8,9,15 Jan	Irene Nant	After Lunchtime

Anomaly

- Insignificant to Investigate
- Significant to Investigate

Hotel Lunch



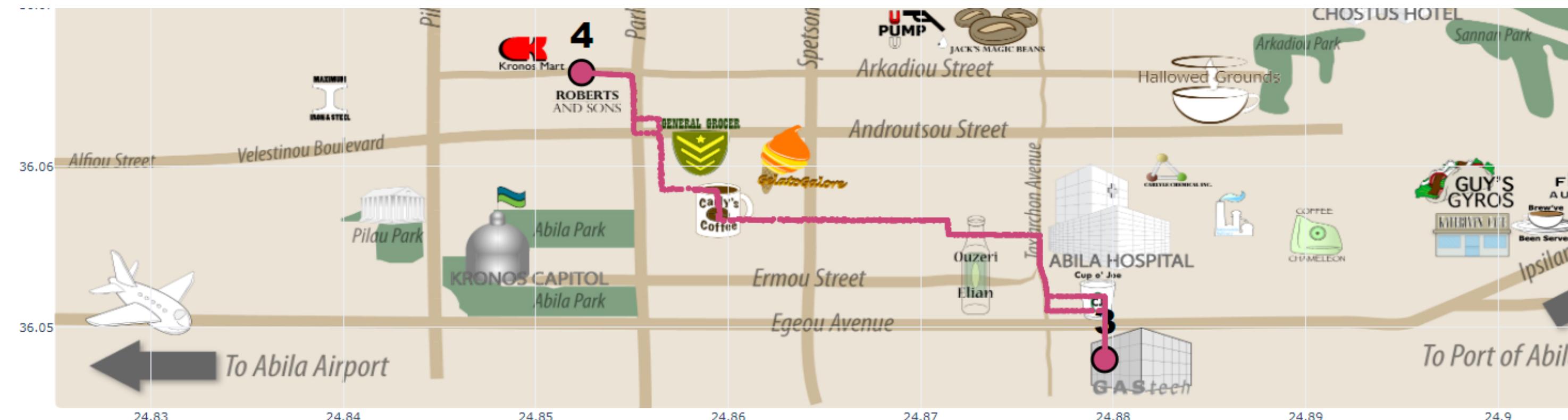
Card Transaction Table

timestamp_full	FullName	location	price
2014-01-08 13:19:00	Brand Tempestad	Chostus Hotel	111.89
2014-01-08 12:00:00	Isande Borrasca	Brewed Awakenings	12.32
2014-01-08 12:56:00	Isande Borrasca	Chostus Hotel	107.51

Who : Isande Borrasca and Brand Tempestad
When : Lunch time on January 8,10,14, and 17
Where: Chostus Hotel

