

# Annex Q

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*Manual for the Improvement of the  
Collection Service*

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## Q Manual for the Improvement of the Collection Service

### Q.1 Introduction

The improvement of the collection service is achieved through the optimization of the collection routes, starting from the current design, trying to maintain as much as possible its covering, the assigned vehicles and the work journey of 8 hours per week.

The optimization of routes includes the following steps

1. Information Summary
2. Diagnostic of the routes
3. Design of the routes
4. Monitoring and evaluation of the routes
5. Definitive installation of the route

Next the flow diagram of the optimization of routes

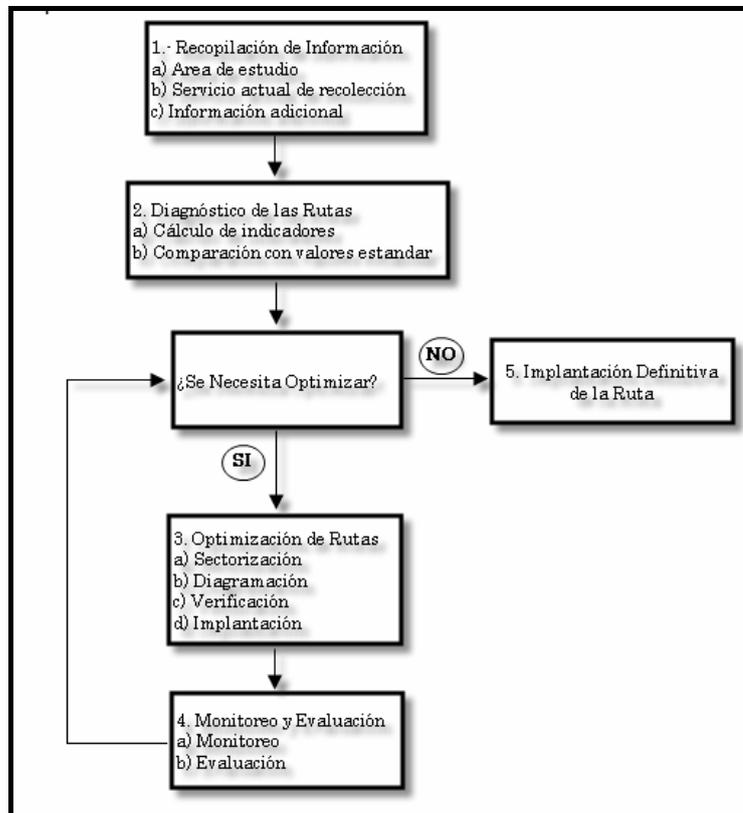


Figure Q-1: Flow Diagram of Optimization of Routes

### Q.2 STEP 1: Survey on the Current Situation

The objective of this step is to obtain information relative to the area where the routes will be optimized, the characteristics of the collection service that is carried out in this area and the rising of additional information if it is required.

This information will allow making the diagnosis of the current collection journeys and generating the necessary information for the later optimization of the routes.

#### a. Study Area

In a plane to a scale that allows visualizing with clarity the whole study area, and the vial infrastructure, identify:

- The neighborhoods and their limits, commercial areas, industrial areas and big generators<sup>1</sup> (for example isolated trades or institutions that can be served by companies authorized by the ADN).
- Number inhabitants and housings of each neighborhood. For determination of these values it uses the data of the last National Census and project this values to the year of study, according to the rate of annual growth, and the data used by the Billing and Collections Directorate.
- The streets where it is not possible the movement of the collection vehicles (wide of the road, height of the electric wired).
- The streets or avenues that have only a circulation sense.
- The streets or avenues with high traffic flow, consigning at the same time the heavy hours when this takes place.
- The streets or avenues that modify their circulation sense during the day, indicating at the same time the schedule when this happens.
- Street or avenues of strong slopes, in this case the highest and lower point will be identified.
- Identification of big generators.
- Identification of green areas.
- Point of the nearest sector to the base
- Nearest point to the sanitary landfill

**b. Current Collection Service**

In a plane of similar scale to the previous one consigns the following information:

- The current collection routes, clearly identifying the movement sense of the truck, the productive and dead journeys
- The location and capacity (yd<sup>3</sup> or m<sup>3</sup>) of the containers if they exist
- Indicate at the same time in a table the productive<sup>2</sup>, dead<sup>3</sup> distances and totals for each collection route, as well as the percentage that represents the productive distance in front of the total distance of the route that is defined by the following relationship.

$$\% \text{ Productive distance vs. Total Distance} = \frac{\text{Productive distance} * 100}{\text{Productive distance} + \text{Dead distance}}$$

*Example:*

*Productive distance : 25 Km.*

*Dead distance : 12 Km.*

*% Productive distance : (25 \* 100) / (12+25) = 67.56%*

- Denominate the plane as "Characteristic Current Routes"

**c. Rising Additional Information**

Through studies of time and movement the times of the routes to optimize will be monitored directly in land.

The monitoring period should be of at least one month and it should be carried out by personal specially qualified for it, in way of avoiding errors in the rising of the information and at the same time to train the driver in the taking of data.

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<sup>1</sup> Big Generators: It corresponds to the users that generate a bigger volume to the one fixed for the residential sector that is of 30 L/day.

<sup>2</sup> Productive Distance: It corresponds to the distance that the truck travels collecting waste

<sup>3</sup> Dead Distance: It corresponds to the distance in which the truck is mobilized and it doesn't exist rise of waste

On the other hand, if the routes in study include the collection of industrial and/or of trade waste and has been decided that once implemented the optimized routes these will be collected through the ICIs exclusive service (institutional, commercial and industrial). Proceed to quantify the quantity of waste that correspond to these generators, for it, at least during 15 days collect separately these wastes and register the tons collected.

**Q.3 STEP 2: Diagnostic of the Routes**

Using the information obtained in the step 1 point 1.2.2, corresponding to the antecedents and indicative monthly averages of the route, proceed to make the diagnosis of the routes, to establish the necessity to optimize it.

The diagnosis is carried out on the base of Good Indicators<sup>4</sup> that are defined next.

**a. Tons Collected vs. Collection Hours.**

It's diagnostic if the collection frequency is the appropriate one, through a comparison among the value obtained for the indicative tons collected/collection time (Ton/hour) for the routes in study with the optimum value that is indicated in the following table:

Acceptable range for indicative Tons/Total Collection time		
Type of Collection	Acceptable range	Optimum value
Door to door or mixed method, 3 collectors	2.3 a 2.6 ton/hr	2.45 ton/hr
Point to point method (containers), 3 collectors	2.8 a 3.2 ton/hr	3.00 ton/hr

If the relation between value of the achieved indicator and the Optimum Indicator is smaller than 0.9, it can be said that the frequency of the service is not the appropriate one, and that requires to extend the period among the collection days, that is to say to reduce the frequency and therefore the route should be optimized.

*Example*

*Quantity of waste collected per month = 300 tons*

*Total time of collection per month = 158 hours*

*Method: Door to door, three helpers, urban area, collection frequency daily*

*Indicator: (300/158) = 1.9 ton/hr*

*Optimum indicator = 2.45 ton/hr*

$$\frac{\text{Indicator}}{\text{indicator}} = \frac{\text{Optimum}}{2.45} \frac{1.9}{2.45} = 0.78$$

The value 0.78 is lower than 0.9, for what should reduce the frequency proposed in order to accumulate a bigger volume of waste in a smaller journey.

**b. Tons per Trip**

It's diagnostic if the collection routes have been appropriately settled and that the vehicles don't operate overloaded, comparing the values obtained for the indicator Tons/trip with the maximum useful load that can transport the truck that carries out the route.

Will be settled that the route is well designed if the relation among tons per trip with the maximum useful load of transport of the truck is in the good range from 0.9 to 1.05, any value out of this range will indicate that the route should be optimized.

The maximum useful capacity of transport of the truck will be settled considering the gross weight of the vehicle, weight of the chassis, and weight of the compactor box according to the following formula:

<sup>4</sup> See optimum indicators in Annex to the Collection Improvement Manual

Maximum useful load= Truck Gross Weight-Chassis Weight-Compactor box weight

*Example 1*

Tons per trip monthly average = 5.9 ton  
 Maximum useful load of the truck = 7.0 ton  

$$\frac{\text{Tons per trip monthly average}}{\text{Maximum useful load of the truck}} = \frac{5.9}{7.0} = 0.84$$

The value 0.84 is under the fixed range, the vehicle is underemployed for what the route should be optimized.

*Example 2*

Tons per trip monthly average = 7.5 ton  
 Maximum useful load of the truck = 7.0 ton  

$$\frac{\text{Tons per trip monthly average}}{\text{Maximum useful load of the truck}} = \frac{7.5}{7.0} = 1.09$$

The value 1.09 is over the optimum range, what indicates that the vehicle works overloaded and it is necessary to optimize the route.

The information of the tons can be obtained in the database of Urban Cleansing.

**c. Tons/Helper/day**

It's diagnostic the daily yield of a collection assistant, comparing the quantity of waste collected per month with the number of helpers effectives per month. If the value is substantially lower to the optimum one fixed, it can be said that the yield achieved by the helpers (collectors<sup>5</sup>) it is not the appropriate one which presumably is due to a low accumulation of waste and a great journey for what another frequency should be studied and optimize the route.

Will be settled that the route is not well designed if the collection helpers' yield is lower than 4.3 tons/helper/day established as optimum value.

*Example*

Tons collected per month = 300 ton  
 Number of collectors effective per month = 3 help  
 Effective days per month = 26  

$$\text{Yield} = \frac{\text{Tons collected per month}}{\text{Number of collectors effective per month} \times \text{Effective days per month}}$$

$$\text{Yield} = \frac{300}{3 \times 26} = 3.8$$

The achieved yield of 3.8 is lower than the optimum value for what the route should be optimized.

**d. Tons vrs Paid Hours**

It's diagnostic if the quantity of tons collected agrees with the quantity of paid hours to execute the service. The diagnosis is carried out through the comparison among the value obtained for the indicator tons collected vs. paid hours, with the acceptable value established for this indicator, which is generally among 0.30 to 0.35, for the diagnosis will be considered that the route should be optimized if the value is lower than the optimum value of 0.33.

*Example*

Quantity of waste collected per month = 300 ton  
 Driver paid hours = 283 hr.  
 Collector paid hours (3 Coll.) = 853 hr

<sup>5</sup> Collector: Personnel in charge of the works of lift of waste and its discharge in the collection truck.

$$\begin{array}{l}
 \text{Total paid hours per month} \\
 \hline
 \frac{\text{Tons collected per month}}{\text{Total paid hours per month}}
 \end{array}
 = \frac{1,136 \text{ hr.}}{300} = 0.26$$

The value 0.26 is lower than the optimum value, what means that the quantity of waste collected in the route is very low with regard to the paid hours or that the service is not executed during the daily journey, generating overtime, for what the route should be optimized.

**Q.4 STEP 3: Optimization of Routes**

The route will be optimized when the diagnosis carried out in the step 2 give as result that some of the indicators present values out of the defined ranges as acceptable or good.

**a. Design of the Routes**

**a.1 Classification**

The first activity to carry out is the classification, which consists on dividing the area that covers the current routes, so that each sector assigns to each collection team an appropriate quantity of work, using all its capacity. The sectors can be divided in sub-sectors, where each one corresponds to a collection trip.

**a.1.1 Definition of the characteristics of the service**

Before proceeding to the classification the following characteristics of the collection service should be determine:

Collection frequency	This can be daily (6 days a week), three times per week or twice per week. The frequency defines the number of days of attention in the sub-sector.
Useful load of the collection truck:	It will be defined the trucks to use and the maxim useful load, which will be determined as is indicated in the step 2 point 2.2.
Number of trips journey:	It will be defined the number of trips that the truck will carry out in the work journey <sup>6</sup> .
Number of journey per day:	It will be defined if the study sector will have day, night collection, in this case only a journey per day will be carried out, or both, what indicates two journey days.
Number of work days per week	It will be defined how many days per week the collection truck will work in the sector.

**a.1.2 Calculation of the quantity of waste to collect**

Determine the quantity of waste to collect, for it consult the database of Urban Cleansing, obtain the quantity of waste collected monthly, as average value of the three months of information.

In the case in that it is considered to eliminate the ICI waste collection that are in the routes, to the total of tons collected monthly will be subtracted the tons month corresponding to this type of waste.

$$\text{Tons Month Project} = \text{Total tons month} - \text{ICIs Tons a month}$$

With the tons month project, determine the P.P.C. for the residential sector, according to the following one it formulates:

<sup>6</sup> Work journey: It corresponds to the number of working hours in the day settled by Law.

$$PPC = \frac{\text{Tons Month Project} * 1000}{\text{Total Inhabitants area} * N^{\circ} \text{ days month}}$$

It can be used the P.P.C. average of the National District content in the Study of the Master Plan for the solid waste management.

Tons month project corresponds to the tons average of the three months of information.

With the P.P.C. and the number of inhabitants per neighborhood calculate the production of waste for the week, for the day of maximum accumulation (heavy day<sup>7</sup>) and the day of normal accumulation (normal day<sup>8</sup>), the last two values according to the frequency with which will be carried out the collection.

The number of days of accumulation based on the collection frequency corresponds to:

Frequency	N° days maximum accumulation	N° days normal accumulation
Daily	2	1
Three times per week	3	2
Twice per week	4	3

Calculated the waste production per neighborhood, calculate the total production of waste for the study area as the summation of the generations per neighborhood.

### a.1.3 Calculation of sub-sectors and number of trucks

Calculate the total number of sub-sectors and the number of sub-sectors assisted by a truck as:

$$N^{\circ} \text{ total sub-sectors} = \frac{\text{Tons day of maximum accumulation}}{\text{Useful load collection truck per trip} * N^{\circ} \text{ trip journey}}$$

$$N^{\circ} \text{ sub-sectors assisted by a truck} = \frac{N^{\circ} \text{ days worked a week} * N^{\circ} \text{ journey days}}{N^{\circ} \text{ of attention days a week in the sub-sector}}$$

Well-known the total number of sub-sectors and the number of sub-sectors assisted by a truck, proceed to calculate the number of trucks necessary to develop the service according to the following formula.

$$N^{\circ} \text{ Trucks} = \frac{N^{\circ} \text{ Total sub-sectors}}{N^{\circ} \text{ Sub-sectors assisted per truck}}$$

Identify the sectors and sub-sectors according to the following approach.