Lunch Treat

Nils Calisto GPS track



Card Transaction Table

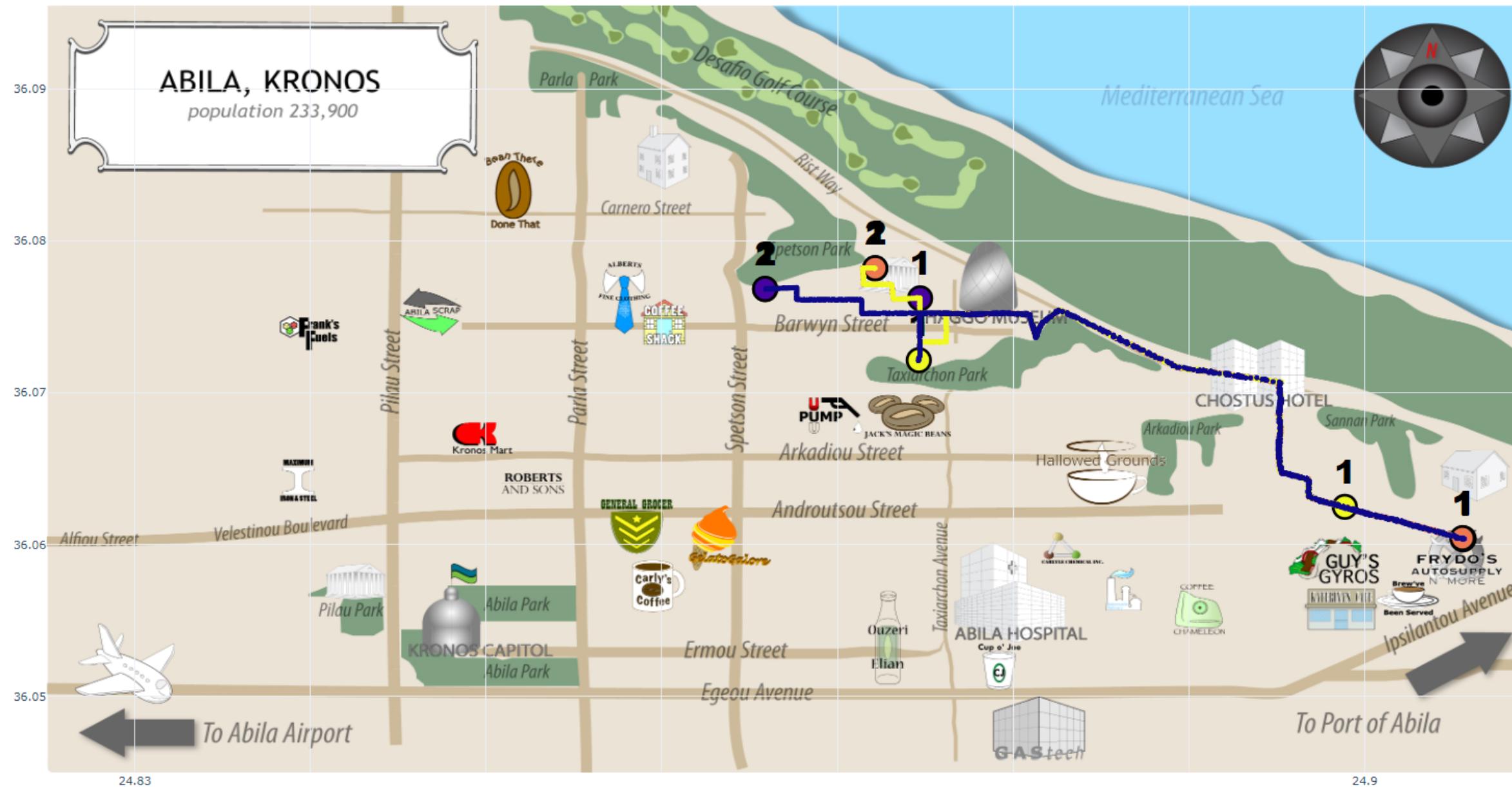
timestamp_full	FullName	location	price
2014-01-17 13:16:00	Linnea Bergen	Kalami Kafenion	140.78
2014-01-17 12:00:00	Isak Baza	Jack's Magical Beans	7.57

Who : Linnea Bergen and her team
When : Friday Afternoon, January 17
Where : Kalami Kafenio

Insignificant to Investigate

Who	Where	When	What	Description
Multiple Employees from IT and Engineering	Lars Azada's House	Friday Night, January 10	House Party	A party is happening at Lars's House, multiple employee went to his place and went home around midnight
Lucas Alcazar	Gastech Office	Night, January 6,8 and 15	Overtime	Lucas often works late, sometimes he had to go back to the office late at night even though he already left in the evening.
Kanon Herrero, Loreto Bodrigi ,Edvard Vann, Elsa Orilla, and Adra Nubarron	Kronos Capitol	Saturday Afternoon, January 18	Event at Kronos Capitol	
Henk Mies	Abila Airport	Night, January 16	Overtime	Usually gets back at the Gastech building before 5pm, but only on this date that he starts leaving the airport around 5pm and returns the truck past 9pm.
Several Employee	Coffe Shop / Restaurant	Several Days	Purchasing outliers	The most logical reason for these outliers would be employees are buying / treating food / coffee for other employees.

Spying on Executives



Who	When	Where
Loreto Bodrogi & Isia Vann	7-Jan	Ada Campo Corrente House
Minke Mies and Loreto Bodrogi	9-Jan	Orhan Strum House
Isia Vann and Hennie Osvaldo	11-Jan	Willem Vasco Pais House
Minke Mines and Hennie Osvaldo	14-Jan	Ingrid Barranco House

Following Ada Campo (Executive)



Who : Isia Vann & Loreto Bodrogi
When : Morning, 7 Jan
Where : Near Ada Campo House

Who : Minke Mines
When : Morning, 7 Jan & 14 Jan
Where : Near Ada Campo House

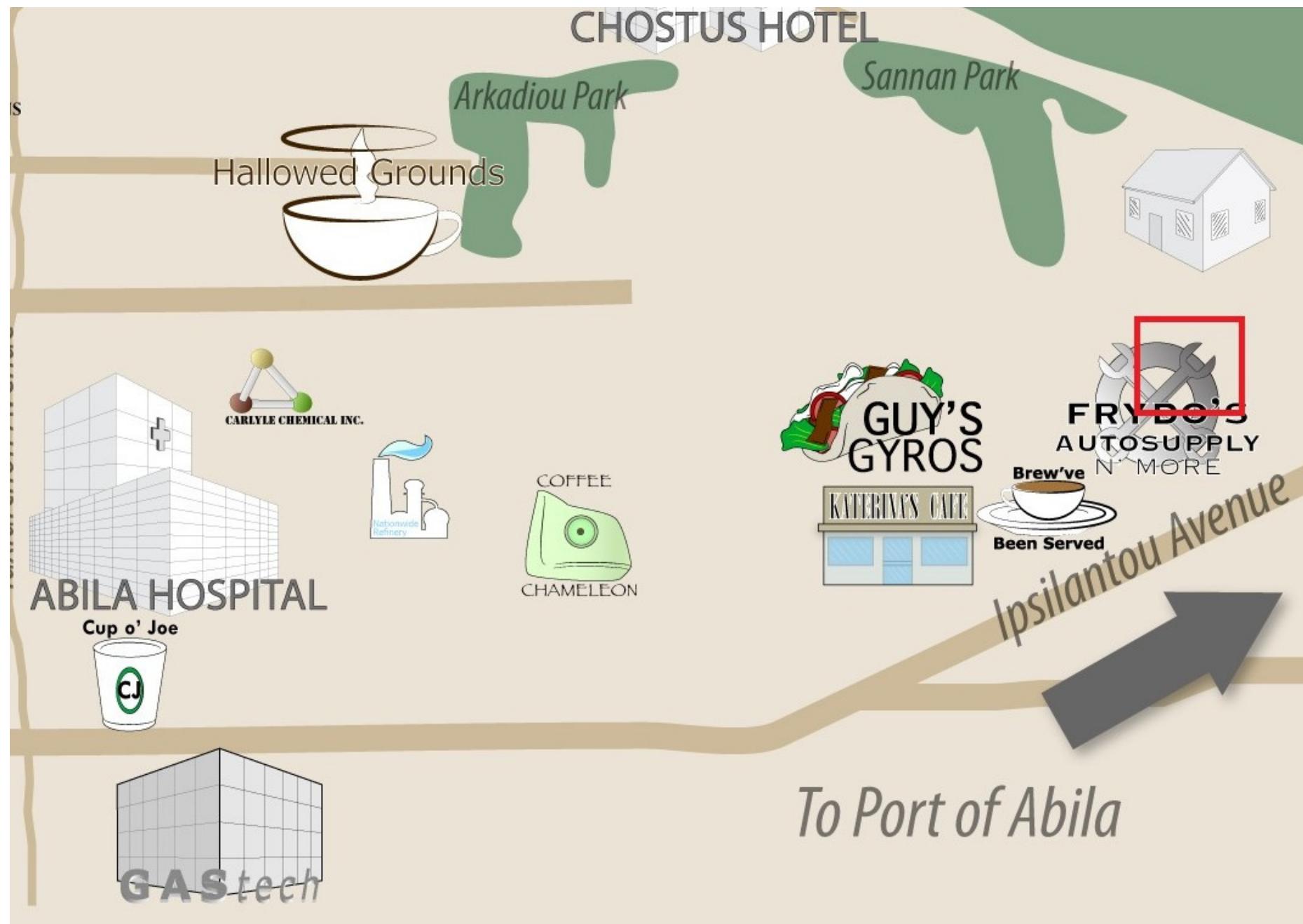
**Happened after he's done spying on
Ingrid's House**