Sector i	Where i is the number of the compactor truck that carries out the collection in the sector
Sub-sector i-j	Where i is the number of the sector where is located the sub-sector and j corresponds to the correlative number that is defined based on the days of attention

#### Example

A residential area has a collection service with a frequency of three times per week, which is carried out with 2 compactors trucks, that work six days a week and each one assist a total of 2 sub-sectors. In this case the sectors and sub-sectors are identified as:

Sector 1	Compactor Truck N°1	
Sub-sector 1-1	2 trips	(Monday – Wednesday – Friday)
Sub-sector 1-2	2 trips	(Tuesday – Thursday – Saturday)
Sector 2	Compactor Truck N°2	
Sub-sector 2-1	2 trips	(Monday – Wednesday – Friday)

<sup>7</sup> Heavy day: Day with the maximum accumulation of waste

<sup>8</sup> Normal day: Day with the minimum accumulation of waste.

*Sub-sector 2-2                      2 trips                      (Tuesday – Thursday – Saturday)*

**a.1.4      Verification of the number of trips by journey and by number**

Well-known the numbers of sub-sectors and necessary trucks to carry out the collection service in the study area proceed to verify the time that is required to make the number of trips settled by journey and the total tons transported.

Of the route sheet, obtain the information with respect to the time outs averages of the routes that includes:

- Base-Sector Time
- Sector-Landfill Time
- Landfill Time
- Landfill –Sector Time
- Landfill –Base Time

Calculate the tonnage that should transport each truck in the day journey of maximum accumulation, according to:

$$Tons\ heavy\ day\ to\ transport\ per\ truck = \frac{Tons\ heavy\ day\ x\ N^{\circ}\ days\ of\ attention\ a\ week\ by\ sub-sector}{Number\ of\ days\ worked\ a\ week\ x\ Number\ of\ trucks}$$

If it is considered for the truck more than a trip in the day, contemplate whenever the first trip is carried out with the maxim useful load.

Calculate the time out and of collection for the first trip, according to:

$$Time\ out\ 1^{st}\ trip = Base\ time\ to\ route + Route\ time\ to\ landfill + Landfill\ time + Landfill\ time\ to\ route$$

$$Productive\ time\ 1^{st}\ trip = \frac{Tons\ maximum\ useful\ load}{Tons / collection\ hours}$$

Adopt the indicator value Tons/collection hour similar to the optimum value indicated in the step 2 point 2.1, taking into account the collection type.

Sum the time out and productive time of the first trip to obtain the cycle time<sup>9</sup> of the first trip.

$$Cycle\ time\ 1^{st}\ trip = Time\ out\ 1^{st}\ trip + Productive\ time\ 1^{st}\ trip$$

If it is considered only one trip by journey, compare the cycle time with the journey time, if the cycle time is lower than the journey time and the relation among Tons per trip vs. maximum useful load, is bigger or similar to 0.9 the sub-sectors are well designed, otherwise, consider the design of the routes with trucks of smaller capacity and calculate the number of sub-sectors again.

If it is considered more than a trip per journey, calculate the available time for the second cycle according to

$$Available\ time\ 2^{\circ}\ cycle = Hours\ journey - Hours\ 1^{st}\ cycle$$

Calculate the total time out for the second trip and the available time for collection as:

$$Time\ out\ 2^{\circ}\ trip =$$

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<sup>9</sup> Cycle Time: It corresponds to the time that demands a complete trip of collection

*Route time to landfill + Landfill time + base landfill time*

*Available time collection 2° trip = Available time 2° trip – Time out 2° trip*

Calculate the tons to transport in the 2° trip

*Ton 2° trip = Ton truck heavy day – Ton 1<sup>st</sup> trip*

Calculate the time necessary to carry out the collection of the tons of the second trip as:

$$\text{Real collection time } 2^{\circ} \text{ trip} = \frac{\text{Tons } 2^{\circ} \text{ trip ton/collection}}{\text{hour}}$$

Adopt the indicator value Tons/collection hour similar to the one used in the first trip.

If the available collection time for 2° trip is bigger than the collection time of 2° trip, is verified that the truck can collect the total of tons assigned in the work journey, calculate then the total time worked in the journey as:

*Total time worked in the journey = Time(out + productive) 1<sup>st</sup> trip + Time (out + productive) 2° Trip*

If the available collection time of the 2° trip is lower than the real collection of the 2° trip, calculate the tons collected corresponding to the available time as:

*Real collection tons 2° trip = Available collection time 2° trip x (Tons/collection hours)*

Use the same value used previously for Tons/collection hours.

Calculate the total of tons collected in the journey as the sum of the tons of the first and second trip and calculate the number of trips journey as

$$N^{\circ} \text{ trips journey} = \frac{\text{Total tons collected in the journey}}{\text{useful load collection truck per trip}}$$

With the new value of the number of trips journey repeat the calculation process of sub-sectors and number of trucks.

### **a.1.5 Delimitation of sub-sectors**

In a copy of the plane denominated study area, write in each neighborhood the tons of waste to collect the day of maximum accumulation

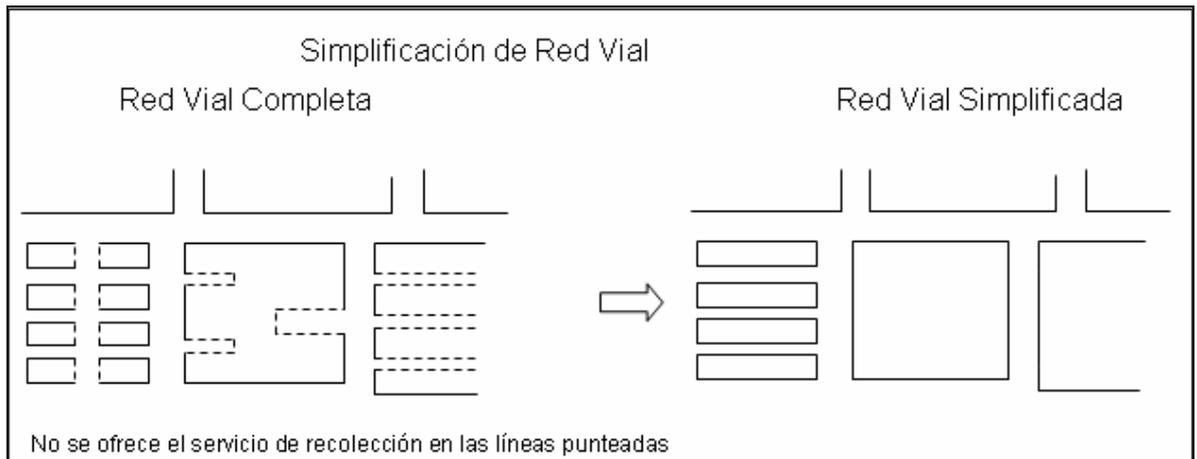
Define the limits of the sub-sectors according to the following considerations:

- Based on the tons to collect the day of maximum accumulation, group the neighborhoods so the sum of the tons to collect will be approximately similar to the tonnage designed by sub-sector (tons to collect by a truck the day of maximum accumulation).
- Use arterial roads and topographical barriers as rivers, lakes, etc. as limits of the sub-sector
- Identify each sub-sector using the defined approach in point 3.1.1. letter a)
- Identify the sectors according to the approach defined in the same previous point
- Identify the plane as Sub-sectors Limits

### **b. Diagramming**

Prepare a work plane for each sub-sector, starting from a copy of the plane Sub-sectors Limits or using transparent papers

In both cases, simplify the net vial according to the information contained in the plane Study Area and the following approach



Draw the development of the route taking into account the following approaches and the information in plane denominated Study Area:

- Avoid duplications, repetitions and unnecessary movements
- Respect the traffic dispositions
- Minimize the number of turns left and round, with the purpose of avoiding losses of time when loading, reduce dangers to the personnel and minimize the obstruction of traffic
- The routes with a lot of traffic should not be traveled in the hour of more transit
- Try to begin the routes in the nearest points to the base, and as the day goes on, continue going closer to the final disposal site with the purpose of reducing the transporting time.
- The highest parts should be traveled at the beginning of the route
- If it's possible the slope roads should be traveled downhill, carrying out the collection in both sides of the roads, in order of increasing the work security, accelerate the collection, minimize the damage of equipments and reduce the fuel and oil consumption.
- When the layout of Peine10 is used is preferable to develop the routes with long and right journeys before doing turns to the right.
- When the layout of Double Peine11 is used is preferable to develop the routes with many turns in the sense of the clock, around blocks.

Repeat the previous procedure to optimize the journey, quantifying for each diagramming the number of turns to the left and the right, and the non productive distances.

Select the diagramming of the route that has the lowest number of turns to the left and the lowest non productive journey.

### c. Calculation of The Number of Containers

In the case in that in the optimization process of the routes, a variation of the frequency is considered (decrease or increase) and the existence of containers the new number of containers will be calculated based on the following procedure.

According to the location of the containers (information contained in plane Characteristic Current Routes), determine the number of inhabitants that use containers to store their waste.

With the number of inhabitants, the PPC calculated in the point 3.1.1. letter b) and the number of days of the maximum accumulation, calculate the tons to store in the containers

$$\text{Tons to store in the container} = N^{\circ} \text{ inhabitants} \times \text{PPC} \times N^{\circ} \text{ days of maximum accumulation}$$

Calculate the total volume of waste to store in containers as:

$$\text{Volume of waste to store in containers} = \frac{\text{Tons stored in containers}}{\text{Waste density in containers}}$$

Assume the density of the waste in the container among 0.15 to 0.2 Ton/m<sup>3</sup>.

Define the capacity of the containers that will be settled and determine the number of containers as:

$$N^{\circ} \text{ of containers} = \frac{\text{Volume of waste to store in containers}}{\text{Capacity of a container} \times 0.9}$$

A security factor has been considered in the calculation, for what is assumed that the containers will only be filled until 90% of their maximum capacity.

#### d. Verification of the Route

Verify each of the routes diagramming, for which converges to land and verify or check:

- The longitude of the journey per kilometers of each route
- Verify the viability (circulation senses)
- Check the transit of the streets, ideally verify it later on for the different times of the year
- Notify if in the route proposed there are blocks uninhabited and consequently they don't need cleaning service
- Take note of the circulation problems, caused by narrow streets, obstruction due to parked vehicles, streets with strong slope, etc.
- Notify if in the route there are big generators

If the existence of conditions that affect the diagramming is verified, make the necessary modifications

Describe the collection route verified for the area according to the following outline.

SOBRE	DESDE	A	VUELTA	ESTILO RECORRIDO	HORA
Calle 1	Calle a	Calle b	Izquierda	Servicio	07:00
Calle b	Calle1	Calle 2	Derecha	Servicio	

Indique el nombre de la calle por donde va circulando el camión

Indique el nombre de la calle hacia donde va a dar vuelta

Indique si el camión va recolectando (servicio) o exclusivamente en transporte (transporte)

Indique el nombre de la calle desde donde inicio el desplazamiento sobre la calle que actualmente circula

Indique el sentido de la vuelta (derecha, izquierda)

Indique la hora de inicio y de término del servicio, puede incluir horario para puntos de control

#### e. Installation of Routes

Before putting in operation the new routes train the personnel, including the supervisors, drivers and collectors in the following matters:

- Responsibilities settled by work position and functional relationship among them

- Interpretation of the symbology used in the diagramming of routes, such as beginning and route term, address of the journey, journey in service and in exclusive transport, inspection points
- Correct filled of the Route Sheet
- Form of executing the service, collection door to door, rise of containers, waste that are not part of the service, form of operating the compactor system, load and discharges procedures, detection of big generators
- Use of the security implements, aspects related to the risks and inherent labor accidents to the activity.
- Train the driver and supervisor on the form of filling and operating with the Order of Daily Work form and train it in land in relation to the new journeys.

Carry out activities directed to inform to the community about the new collection service, within these develop:

- Meetings with the residents of the different neighborhoods where the frequency, days and schedules of attention of the collection service is clearly inform
- Installation of posters in highly converged points, such as sport fields, supermarkets, schools, etc.
- Distribution of flyers where is indicated the days and schedules of attention, frequency of the service and the phone number where the new service and/or outline birdcalls can be consulted.

Put in operation the new routes, and consider a test period of 30 days in which will make their constant monitoring and the necessary adjustments.

Put in operation the pursuit sheet of routes during the test period of the route, as a form of identifying the inspection points to use once the route is calibrated.

#### **f. Monitoring and Evaluation of the Route**

##### **f.1 During the test period**

###### **f.1.1 Monitoring**

During the first week assign a technician to verify daily the execution of the routes and detect any anomaly.

If some anomalies are detected, analyze how this impacts the design and/or the diagramming and carry out the corresponding adjustment

Assign to the supervisor of the route specific points where he will control the passing hour of the truck. Later on these points will be used as control points of the route.

In the test period check in a random form each of the routes during and immediately after the collection and verify the service quality, controlling:

- The correct rises of all the waste
- The appropriate management of the compactor equipment
- The correct rises and discharge of the containers
- The existence of disseminated waste
- The cleaning of the whole area around to the containers
- The generation of excessive noises, identify its origin (compacting equipment, horn, personnel, etc)

- The discharge of liquids from the truck toward the streets
- Use of the diagramming plane by the driver
- The appropriate use of the uniform and security implements by the workers
- The collection personnel's behavior toward the users
- The presence of non domiciliary waste that cannot be loaded in the compactor truck
- Avoid the existence of transfer of small trucks toward big ones
- Identification of special generators

Take corrective measures to eliminate or minimize any anomaly detected and that affects the service quality.

Of being necessary train the personnel again and reinforce their training in relation to the form of executing their work.

Daily recover the data contained in the Route Sheet to make the evaluation of the routes later on.

### **f.1.2 Evaluation**

The control variables and indicators through which the routes will be evaluated in the test period correspond to:

Control variables

- Tons
- Routes time
- Fuel consumption
- Route hours worked

Indicators

- Tons / Collection hours
- Tons / Paid hours
- Tons / Trip
- Tons / Helper / day
- Combustible yield measured as gallons / hour

The control variables will allow evaluating the behavior of the routes through the time, for what will keep a registration book of the control variables of each route.

Check daily the indicator values and make a comparison with the optimum values defined for the indicators in the Step 2. If it detects that some of the indicators presents every day values lower to the optimum one, analyze the possible causes and make the necessary adjustments to the route.

In the same way compare the daily indicators among them, to settle if there are important changes according to the collection day.

Check daily the collection times and time outs of each route, if important fluctuations are detected daily, investigate the cause in land and correct

The control variables will allow him to evaluate the behavior of the routes through the time, for what will take a book of registration of the variables of control of each route.

Revise the values of the indicators daily and make a comparison with the defined good values for the indicators in the Step 2. If it detects that some of the indicators presents every day inferior values to the good one, analyze the possible causes and carry out the necessary

adjustments to the route.

Of equal it forms it compares the daily indicators among if, to settle down if there are important changes according to the day of gathering.

Compare the results of the indicators for the new routes optimized with the indicators under which the routes were diagnosed initially. Calculate the variation percentage of each one and analyze the necessity of making some adjustment to the route.

At the end of the 30 days of the test period carry out the diagnosis of the routes according to the step 2. If the diagnosis indicates that the routes are well designed implant the routes definitively. If the diagnosis is negative, optimize the route again.

At the end of the test period and achieved the optimization objectives, elaborate the definitive plane of the routes and describe each of them according to what is indicated in step 3.3, also incorporate in the plane the location of the containers and of the control points of the route and the foreseen schedules of passing of the truck for them.

## **f.2 During normal operation period**

### **f.2.1 Monitoring**

Daily lift the information of times through the Route Sheet.

The supervisor or inspector will verify the development of the route, monitoring all the control points of the route at least once a week, it will also verify the service quality controlling the same aspects indicated for the test period, (point 3.5.1. letter a). Will weekly inform the technical personnel in case it register anomalies.

### **f.2.2 Evaluation**

Monthly obtain from the database the indicators values.

With the indicators obtained carry out a diagnosis of the route according to the step 2. and settle it if the fixed goals are fulfill (optimum indicators).

For the fuel yield indicator, compare the value obtained with the optimum value assigned by vehicle type. The relation between the indicator and the optimum value should not be lower than 0.9.

If the goals are not fulfill, program a monitoring of the route according to what is indicated in the point 3.5.1 letter a) and determine the causes of the low results. Correct the anomalies, of is not possible evaluate the necessity of optimizing the route again.

According to what is indicated in the following table, recover of the database the values of the control variables and the accumulative hours of work of the trucks, and carry out the following evaluations:

Control Variable	Evaluation
Tons	<p>It will allow knowing if an increase or decrease of the waste generation takes place in the area and at the same time program the acquisition of new equipments if it is required.</p> <p>Evaluate biannual or annually the variation of the tons collected monthly in the sector, calculate the growth rate.</p> <p>Project for the next two or three years the waste generation for the sector, and evaluate the necessity of incorporating new vehicles.</p> <p>Carry out the same operation with the other sectors and elaborate an acquisition program of trucks by increase of the waste generation.</p>
Route times	<p>It will allow to control the times that are used in the different movements of the truck and verify the execution of the route.</p> <p>It will also be able to detect those movements that present an increment in their times and that requires control, for example, the discharge of waste in the sanitary landfill or the displacement of the truck for saturated roads. This control variable allows inspecting the work of the collectors and driver of the vehicle, since generally an increase in the times associated to transport are associated to variations in the journey or route exits.</p> <p>Compare monthly if the times suffer important variations, if it investigate it causes and take the corrective measures, if it is not possible the working hours in the journey should be verified and if overtime is generated the route will be you optimize again.</p>
Fuel consumption	<p>It will allow him to calculate the fuel necessities by sector and for the whole fleet of trucks, and determine the fuel requirements per year.</p> <p>Biannually check if an important increase has been generated in the fuel consumption, if this happens investigate which are the causes (mechanical, bad control of the resource) and correct it.</p>
Hours worked in the route	<p>It will allow comparing along the time the use of the resource truck, the execution of the daily journey, and project the annual hours of operation of the truck.</p> <p>Biannually calculate the variation that is generated in the hours worked in the route and project the hours for next two years.</p> <p>The projected hours add them to the accumulative hours of operation of the truck and will obtain the accumulative hours projected for the two years.</p> <p>Carry out the difference between the useful life hours of the truck and the accumulative hours projected, for each of the years, with what will obtain the remainder of useful life of the truck and analyze the necessity of reposition of the vehicle.</p> <p>Carry out the same operation with the other sectors and elaborate a program of acquisition of trucks for reposition.</p>

Upgrade the control variables of the route annually in the registration book.

**g. Example**

*a) Characteristic of the service*

<i>Population year 2004 of the area to optimize</i>	26,808
<i>Population projected year 2006</i>	27,673
<i>Annual growth rate</i>	1.6%
<i>Defined frequency for optimization</i>	3 times per week
<i>Useful load collection truck</i>	8 tons
<i>Number of trip journey</i>	2
<i>Number of day journey</i>	1
<i>Number of days worked a week</i>	6
<i>Number of days of the week of attention sub-sector</i>	3
<i>Tons average last 3 months</i>	686 ton/month
<i>ICI Tons</i>	98.4ton/month

*b) Quantity of waste to collect*

$$\text{Tons Project month} = 686 - 98.4 = 587.6 \text{ ton/month}$$

$$\text{PPC} = (587.6 \times 1000) / (27,673 \times 30) = 0.71 \text{ kg/inhab/month}$$

The following table shows the waste productions by neighborhood and total for the area to optimize, the number of days of maximum accumulation is three.

Neighborhood	Inhabitants Year 2004	Inhabitants Year 2006	Generation Week	Generation heavy day	Generation normal day
	N°	N°	Ton/week	Ton/day	Ton/ day
A	3207	3,310	16.2	7.0	4.6
B	1989	2,053	10.1	4.3	2.9
C	2406	2,484	12.2	5.2	3.5
D	1361	1,405	6.9	3.0	2.0
E	2321	2,396	11.7	5.0	3.4
F	1342	1,385	6.8	2.9	1.9
G	1986	2,050	10.0	4.3	2.9
H	1636	1,689	8.3	3.5	2.4
I	1322	1,365	6.7	2.9	1.9
J	1528	1,577	7.7	3.3	2.2
K	3898	4,024	19.7	8.4	5.6
L	1648	1,701	8.3	3.6	2.4
M	2164	2,234	10.9	4.7	3.1
Total	26,808	27,673	135.6	58.1	38.7

c) Calculation of the sub-sectors and sectors

Total N° Sub-sectors =  $58.1 / 16 = 3.63$       4 sub-sectors

N° sub-sectors assisted per truck =  $(6 \times 1) / 3 = 2$  sub-sectors / truck

N° trucks =  $4 / 2 = 2$  trucks

Sub-sectors denomination

Sector 1	N° trips	Compactor truck N°1
Sub-sector 1-1	2 trips	(Monday – Wednesday – Friday)
Sub-sector 1-2	2 trips	(Tuesday – Thursday – Saturday)
Sector 2		Compactor truck N°2
Sub-sector 2-1	2 trips	(Monday – Wednesday – Friday)
Sub-sector 2-2	2 trips	(Tuesday – Thursday – Saturday)

d) Verification of the number of trips

Tons in heavy days per truck =  $58.1 \times 3 / (6 \times 2) = 14.5$  Ton/day/truck

The averages time outs obtained of the previous months are:

Times	Hours
Base-Route	0.2
Route-Landfill	0.34
Landfill	0.25
Landfill - Route	0.15
Landfill -Base	0.35

Time out 1st trip =  $0.20 + 0.34 + 0.25 + 0.15 = 0.9$  hours

Productive time 1st trip =  $8 / 2.45 = 3.3$  hours

Cycle time 1st trip =  $0.9 + 3.3 = 4.2$  hours

Available time 2° cycle =  $8 - 4.2 = 3.8$  hours

Time out 2° trip =  $0.34 + 0.25 + 0.35 = 0.94$  hours

Available time collection 2° t. =  $3.8 - 0.94 = 2.9$  hours

Tons 2° trip =  $14.5 - 8 = 6.5$  ton

Real time collection 2° trip =  $6.5 / 2.45 = 2.7$  hours

Available Time collection 2° trip (2.9 hours) is higher than real time collection 2° trips (2.7 hours), for what is verified that the truck can collect the total of tons assigned in the work journey the heavy day.

e) *Delimitation of sectors*  
*Tonnage grouping by neighborhood and by its location*

Neighborhood	Generation Heavy day	S1 -1	S1 -2	S2 -1	S2 -2
	Ton/day	Ton/ day	Ton/ day	Ton/ day	Ton/ day
A	7.0	7.0			
B	4.3	4.3			
C	5.2		5.2		
D	3.0	3.0			
E	5.0		5.0		
F	2.9			2.9	
G	4.3		4.3		
H	3.5			3.5	
I	2.9				2.9
J	3.3				3.3
K	8.4				8.4
L	3.6			3.6	
M	4.7			4.7	
Total	58.1	14.2	14.6	14.7	14.6

The following figure shows the delimitation of sectors



# Annex R

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*Manual for the Inspection of the  
Collection Service*

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## **R Manual for the Inspection of the Collection Service**

### **R.1 Definition of the Inspection Program**

The objective of this step is to establish the parameters that will be controlled as part of the inspection process, and the information to rise in the route for its later evaluation.

#### **a. Aspects of the Inspection settled by the Regulation**

Next the aspects settled in the "Regulation Non Hazardous Municipal Waste Management Service", Chapter VII, Article hundred six, with regard to the collection quality, which should be included in the inspection, control and pursuit program of the service. The aspects to consider correspond to:

Service Levels: In relation to the quality of the collection service, this should fulfill the following dispositions:

1. The frequencies and schedules pointed to the clients are of obligatory character and any change will be communicated with an advance of 15 days.
2. All the solid waste will be collected surrendered appropriately and it will proceed to collect those that have been spread or scattered during the collection process.
3. The collection vehicles will group the conditions for this activity and will be in correct operation and presentation conditions
4. The vehicles will have storage devices for the leached that take place during the compacting operations, and at the end of the daily journey the vehicles will be washed
5. The level of noise product of the operation will stay at the possible lowest level, mainly in night shifts
6. The operations are the image of the Municipality, and therefore, they will observe in the development of their activities all the courtesy and education norms towards the clients and public in general and they will be presented properly uniformed and will use the elements obligatorily that, for their personal security, the Municipality will give them
7. The drivers of the collection vehicles will strictly fulfill all the transit rules, mainly as for the speed and parking refer.

#### **b. Aspects of the Inspection contained in the Contract**

It should be proceed with the revision of the contract that governs the service that is been inspected with the purpose of identifying the parameters, the variables, etc. that will be controlled. In the case that both the Regulation and the Contract identify the same variable to control, that that is more restrictive will prevail.

#### **c. Other Documents**

In a same way it will be verified if there are other documents or legal instruments that establish restrictions as for the service or its quality, which will be incorporate to the inspection process.

Once all the documents mentioned previously are revised, the parameters or aspects to monitor will be defined.

### **R.2 Inspection Process**

#### **a. Inspection: Administrative Aspects:**

The main objective is to verify the correct operation of the physical and personnel resources by the Contractor Company.

**a.1 Infrastructure**

The inspector will monitor and investigate different aspects of the units or equipments that lend the service, among them:

Vehicles	Frequency	Methodology	Doc. Required
Technical Revision	1 time a month	The inspector will verify that the technical revision certificate is valid. In the case that doubt exists with regard to the mechanical state of a vehicle, its mechanical revision should be request to a company external to the service operator.	Copy technical revision  Certificate of mechanical state granted by an external company
Circulation permit	1 time a month	The inspector will verify that the vehicles have the respective circulation permit, requesting to the private operator the corresponding permit.	Copy of the circulation permit
Insurance or Policy of the Unit	According to the duration of the policy	The inspector will verify that the policies that are mention in the Contract are effective	Copy of the insurance policy
Vehicle Registration	At the beginning of the contract	The inspector will verify that the vehicle is registered according to the Law	Inscription in the National Registration of Motorized Vehicles
Other documents	According to the validity of the documents that are settled in the Contract	The inspector will verify that the documents requested in the contract are valid	Copy of the documents
Registration System	Weekly	The inspector will verify the existence and upgrade of the registration systems settled for the vehicles and equipments in the Contract	Registration book

**a.2 Personnel:**

The inspector will monitor and investigate different aspects related with the personnel that is part of the service, among them:

Personnel	Frequency	Methodology	Doc. Required
Work Contract	Monthly	The inspector will verify that the whole personnel dedicated to the service have Work Contract according to the valid normative.	Copy of the contracts
Driver license (In the drivers case)	Quarterly and every time that a new driver incorporates to the service	The inspector will verify that all the drivers considered in the service have the respective document to drive (according to the vehicle type) and be effective	Copy of the driver license
Use of work implements (gloves, uniforms, shovels, collectors).	1 time a week	The inspector one day a week, in a random way, in the route will make observations, indicating them in the inspection sheet	Visual inspection
Registration of the Personnel considered in the Contract	1 time a week	The inspector will verify the existence and upgrade of the registration systems settled for the personnel in the Contract	Registration book

**b. Inspection: Operative Aspects.**

The contractor company is the only responsible for the operation of the collection services. The inspector, will veil the execution at least of the following aspects:

**b.1 Pursuit of the journey:**

- Verify that the driver carries the route sheet and the diagramming of the corresponding route (plane).
- Faithful execution of the journey.
- Verify if during the development, the journey change, which should be informed to the Municipality by the private operator and at the same time to the users according to what is indicated by the EMUCD.
- Execution hour and place of beginning of the Route.
- Execution hour and place of term of the Route.
- Execution of the discharge place of the waste (final disposal site or transfer station)

**b.2 Verify the service quality:**

- Cleaning of the collection area
- Check the thrown tanks or the containers left in their place.
- Discharges of liquids.
- Laundry of the truck
- Personnel's uniform
- Use of tools by the personnel.
- Verify that gifts or collections are not requested by the service
- Communication of the truck (radio transmitter, for the location report, damages, accidental.)
- GPS.