Suspicious Location



Name / Area	1	2	3	4	5
Loreto Bodrogi	7,8,11,14	8,17	15	9	13
Inga Ferro	9	17,18	13,15	7,10	16
Minke Mies	10,16	8	9,14	15	7
Hennie Osvaldo	16	9	15	10,17	8,11

Possible POK Base of Operation

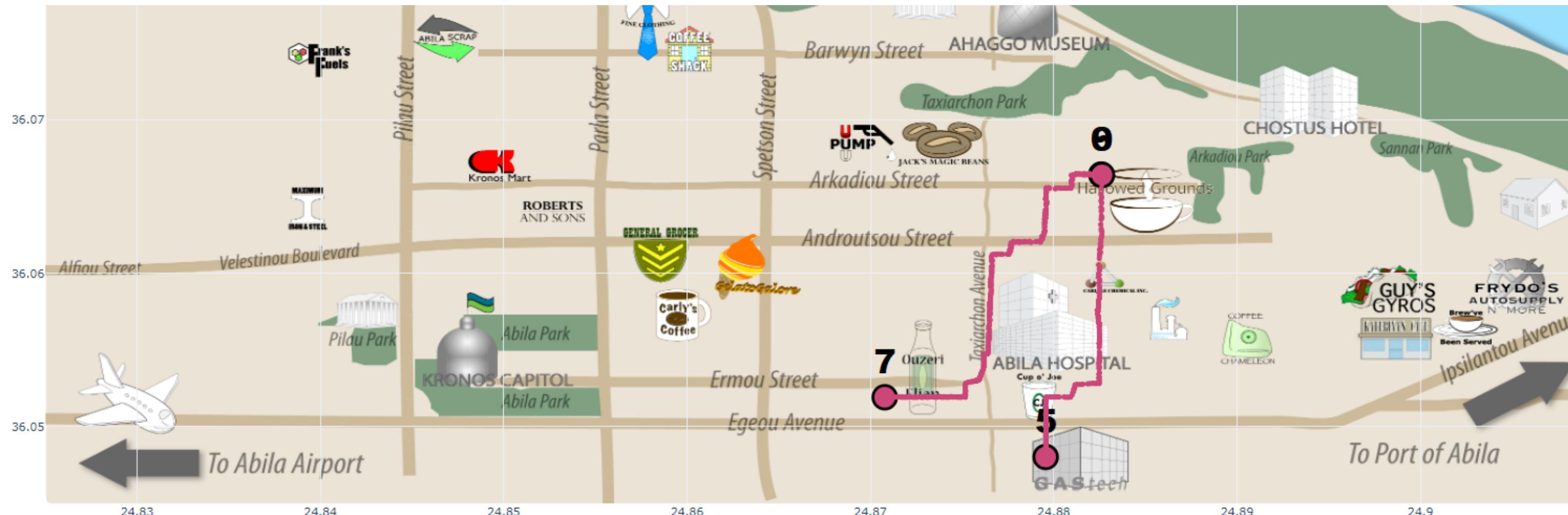


Who : Inga Ferro, Loreto Bodrogi, Hennie Osvaldo and Isia Vann

When : Everyday

Where : Loreto Bodrogi / Isia Vann / Inga Ferro House

Lucas's Suspicious Transaction



Card Transaction Table

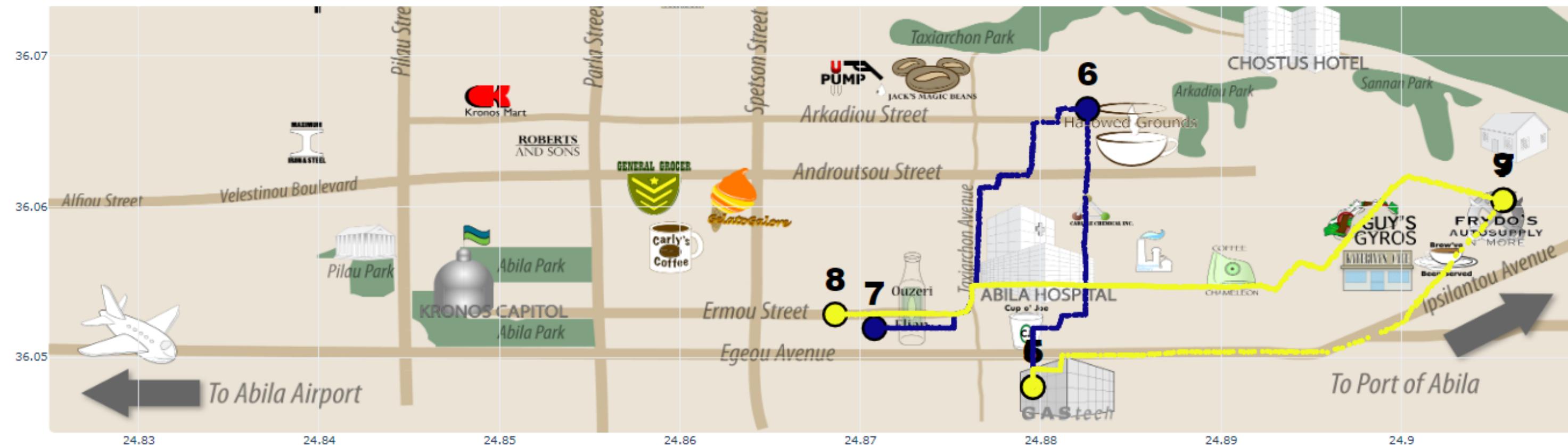
timestamp_full	FullName	location	price
2014-01-13 19:20:00	Lucas Alcazar	Frydos Autosupply n' More	10000

Who : Lucas Alcazar

When : Night, 13 Jan

Where : Frydos Autosupply n' More

Suspect 1 : Loreto Bodrogi



Card Transaction Table

timestamp_full	FullName	location	price
2014-01-13 19:20:00	Lucas Alcazar	Frydos Autosupply n' More	10000
2014-01-13 19:30:00	Lucas Alcazar	Ouzeri Elian	28.75
	Lucas Alcazar	Hallowed Grounds	14.11
2014-01-13 19:27:00	Loreto Bodrogi	Shoppers' Delight	216.43

Suspect 2 : Minke Mies



Card Transaction Table

timestamp_full	FullName	location	price
	Minke Mies	Frydos Autosupply n' More	87.57

Lucas's Transaction History