**R.3 Implementation of the Inspection:****a. Diagramming Pursuit.**

To guarantee the good operation of a route the diagramming should be verified often to check if changes have taken place such as:

- New constructions or users
- Uninhabited blocks that don't need the service.
- New big generators.
- Increase or decrease of the transit or changes of senses of the streets according to the season.
- Deviations for repairs and/or construction of public works.
- The longitude of the journey per kilometer in the route.

*Note: any change that takes place means that the route should be evaluated and redraw if it is necessary.*

**b. Verification of the Service Quality**

To obtain a good service quality it is necessary to evaluate daily in each route the following:

- The correct rise of all the waste.
- The appropriate management of the compactor equipment.
- The existence of disseminated waste.
- The generation of excessive noises collection equipment).

- The discharge of liquids from the truck toward the street.
- The appropriate use of the uniform and security implement by the workers.
- The collection personnel's good behavior toward the users.
- The presence of non domiciliary waste that can be loaded in the compactor truck.
- The execution of the frequency or day of attention.
- Execution with the collection schedule.
- Grade of cleaning of the collector truck.

*Note: Correctives measures should be taken to eliminate or minimize any anomaly detected, independently of the application of the corresponding sanction.*

**c. Monitoring**

- Daily an inspector will be assigned to each route with the purpose of verifying its daily execution and in the event of any anomaly inform his direct boss to take the necessary correctives measures.
- Each route should have inspection points, where it will control the passing hour of the truck.
- The inspector will control all the aspects mentioned previously.
- The inspector will verify the delivery of the copy of the route sheet by the operator for each route that has been assigned him.
- Daily the EMUCD will pass over the information to the control form for the later evaluation of the service.

**d. Data Evaluation:**

After incorporating in the control form, the information contained in the inspection documents and routes sheet the values of the following variables and quality indicators should be determined:

- **Quantity of waste collected:** The total quantity of waste lifted daily by route will be determined, antecedents that are obtained from the entrance control of the sanitary landfill or transfer station. With these data the total quantity of waste collected daily by route, sector, area and private operator will be calculated. From the previous calculations the weekly, monthly consolidated, etc. will be elaborated.
- **Routes-Times:** From the information contained in the route sheet it will be determined the times of the different collection, transport, discharges, activities, etc. executed in each route, and will be compared with those indicated in the design. Monthly it will be verified if there are important variations in the route times with the purpose of detecting problems and take the correctives measures and if the times worked by the operative personnel fulfill with what is settled in the Labor Law.
- **Ton/trip:** With the entrance data the load transported by each vehicle by trip will be determined; from this value it will be verified that such value is adjusted to the design load.
- **Yields:** With the antecedents of entrance control to the sanitary landfill or transfer station and the route sheet the yields of each route will be determined, measured as ton/hr and ton/collector/day, with the purpose of verifying its correct design, detect eventual problems and apply corrective measures or calibration of the route if it is necessary.

## R.4 Cabinet works

With the antecedents obtained in the point 4 and other parameters monitored the service should be evaluated using for it the quality indicators.

### a. Evaluation of the Service through the use of Indicators:

**The Indicators**, they are numbers that are obtained through the analysis of activities and they are result of relating prefixed quantities to obtain certain values. These prefixed quantities correspond to the base information, which is obtained of the constant monitoring of the urban cleaning activities.

The indicators constitute an excellent evaluation tool of the collection service, through their constant management, it can improve the administration of the service, monitor and control the different activities that compose it and additionally allow the comparison among similar activities.

In the base information for each route are:

- Number of effective assistants a month
- Quantity of waste collected
- Quantity of trips carried out a month
- Quantity of hours worked a month
- Quantity of hours paid a month, etc.

Through the indicators a series of irregular situations during the operation of the service can be inferred, as it is shown next:

**Tons/hours**, it is verified if the collection frequency is the appropriate one, through a comparison among the obtained value (ton/hour) with the acceptable range of the method door to door with three assistants that goes from (2.30 up to 2.60), if is not like this the design of the route should be verified.

**Tons/trip**, it is verified that the routes have been settled appropriately and that the collection vehicles don't operate overloaded, the values obtained are compared with the maxim useful load that can transport the truck of this route. If the operation of the previous relationship is in the optimum range (0.9 to 1.05), it indicates us that the route is well designed.

**Tons/helper/day**, to analyze the daily yield of a collection helper the quantity of waste collected a month is related with the number of effective helpers a month.

It will be settled that the route is not well designed if the collection helper yield is lower than 4.30 ton/helper/day. Any value below this means that there are a low accumulation of wastes and/or a great journey in the route established, for what another frequency will be studied and optimize the route.

**Tons/route**, is the relationship among the quantity of tons collected by a collection vehicle on the quantity of tons produced in the route: daily, weekly and monthly.

**Tons /sector**, is the relationship of the quantity of tons collected on the quantity that produces a sector: daily, weekly and monthly.

**Tons /truck/trip**, is the quantity of tons collected by a truck each trip: daily, weekly and monthly.

**Number of trips/day/truck**, is the number of trips that a truck carries out daily.

**Number of trips/day/route**, is the number of trips carried out daily in a route.

**Number of trips/day/sector**, is the number of trips carried out daily in a sector.

**(%) Fulfillment of the frequency**

The fulfillment of the frequency of a route is determined relating the quantity of days assisted with the quantity of days programmed according to the frequency assigned.

**(%) Days with period  $\leq$  to 8 hours (that fulfills the day of work daily)**

Is the relationship of the number of days with journeys minor or similar to eight hours related with the effective number of days of the month.

**(%)Times that anomalies are detected**

Are the quantities of factors that affect the normative with which a route should be carried out, such as:

- Delay in the exit of the truck (damaged, absence of the driver)
- Damages in route
- Taking out the truck of the route
- Climatic Conditions
- Work accident
- Direct transfer

**(%) Containers not well located**

Is the relationship of the number of containers outside of the corresponding place on the total of these of a certain route.

**(%) Containers with solid waste**

Is the relationship of the number of containers left with waste with the total number of containers that should be rise.

**(%) Days that the collection truck comes out clean**

Is the relationship of the number of days that the truck comes out clean in one month, this value should be evaluated in relation to what is indicated in the corresponding Contract.

## **R.5 Reports**

**a. Immediate reports:**

Are those that should be reported to the most possible brevity either in a direct way or by phone to the EMUCD in front of situations such as:

- Accidents.
- Damages.
- If affect the route (it the truck doesn't leave or there is no replacement).
- Any other situation that affects the attention that indicates which service won't be developed.

**b. Daily Reports:**

Are the observations registered through the inspection in routes and the evaluation of the results of the database. Among these they are:

- Numbers of trucks operating in routes vs. total of trucks programmed for all the routes.
- Number of routes assisted vs. number of routes programmed.
- Number of personnel's working vs. number of effective personnel a month.
- Tons collected by each route.
- Infractions to the contractor.
- Service Quality.
- Special situations (birdcalls, attention to birdcalls, answers to applications).

**c. Weekly Report**

Is a consolidated of the daily reports in order to make comparisons of the activities produced during the whole week:

- Report the behavior of the different indicators through tables and graphics.
- Identification of the problems with the users (big generators, undue waste, containers, location of remains of debris, prunes or others that require special services).
- Consolidated of the daily information
- Weekly evaluation of the service
- Non fulfillment of operative aspects of the service that constitute lacks

**d. Monthly Report:**

It includes a consolidated of the weekly reports, the monthly evaluation of the service and the identification of anomalies that constitute lack according to Contract.

**R.6 Annex**

Next the two documents used for the rising of land information during the inspection of the service

**a. Route Sheet**

ADM Service LTD., S. A.

Carta de Ruta Fecha

Sector  Ruta

Camión Fecha

Supervisor			
Chofer			
Obrero			
Obrero			
Obrero			

Recorrido a Realizar:


INICIO DE ACTIVIDADES				FIN DE ACTIVIDADES			
Hora de Salida		Leotura de millero Inicial		Hora de Llegada		Leotura de millero final	

**DETALLE DE ACTIVIDADES**

	1 VIAJE			2 VIAJE		
	HORA	KILOMETRAJE	CALLE/LUGAR	HORA	KILOMETRAJE	CALLE/LUGAR
Inicio de Carga						
Fin de Carga						
Disposición Final						
Peso Neto						

**CONTROL DE SUPERVISION**

HORA	LUGAR	FIRMA	
		COMPANIA	AYUNTAMIENTO

Reporte de Combustible y Lubricantes		REPARACIONES		SALIDA DEL TALLER
COMBUSTIBLES	GALONES	FECHA DE ENTRADA EN EL TALLER		
GASOIL		HORAS DE TRABAJO EN REPARACION		
ACEITE DE MOTOR		MORTE DE REPUESTOS UTILIZADOS		
ACEITE DE TRANSMISION		N.º ORDEN DE TRABAJO DE TALLER		
ACEITE DE DIFERENCIAL		PROBLEMAS DURANTE LA RECOLECCION:		
ACEITE HIDRAULICO				
OTROS LUBRICANTES				

**OBSERVACIONES:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ FIRMA DEL CHOFER \_\_\_\_\_ FIRMA DEL SUPERVISOR  
 \_\_\_\_\_ FIRMA DEL GERENTE  
FORM 003 Mejoramiento del Servicio de Rutas



# Annex S

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*Data Management*

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# S Data Management

## S.1 Outline

To establish and maintain an effective SWM is very important an adequate management of the information, reason why the following points, showed in the following figure, had been implemented. ① Reception process of the weight data obtained at Duquesa by the weighbridge. ② Develop the weight data capture system in the transfer station and the data reception process in a digital form. ③ Develop of the Collection Route DB. ④ Analysis of the customer service system generated by AAA.

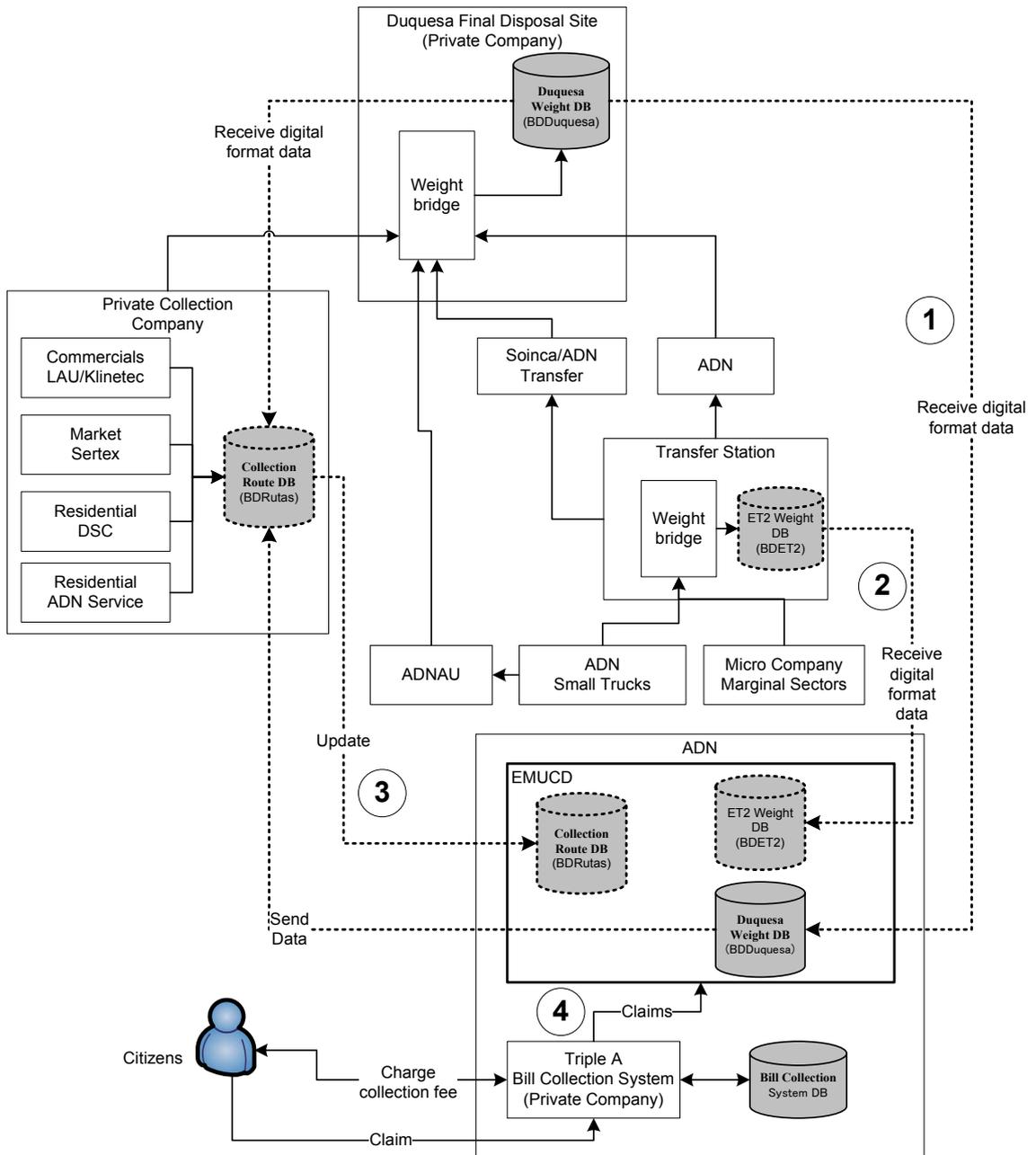


Figure S-1: General Scheme of the Data Management

a. ① **Reception process of the weight data obtained at Duquesa by the weighbridge.**

The S/T, with the collaboration of the Duquesa Consortium, develops an exportation module of the weight registered which is obtained by the Duquesas' weighbridge. This module exports the data of duquesas' weight system into a Microsoft Excel file format. This way, ADN and all the collection companies would be able to receive the weight data of their trucks in a digital form, with previous authorization from Duquesa.

The register exportation module is as the following figure:

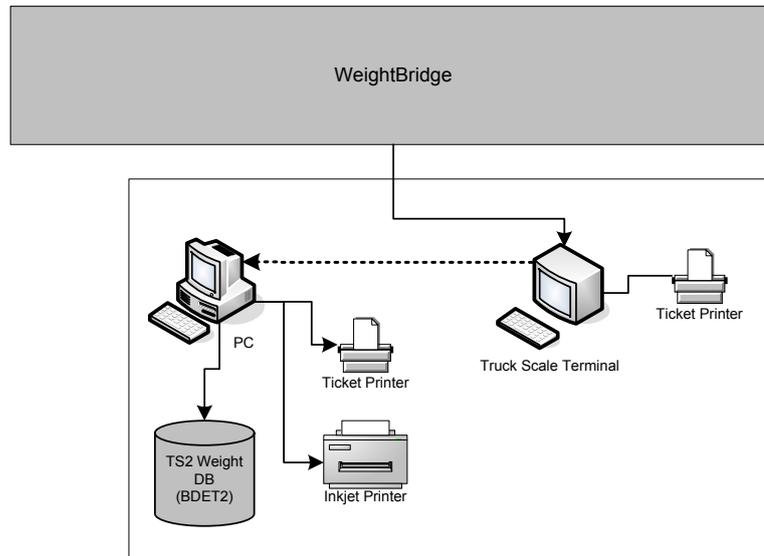
Duquesas' administrator system will generate the files according to ADN requirements. First you entered the period (dates from/until), the municipality from where the waste comes, also you can make a filter by collection companies, then this information is exported to an Excel file with the following format:

Field	Example Data	Description
Date	2006/06/25	Register capture date
Time	7:10	Time capture date
Card	1169	Code of the vehicle that enters
TypeWaste	1	Code of the type of waste
Percentage	100%	Percentage of the waste loaded
Gross	19560	Gross weight of the load
Weight	5890	Net weight of the load
Discount	0	Discount weight of the load
Total	5890	Total of the load
Collector	1	Code of the Collection Company
Name	A.D.N.	Name of the Collection Company
Municipality	National District	Municipality from where the load comes
Destination	1	Code of the final disposal destination 1=Duquesa

ADN can discharge daily the registrations of the previous day from the USB memory with which the DB of Duquesas' weight will be upgraded. The collection company also will be able to accede to these data, with previous authorization of Duquesas' administration, and with this information they could generate their own informs faster and precisely.

**b.      ② Develop the weight data capture system in the Transfer Station and the data reception process in a digital form.**

ADN installed, in the Transfer Station, a weighbridge with a weight capture terminal and a ticket printer. Also a computer and a printer had been installed. To capture the weight they were only using the weight capture terminal, so its memory was limited and they could not generate a DB of the vehicle registration. The S/T has developed a weight capture system connecting the computer with the weight capture terminal. The following figure shows the general scheme.



With this system we can obtain all the weight of all the vehicles that enters in the Transfer Station and generate a TS2 (Transfer Station) Weight DB.

The system was designed in Microsoft Access, and captures the weight data. See the following figure.

The screenshot shows the 'Entrada/Salida Automatico' window. At the top, there's a 'TicketNo:' field with '0002334' and a 'Bascula 1' dropdown. Below that are 'Entrada', 'Error', and 'Gross' buttons. A table with three columns: 'PesoBruto(kg)', 'PesoVehiculo(kg)', and 'PesoNeto(kg)', all containing '0'. Below the table are several input fields: 'Ficha', 'Marca/Modelo/Tipo' (dropdown), 'Recolector' (dropdown), 'RutalD' (dropdown), 'Tipo Basura' (dropdown), and 'Fecha' (with 'Hora' field). At the bottom are 'OK' and 'Cancelar' buttons. The status bar at the very bottom shows 'UserID: Administrador', 'Status: A', and 'Peso Automatico'.

Firstly the vehicles that enters in the transfer station and their tare weight is registered.

The card of the vehicle is entered, if the vehicle is already registered, the system shows its tare weight. The gross weight is captured automatically from the weight capture system and the weight net of the load is generated; the code of the route where the waste comes from and the type of waste is entered and then the ticket that belongs to the registration is printed.

The system generates the corresponding reports of the weight registration. The following picture shows an example of the daily reports by Ticket Number and the total, grouped by Card.

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**Informe diario por No. Ticket**

Ticket	Ficha	Recolector	Ruta	Tipo Basura	Hora	Peso(Kg)						
						PB Bruto	PTara	PI Neto				
E	Entrada											
2642	ET084	DOMINGO RODRIGUEZ		Basura	7:28:36	5,710	3,620	2,090				
2643	ET118	ECOREBAPU U. E.		Basura	9:24:30	7,000	3,050	3,950				
2644	ET119	ECOREBAPU U. E.		Basura	9:37:52	5,260	2,950	2,310				
2645	ET091	FRANCISCO G. SANCHEZ		Basura	9:52:01	5,840	3,010	2,830				
2646	ET097	ALBERTO HAWKING		Basura	10:06:34	5,360	3,410	1,950				
2647	ET074	ESASULSA		Basura	10:09:19	5,420	2,810	2,610				
2648	ET092	GERMAN VENTURA		Basura	10:27:41	6,240	3,010	3,230				
2649	ET076	ESCOBA		Basura	10:32:37	5,950	2,810	3,140				
2650	ET080	ECOSAGUASIGUA		Basura	10:39:11	5,340	2,920	2,420				
2651	ET098	SECUNDINO MERCEDES		Basura	10:42:45	6,900	4,000	2,900				
2652	ET083	ECOSAGUASIGUA		Basura	10:48:11	5,160	2,990	2,170				
2653	ET084	DOMINGO RODRIGUEZ		Basura	11:17:49	6,800	3,620	3,180				
2654	ET078	ESCOBA		Basura	11:35:10	8,340	2,870	5,470				
2655	ET081	ECOSAGUASIGUA		Basura	11:49:57	6,830	2,870	3,960				
2656	ET119	ECOREBAPU U. E.		Basura	12:00:19	5,140	2,950	2,190				
2657	ET118	ECOREBAPU U. E.		Basura	12:01:38	6,030	3,050	2,980				
2658	ET080	ECOSAGUASIGUA		Basura	12:57:35	5,750	2,920	2,830				
2659	ET076	ESCOBA		Basura	13:02:46	5,410	2,810	2,600				
2660	ET092	GERMAN VENTURA		Basura	13:10:45	5,630	3,010	2,620				
2661	ET097	ALBERTO HAWKING		Basura	13:21:40	6,010	3,410	2,600				
2662	ET091	FRANCISCO G. SANCHEZ		Podas	14:35:34	6,320	3,010	3,310				
2663	ET081	ECOSAGUASIGUA		Basura	14:47:50	6,050	2,870	3,180				
2664	ET083	ECOSAGUASIGUA		Basura	15:11:20	6,540	2,990	3,550				
2665	ET098	SECUNDINO MERCEDES		Basura	15:12:47	7,040	4,000	3,040				
2666	ET076	ESCOBA		Basura	15:24:04	5,540	2,810	2,730				
2667	ET078	ESCOBA		Basura	15:29:56	5,260	2,870	2,390				
2668	ET080	ECOSAGUASIGUA		Basura	15:31:25	5,740	2,920	2,820				
2669	ET084	DOMINGO RODRIGUEZ		Basura	15:47:13	6,730	3,620	3,110				
2670	ET076	ESCOBA		Basura	16:40:20	4,810	2,810	2,000				
<b>Total Entradas:</b>						<b>29</b>	<b>Peso Total(kg)</b>	<b>84,160</b>	<b>PesoMaximo</b>	<b>8,340</b>	<b>4,000</b>	<b>5,470</b>
									<b>PesoMinimo</b>	<b>4,810</b>	<b>2,810</b>	<b>1,950</b>
									<b>PesoPromedio</b>	<b>6,005</b>	<b>3,103</b>	<b>2,902</b>

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**Informe por Ficha de Vehiculo**

Ficha	Recolector	Marca	Tipo	Hora Viajes		Ho. Viajes	Total	Peso(ton)							
				Primero	Ultimo			Max	Min	Prom					
E	Entrada														
ET074	ESASULSA	Daihatsu	Volteo	10:09:19	10:09:19	1	2.61	2.61	2.61	2.61					
ET076	ESCOBA	Daihatsu	Volteo	10:32:37	16:40:20	4	10.47	3.14	2.00	2.62					
ET078	ESCOBA	Daihatsu	Volteo	11:35:10	15:29:56	2	7.86	5.47	2.39	3.93					
ET080	ECOSAGUASIGUA	Daihatsu	Volteo	10:39:11	15:31:25	3	8.07	2.83	2.42	2.69					
ET081	ECOSAGUASIGUA	Daihatsu	Volteo	11:49:57	14:47:50	2	7.14	3.96	3.18	3.57					
ET083	ECOSAGUASIGUA	Daihatsu	Volteo	10:48:11	15:11:20	2	5.72	3.55	2.17	2.86					
ET084	DOMINGO RODRIGUEZ			7:28:36	15:47:13	3	8.38	3.18	2.09	2.79					
ET091	FRANCISCO G. SANCHEZ	Daihatsu	Volteo	9:52:01	14:35:34	2	6.14	3.31	2.83	3.07					
ET092	GERMAN VENTURA	Daihatsu	Volteo	10:27:41	13:10:45	2	5.85	3.23	2.62	2.93					
ET097	ALBERTO HAWKING	Mitsubishi	Compactador	10:06:34	13:21:40	2	4.55	2.60	1.95	2.28					
ET098	SECUNDINO MERCEDES	Mitsubishi	Compactador	10:42:45	15:12:47	2	5.94	3.04	2.90	2.97					
ET118	ECOREBAPU U. E.	Daihatsu	Volteo	9:24:30	12:01:38	2	6.93	3.95	2.98	3.47					
ET119	ECOREBAPU U. E.	Daihatsu	Volteo	9:37:52	12:00:19	2	4.50	2.31	2.19	2.25					
<b>Hora Entrada 1er. Vehiculo</b>				<b>7:28:36</b>	<b>Ultimo</b>	<b>16:40:20</b>	<b>Viajes, Total</b>	<b>29</b>	<b>Promedio</b>	<b>2</b>	<b>Total(ton)</b>	<b>84.16</b>	<b>5.47</b>	<b>1.95</b>	<b>2.93</b>

Also the system has an exportation module of the registers, which is generated in the following format.

Field	Example Data	Description
TicketNo	1	Sequential ticket number
CardID	ET097	Vehicle ID
CollectorID	106	Collection Company ID
RouteID	C11001	Collection Route ID
TypeWasteID	1	Type of Waste
InDate	2006/06/07	Weight register date
InTime	1900/01/00	Weight register time
GrossWeight	5190	Gross weight
TruckWeight	3410	Tare weight
NetWeight	1780	Net weight
Destination	2	ID of the destination where it was weight
Status	A	Weight form status
InOut	E	In/Out of the weight
UserID	1	Operator system ID

The system administrator will generate the file of the weight registrations and send it to the EMUCD where the TS2 weight DB will be upgraded and where the registers will be processed and the reports will be generated.

**c.        ③ Develop of the Collection Route Data Base (RouteDB).**

In the Integrated Improvement of the Collection Service the routes are been designed. A collection Route Data Base System (RouteDB) has been developed in order to register and make faster the processing of the information generated.

The following figure shows the general scheme of the RouteDB, where the EMUCD of ADN and the collection companies perform the analysis, definition, codification and adjustment of the collection routes. Once the collection routes are defined, the RouteDB will be upgraded with the data of the collection routes (Neighborhood, Barrio, No., Collection frequency, schedule and the company in charge of the collection), and a map of the corresponding route.

The RouteDB will be installed in the EMUCD and a copy in the collection companies. The collection companies will receive the RouteDB with the collection routes registrations. The RouteDB System will generate automatically the list of the routes of the day; also the maps of the routes with the schedule and frequency could be printed. The list of the collection routes of the day, the map and the route sheet will be surrender to the truck dispatcher; he will give it to the truck driver who will carry out the collection. The driver will perform the collection on the route assigned and will complete the route sheet, and when he finished the collection, the driver will give the dispatcher the map and the route sheet, and then the dispatcher will give it to the operator who is in charge to enter the information in the RouteDB. After entering the data of the route sheet in the RouteDB, it would be able to emit reports of the collection indicators where the collection routes could be analyzed and make adjustment if it is necessary.

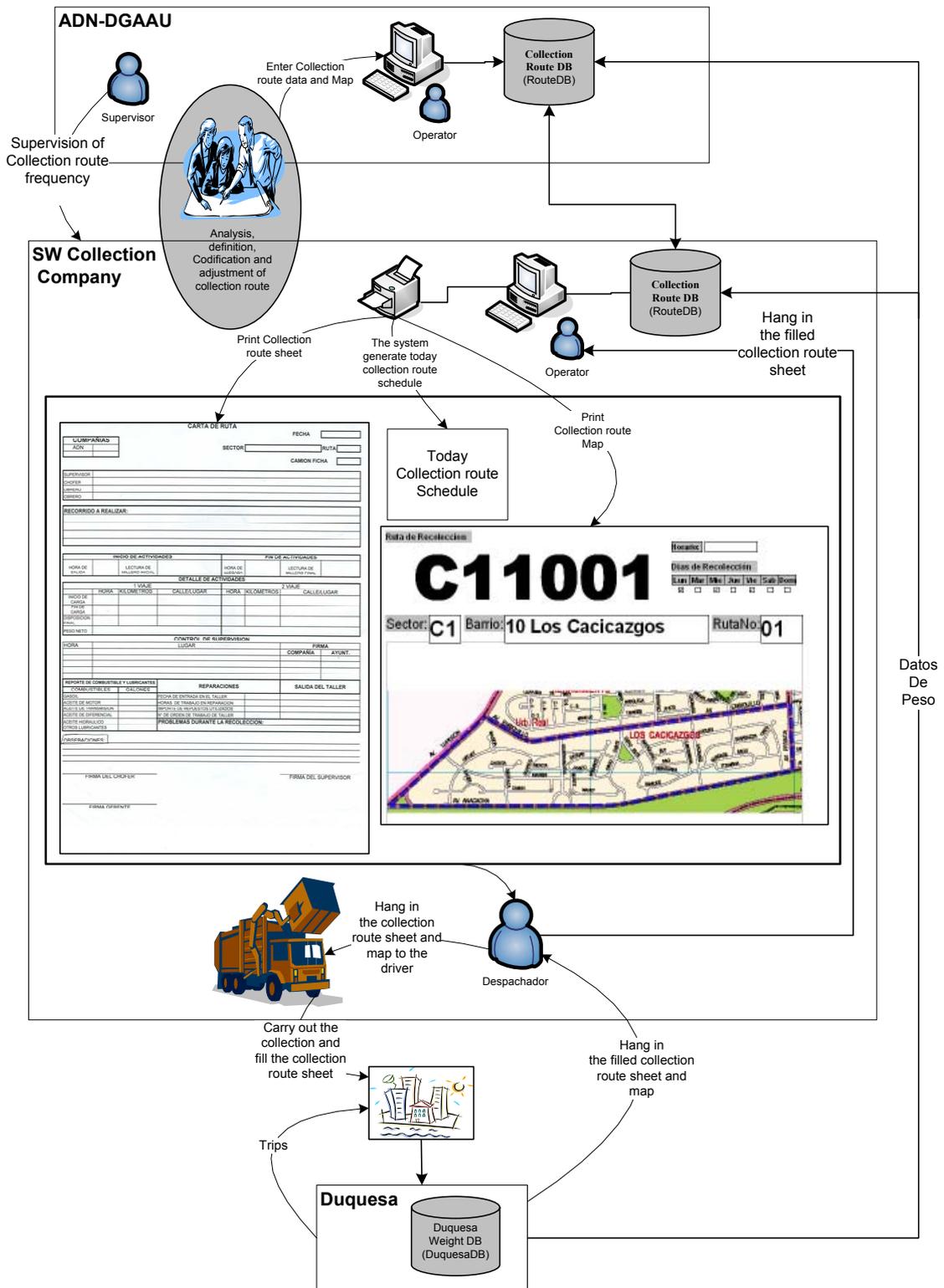
The weight data registered in Duquesas' final disposal site could be digitally imported to the RouteDB in order to have the weight data of each trip of the trucks.