618	2014-01-13	Frydos Autosupply n' More	10000.00	2014-01-13 19:20:00	Lucas Alcazar	1.0	0.0	1.0	Information Technology	IT Helpdesk
617	2014-01-13	Hippokampos	30.51	2014-01-13 13:28:00	Lucas Alcazar	1.0	1.0	1.0	Information Technology	IT Helpdesk
615	2014-01-13	Daily Dealz	2.01	2014-01-13 06:04:00	Lucas Alcazar	1.0	0.0	1.0	Information Technology	IT Helpdesk
637	2014-01-14	Kalami Kafenion	16.84	NaT	Lucas Alcazar	0.0	1.0	1.0	Information Technology	IT Helpdesk
638	2014-01-14	Ouzeri Elian	15.94	NaT	Lucas Alcazar	0.0	1.0	1.0	Information Technology	IT Helpdesk
640	2014-01-15	Ouzeri Elian	24.81	NaT	Lucas Alcazar	0.0	1.0	1.0	Information Technology	IT Helpdesk
641	2014-01-15	Ouzeri Elian	32.95	NaT	Lucas Alcazar	0.0	1.0	1.0	Information Technology	IT Helpdesk
639	2014-01-15	Hallowed Grounds	15.86	NaT	Lucas Alcazar	0.0	1.0	1.0	Information Technology	IT Helpdesk
622	2014-01-16	Ouzeri Elian	9.91	2014-01-16 20:28:00	Lucas Alcazar	1.0	1.0	1.0	Information Technology	IT Helpdesk

06 Addressing the Uncertainties and Conflicts

Outlier : Visualize with Boxplot

Missing Data : Graph Analysis

Conflicting Data : Cross-Referencing