EMUCD will check if the frequency and the schedule of the collection routes are fulfilled.

The collection companies that have the RouteDB installed will transmit periodically the data of the RouteDB to the EMUCD.

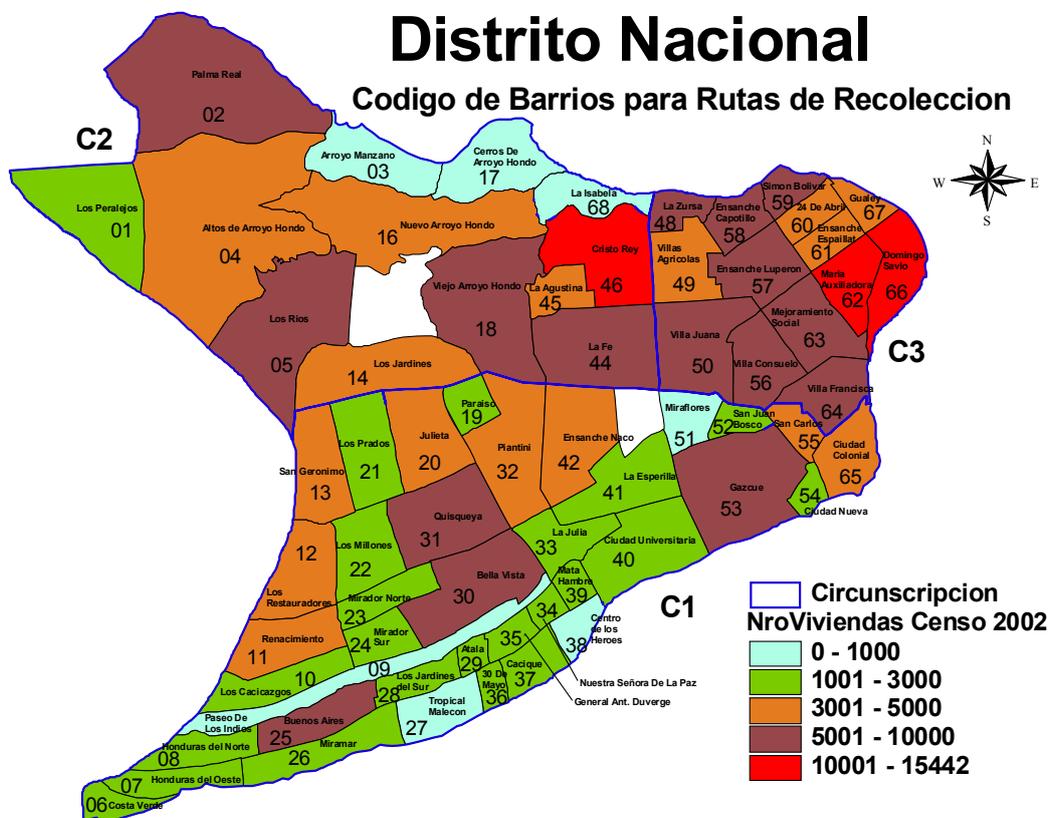
The route adjustments, such as the changes of the frequency or schedule will be carried out

jointly by the EMUCD and the collection companies.



**c.1 Codification of the Collection Routes**

The codification of the collection routes will be assigned according to the following criteria:

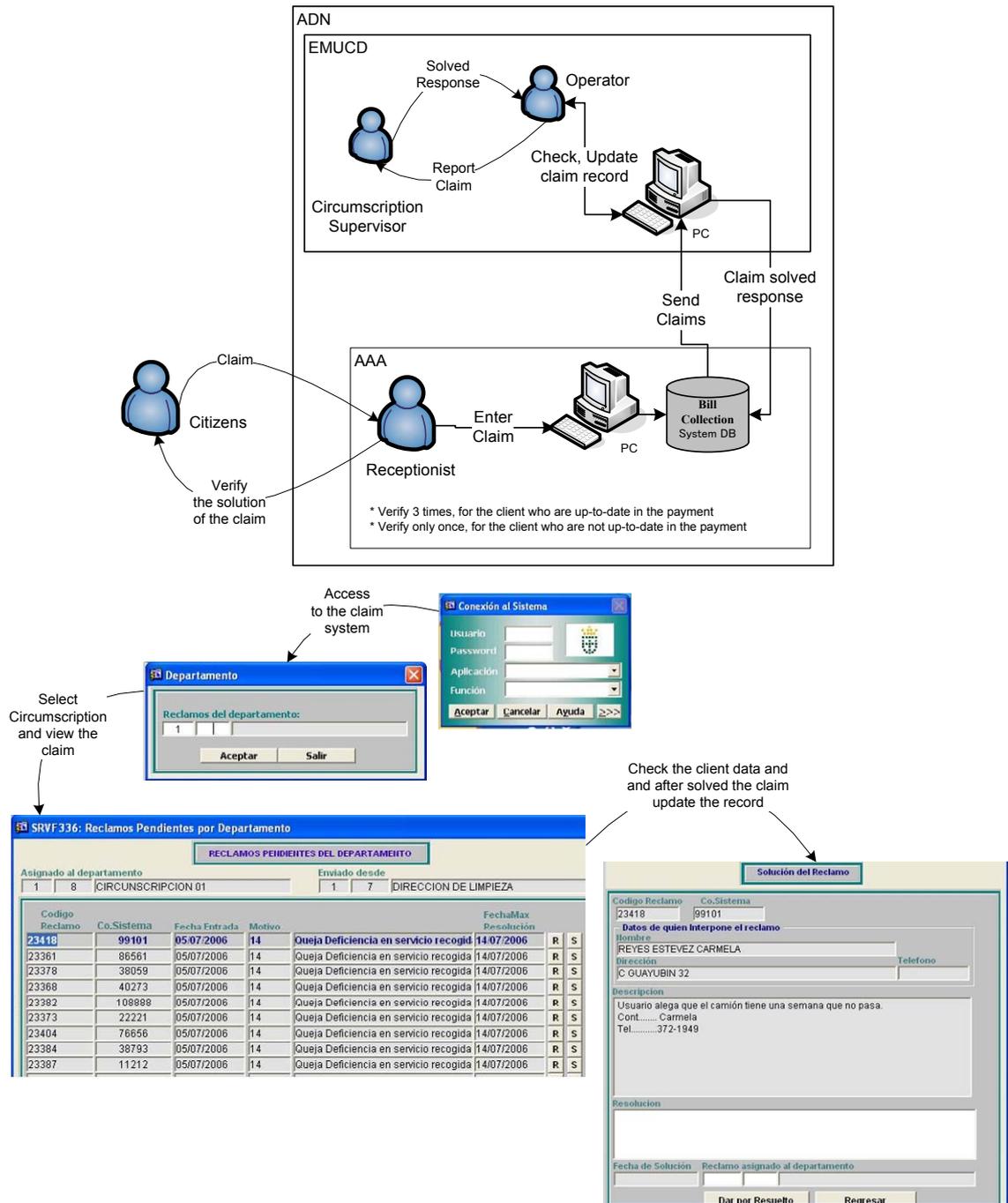


For Household routes	
Digit No.	Description
2 digits for the neighborhood	The neighborhood will be defined by the Circunscription.
2 digits for the barrial unit	The barrios will be enumerated according to the barrio number assigned by the national census.
2 digits of numeration sequence	Sequential number
Example	C13001 (Circunscription 1, Barrio Bella Vista, Route number 01)
For Avenues, Markets and ICIs routes	
2 digits for the neighborhood	The neighborhood will be defined by the Circunscription.
2 digits for the type of route	AV(Avenues), ME(Markets), IC(ICIs)
2 digits of numeration sequence	Sequential number
Example Avenue Route	C1AV01 (Circunscription 1, Avenues , Route number 01)
Example Market Route	C1ME01 (Circunscription 1 Market, Route number 01)
Example ICIs Route	C1IC01 (Circunscription 1 ICIs, Route number 01)

**d. ④ Analysis of the customer service system generated by AAA.**

How you can see in the following figure, the complaints of the clients are received by AAA, who has a PC Terminal in the EMUCD where the operator has access to the complaints registered. EMUCD operator checks the complaints registered and inform the supervisor of the corresponding circunscription, who communicates the operator the complaint attention

and the operator upgrade the complaint registration.



The third day AAA verifies if the complaint has been solved; for the clients that are up to date in the payment the verification is done 3 times and for those that are not on date on the payment the verification is done once.

Since the complaints filed are stored by neighborhood and the billing routes of AAA are not related with the collection route codification that are been designed. According to the client file of AAA, the exact location of the client that sends the complaint can be known, but is not known accurately who or which collection vehicle is in charge of that area. With the implementation of the collection route and the RouteDB all that information can be known.

To relate the client complaints and the collection routes that are designing, they had made

contact with AAA to add a field of the collection routes to the client DB and upgrade the collection route of each client. With this the attentions of the client complaints and the communication with the users regarding the frequency and the collection schedule could be improved, and the collection activities could be synchronized.

AAA will export the complaint files to an Excel format and will send it to EMUCD, where these files will be processed in order to generate informs and analyze the complaints systematically.

## S.2 Results

### a. Established Systems

The project established the following systems.

① Reception process of the data from Duquesa	With this the upgrade of the Duquesas' DB of EMUCD has improved, where the weight registration was entered manually. The collection company of the National District and of the other municipalities would be able to receive in a digital form all the weight registered. This will facilitate its process.
② DBTS2 System	With this system all the weight data has been captured, and tickets of all the vehicles that enters in Duquesa are been emitted. Emit informs instantly of all the weights of the day and export this data to the EMUCD where they can be analyzed and informs can be created if it's necessary.
③ RouteDB System	This has been implemented in ADN Service with 11 routes that are been analyze with the P/P and in ADNAU with 9 routes designed in the PPP. Regarding the dispatch process of the trucks this had improved quite good, but since all the data necessary of the field cannot be captured, it is not possible to obtain complete indicators.
④ Analysis of the customer service system generated by AAA	Still no result is obtained because they are in the stage of designing the routes and the data structure of the client DB of AAA has not been modified. Shortly the changes will be done and the client complaints will be solved more efficiently.

### b. Training

Counterpart	Hugo Perez has work in the whole process, and he will be in charge of pursuit, give maintenance and improve the information system. Heisor Arias has been trained in the importation data process of Duquesa and in the management of the weight data information.
Duquesa	The system administrator has been trained to use the exportation module of the weight data to send to the EMUCD.
Transfer Station 2	3 operators have been trained to use the weight system of DBTS2.
ADN Services	The RouteDB has been installed, and the system administrator has been trained to use it.
ADNAU	The RouteDB has been installed, and the Administrative Manager and the operator have been trained to use it.

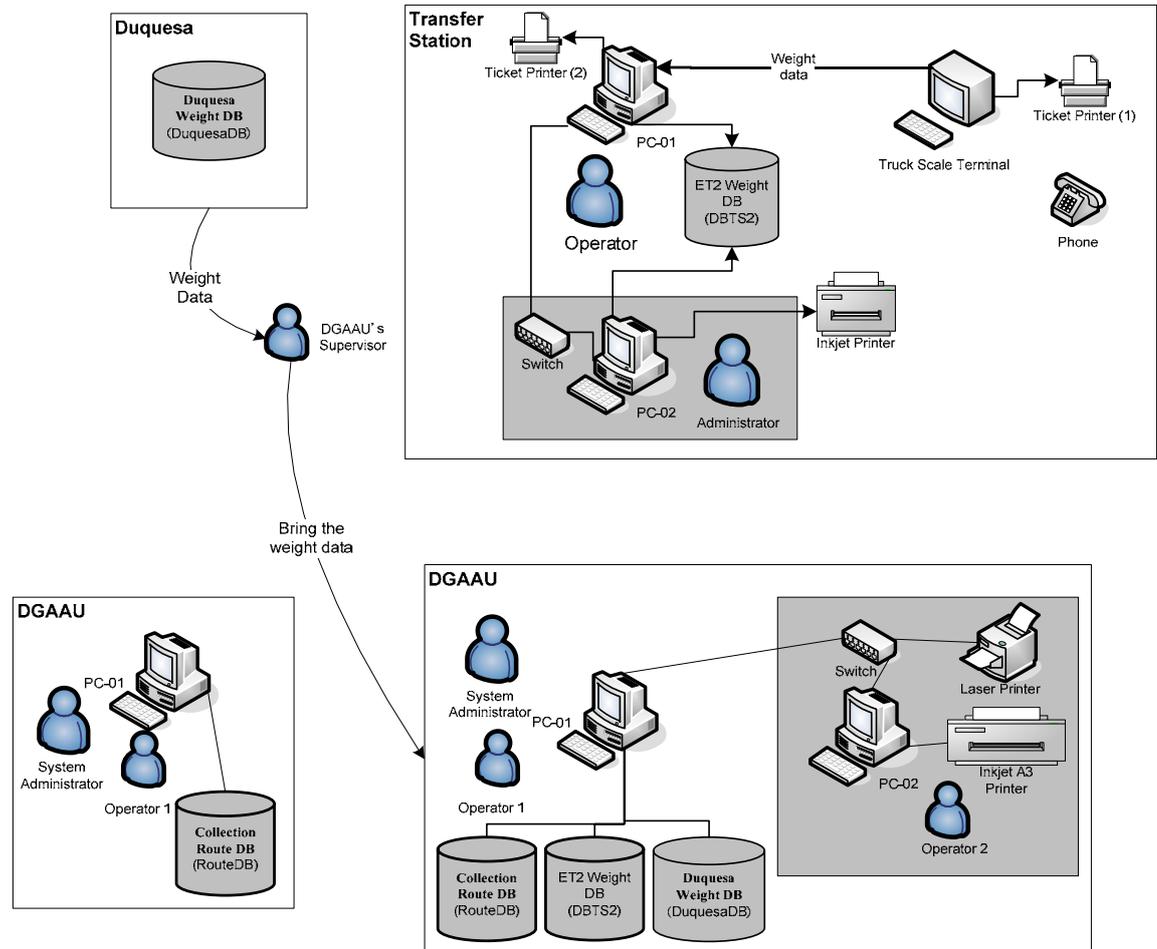
## S.3 Recommendations

- Regarding the reception of data of Duquesa, at this moment the information is received in magnetic media which are brought by the supervisor manager of Duquesa. See the possibility of accessing to Internet from Duquesa and transmitted through Internet.
- Regarding the Transfer Station, once the construction has been finished, see the possibility of transmitting the data to the EMUCD through the Internet.
- Regarding the RouteDB, pursuit the raising process and the data entry in ADN Service and in ADNAU and implement it with the other collection companies.

- Regarding the complaints, pursue the modification process of the data structure of the Client DB of AAA; and once the collection routes are established, upgrade the client file with it corresponding route code.

**a. Human Resources and Equipment**

For the effective implementation it will be necessary the following human resources and equipments. Also Microsoft Office and Access will be needed. All the DB were developed in Microsoft Access due to its popularity and easy maintenance.



Transfer Station			
Human Resources	Quantity	Outline	Tasks
PC Operator	1 per shift	Knowledge of handling a PC.	Will be in charge of capturing the weight data of all the vehicles that enters.
Administrator	1	Knowledge of the general management of the transfer station and of handling a PC.	Will be in charge of administrating the whole weight system, register the vehicles, generate the reports and send the weight data to EMUCD.
Equipments	In Existence	Necessaries	Note
	1 PC , 2 ticket printers, and an injection printer	1 additional PC and a network connection and an Internet connection (can be dial up).	The additional equipments are necessaries to generate the reports and for the process of exporting the files.

DIGAU			
Human Resources	Quantity	Outline	Tasks
PC Operator	2	High knowledge of handling a PC, Excel, Data Base, Internet	Will be in charge of receiving all the informations, manage the DB system, process and prepare the reports.
System manager	1	System Engineer	Will be in charge of developing, and keep the DB systems.
Equipments	In Existence	Necessaries	Note
	1 PC	1 additional PC, 1 laser printer and 1 A3 color printer, network connection and wide band internet	The additional equipment are necessaries to develop the DB, generate the reports.

Collection Companies			
Human Resources	Quantity	Outline	Tasks
PC Operator	1	Knowledge of handling a PC, Excel, Data Base and Internet.	Will be in charge of entering all the informations, manage the DB system, process and prepare the reports.
System Manager	1	System Manager	Is not a priority but if exist it will be better.
Equipments		Necessaries	Note
		1 PC and 1 printer, if it is possible network connection.	The equipments will be necessary to install the RouteDB and print the route sheet, maps and the reports.

# Annex T

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*Collection Routes Database  
System Users Manual*

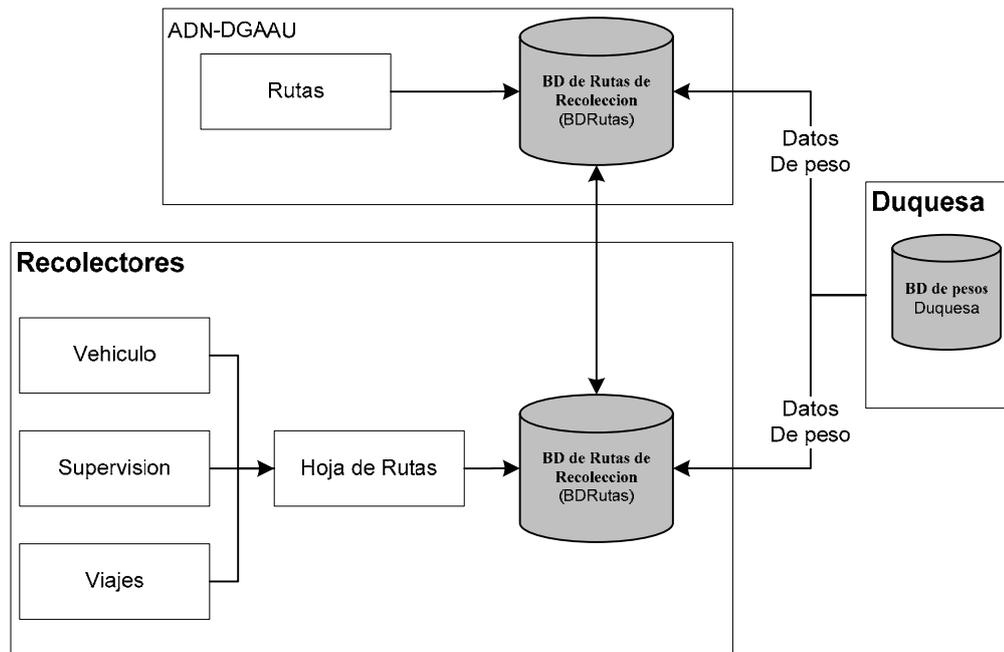
Contents

<b>T</b>	<b>Collection Routes Database System Users Manual.....</b>	<b>T-1</b>
T.1	Introduction .....	T-1
T.2	Installation .....	T-2
T.3	DBRoutes .....	T-2

## T Collection Routes Database System Users Manual

### T.1 Introduction

The Collection Routes Databases System (DBRoutes), has been developed with the purpose of having the objective of registering and speed up the prosecution of the informations of the collection routes. The system has been developed with Microsoft Access because is a system very used at the present time and is of easy maintenance. The general scheme is presented in the following figure.



The EMUCD of the ADN jointly with the collector companies will carry out the analysis, definition, code and adjustments of the collection routes. Once defined the collection route, the DBRoutes will be loaded with the data of the collection routes (Sector, Neighborhood, No., collection Frequency, schedule and the collector company in charge), and a map of the corresponding route.

The DBRoutes will be installed in the EMUCD and a copy settled in the collector companies. The collector companies will receive the DBRoutes with their corresponding registrations of the collection routes. The DBRoutes System will automatically generate the list of the routes corresponding to the day; also the maps of the routes with its schedules and frequencies can be printed. The list of the collection routes of the day, the map and the route sheet will be surrender to the trucks dispatcher, and the dispatcher will give it to the diver of the truck that will carry out the collection. The driver will carry out the collection of the assigned route and will complete the route sheet, and at the end of the collection he will give the map and the route sheet to the dispatcher, and then he will give it to the operator in charge of entering the informations to the DBRoutes. After the data of the Route Sheet is entered in the DBRoutes, it will be able to emit reports of the collection indicators where the collection routes can be analyze and adjusted if it is necessary.

The data of the weight registered in the final disposal site of Duquesa can be imported digitally to the DBRoutes and this way we can have the data of the weight of each trip of the trucks.

The EMUCD will carry out the inspections of the execution of the frequency and schedule of the collection routes.

The collector companies that have installed the DBRoutes, will transmit the data periodically from the DBRoutes to the EMUCD.

## T.2 Installation

To use the system of BDRutas the following files should be installed in a PC. For the use of the system it will be needed, Windows XP and Microsoft Access 2000 or higher version.

Name of the File	Description
DBRuta.mdb	Is the file of the DB that will contain all the data of the DB.
DBRutaSys.mdb	The DB system for the operator.

Once the files are copied in the designated folder, the charts of the BD should be linked. See the section of linking charts of DBRoutes.

## T.3 DBRoutes

### a. Beginning

To begin the system, execute the file "DBRutaSys.mdb", from the folder where it was installed. The following window of main menu of the DB will appear.



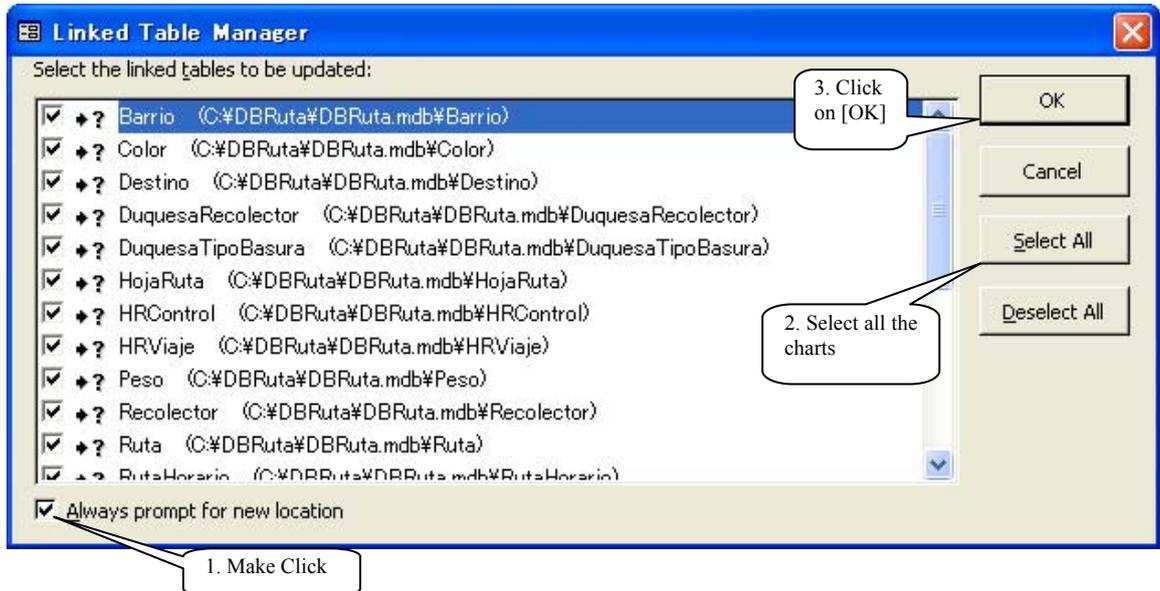
### b. Link Charts and Compact DB

#### b.1 Link charts

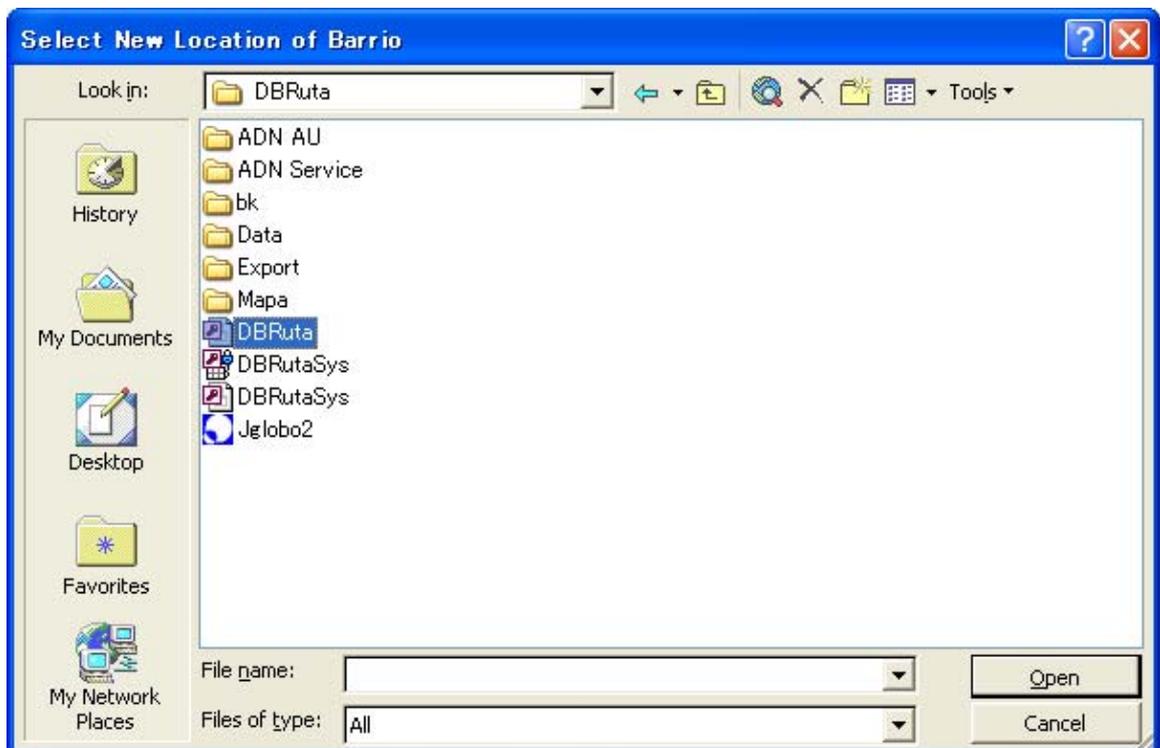
The system "DBRutaSys.mdb" it will be linked with the DB "DBRuta.mdb", so that it can accede to the data of the DB, for this follow the following steps.



In the main menu select [Linked Table Manager], and the following window will appear.



Follow the steps and the following window will appear where the file should be located, "DBRuta.mdb."



Make click in [Open], and all the charts will link and the following information window will appear and you could be able to accede to the data of the DB and use the system.



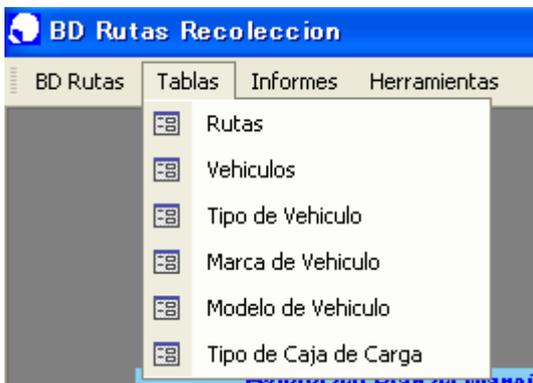
### b.2 Compact the DB

To give maintenance to the DB, it should be compacted periodically.



In the main menu select [Compact and Repair Database], this will compact and will give general maintenance to the DB.

### c. System Charts



#### c.1 Collection Routes

The ADN-EMUCD will provide all the data related to the collection routes, and the collectors will be able to accede to these data, in the main menu select [Charts] and then [Routes] and the following window will appear.

**Rutas de Recoleccion**

Todas las rutas

Sector:

**Nueva Ruta**

Doble Click en RutaID para editar

RutaID	SectorID	BarrioID	RutaNo	Descripcion	Lun	Mar	Mie	Jue	Vie	Sab	Dom
C11001	C1	10 Los Cacicazgos	01	C1 Los Cacicazgos Ruta 01	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C11002	C1	10 Los Cacicazgos	02	C1 Los Cacicazgos Ruta 02	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C11101	C1	11 Renacimiento	01	C1 Renacimiento Ruta 01	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C11102	C1	11 Renacimiento	02	C1 Renacimiento Ruta 02	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C12301	C1	23 Mirador Norte	01	C1 Mirador Norte Ruta 01	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C12401	C1	24 Mirador Sur	01	C1 Mirador Sur Ruta 01	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C13001	C1	30 Bella Vista	01	C1 Bella Vista Ruta 01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C13002	C1	30 Bella Vista	02	C1 Bella Vista Ruta 02	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C13003	C1	30 Bella Vista	03	C1 Bella Vista Ruta 03	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C13004	C1	30 Bella Vista	04	C1 Bella Vista Ruta 04	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Record:  of 10

To accede to the data of the route make double click in [RutaID] and the following window will appear with all the data of the route. All the modifications shall be made jointly by ADN-EMUCD and the collectors of the respective routes.

**Actualizacion de Ruta**

RutaID:  Sector:  Barrio:  RutaNo:

Descripcion:

Dias Recol. Lun Mar Mie Jue Vie Sab Dom

Horario:

Note:   Use

NroVivienda:  NroHabitante:

Recolector:

Ficha:

Mapa:

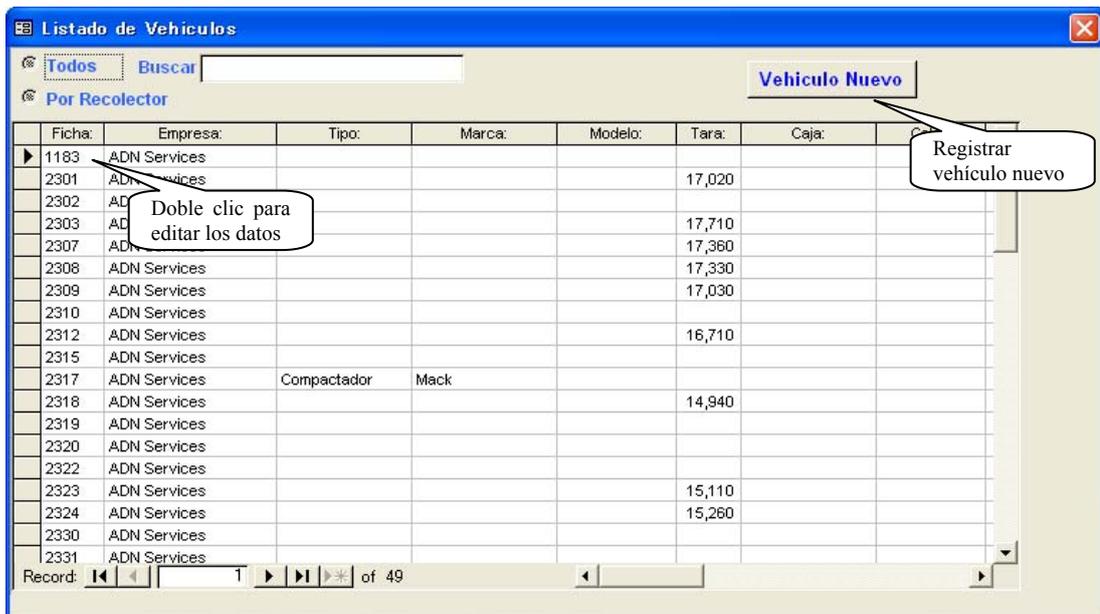
Record:  of 1 (Filtered)

To print the data of the routes make click in the button [Preliminary View] and the following window will appear and can be printed.



## c.2 Vehicles

This chart will have all the informations of the vehicles used for the collection. In the main menu select [Charts] and then [Vehicles] and the following window will appear.



To add a new vehicle make click in the button [New Vehicle] and the following window will appear.

**Registro de Vehículo Nuevo**

Recolector: **ADN Services**

Ficha: **0000**

Tipo: [ ] Tipo Caja: [ ]

Marca: [ ]  Compacta  Drena  Vierte

Modelo: [ ] Color: [ ]

Placa: [ ] Matrícula: [ ] Chasis: [ ]

Peso Tara: **0** Volumen(m3) [ ] 0 Peso Max (ton): [ ] 0 Año: [ ]

Fecha de Operacion: [ ]

Enter the name of the collector and enter the new record of the vehicle and then all the data of the new vehicle.

To edit the data of the registered vehicles make double click in [FichaID].

### c.3 Electoral District

In this chart will be stored the data of the district, in the main menu select [Charts] and then [District] and the following window will appear.

**Circunscripción**

CircunscripciónID:	Nota:
C1	Circunscripción 1
C2	Circunscripción 2
C3	Circunscripción 3
*	

Record: 1 of 3

### c.4 Neighborhoods

In this chart will be stored the data of the different neighborhoods inside the district, in the main menu select [Charts] and [Neighborhoods] and the following window will appear.

BarrioID:	Circunscripcion:	Barrio:	NoHabitantes:	NoVivi
01	C2	Los Peralejos	6032	
02	C2	Palma Real	32506	
03	C2	Arroyo Manzano	3218	
03	C2	San Diego	37	
04	C2	Altos de Arroyo Hondo	9742	
05	C2	Los Ríos	37317	
06	C1	Costa Verde	3464	
07	C1	Honduras del Oeste	8896	
08	C1	Honduras del Norte	9795	
09	C1	Paseo De Los Indios	279	
10	C1	Los Cacicazgos	7445	
11	C1	Renacimiento	9656	
12	C1	Los Restauradores	13723	
13	C1	San Gerónimo	12443	
14	C2	Los Jardines	15374	
16	C2	Nuevo Arroyo Hondo	17104	
17	C2	Cerros De Arroyo Hondo	1357	
18	C2	Viejo Arroyo Hondo	21372	
19	C1	Paraíso	4020	
20	C1	Julieta	15448	
21	C1	Los Prados	10439	
22	C1	El Millón	8407	
23	C1	Mirador Norte	5581	
24	C1	Mirador Sur	3860	
25	C1	Buenos Aires	24587	
26	C1	Miramar	7773	

Record: 1 of 66

**c.5 Type of Vehicle**

In this chart will be stored the different type of vehicles, in the main menu select [Charts] and then [Type of Vehicle] and the following window will appear.

Vehicul	Tipo:
1	Compactador
2	Volteo
3	Volqueta
4	Roll on - Roll off
5	Araña
6	Cama larga c/barandilla
7	Cama larga
8	Cama corta c/barandilla
9	Cama corta

Record: 1 of 10

**c.6 Brand of the Vehicle**

In this chart will be stored the different vehicle brands, in the main menu select [Charts] and then [Mark of Vehicle] and the following window will appear.



The screenshot shows a window titled "Marca de Vehiculos" with a table containing the following data:

VehiculoMarcaID:	Marca:
	Renault
1	Mitsubishi
2	Toyota
3	Chevrolet
4	Mack
5	Crane Carrier
6	Daihatsu
7	Hino
8	Iveco
9	Kia
10	Mercedes Benz

Record: 1 of 16

### c.7 Model of the Vehicle

In this chart the different vehicle models will be stored, in the main menu select [Charts] and [Model of Vehicle] and the following window will appear.



The screenshot shows a window titled "Modelo de Vehiculo" with a table containing the following data:

VehiculoModeloID	Marca:	Modelo:
	Mitsubishi	Canter
2	Chevrolet	Kodiak
3	Mack	MR 690S
4	Mack	MR 686S
5	Crane Carrie	Dump Truck
6	Daihatsu	Hijet
7	Toyota	Dyna
*	0 Renault	

Record: 1 of 7

### c.8 Color

In this chart will be stored the different vehicle colors, in the main menu select [Charts] and then [Color] and the following window will appear.



The screenshot shows a window titled "Color" with a table containing the following data:

ColorID:	Color:
	Amarillo
2	Azul
3	Blanco
4	Gris
5	Morado
6	Negro
7	Rojo
8	Verde
*	0

Record: 1 of 8

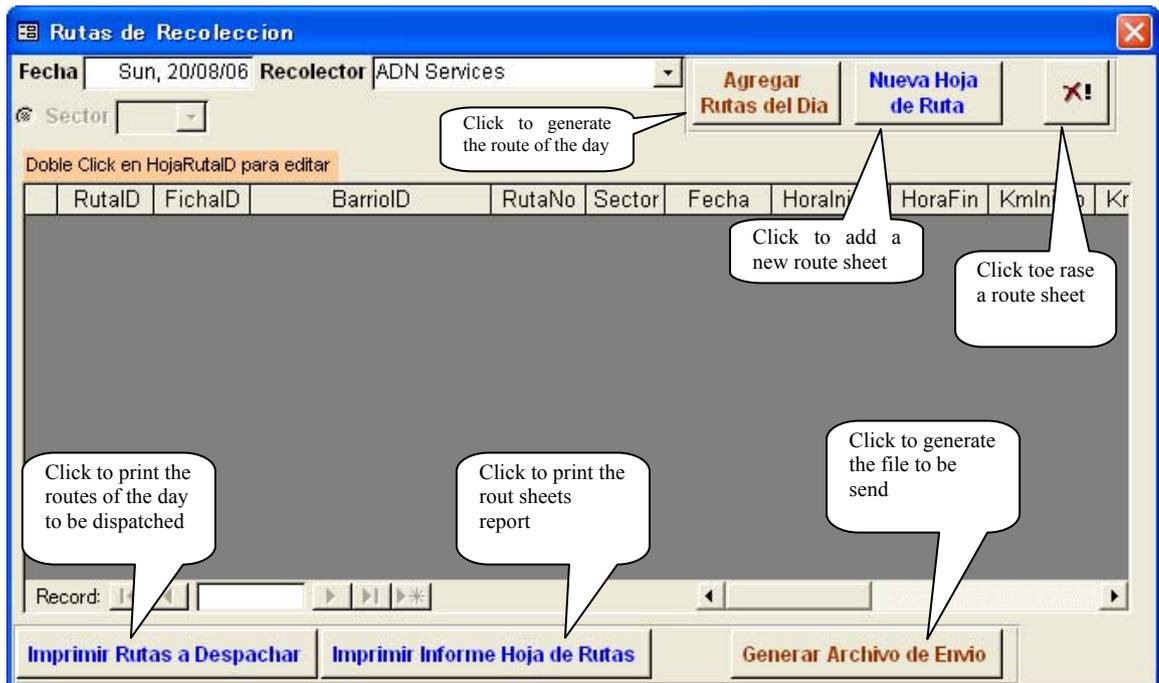
### c.9 Type of box

In this chart will be stored the different type of compactor boxes of the vehicle, in the main menu select [Charts] and then [Type Box of Load] and the following window will appear.



### d. Route Sheet

To load the data of the routes sheet, in the main menu select [DBRoute] and [Routes Sheet], and the following window will appear.



#### d.1 Add Route Sheet

The routes sheet contains all the data of the collection routes that should carry out the collector with his vehicle. To add a route sheet make click in the button [New Route Sheet] and if you want to add all the assigned routes of the date make click in the button [Add Routes of the Day], and the system will add all the routes corresponding to the day and will show the following window.

**Rutas de Recoleccion**

Fecha: Sat, 19/08/06 Recolector: ADN Services

Sector: [ ]

Agregar Rutas del Dia Nueva Hoja de Ruta

Doble Click en HojaRutaID para editar

	RutaID	FichaID	BarrioID	RutaNo	Sector	Fecha	Horainicio	HoraFin	Kmlnicio	Kr
▶	C11002		10 Los Cacicazgos	02	C1	19/08/06				0
	C12301		23 Mirador Norte	01	C1	19/08/06				0
	C12401		24 Mirador Sur	01	C1	19/08/06				0
	C13001		30 Bella Vista	01	C1	19/08/06				0
	C13002		30 Bella Vista	02	C1	19/08/06				0
	C13003		30 Bella Vista	03	C1	19/08/06				0

To load the data of the routes sheet, make double click in [RutaID] and the following window will appear.

**HojaRuta**

Fecha: Sat, 19/08/06 Recolector: ADN Services

RutaID: C11002 SectorID: C1 BarrioID: 10 Los Cacicazgos RutaNo: 02

FichaID: [ ]

**Inicio de Actividades** **Fin de Actividades**

Hora: [ ] Millaje: [ 0 ] Hora: [ ] Millaje: [ 0 ]

Chofer: [ 1 ] Ayudante: [ 0 ] Gasoil: [ 0 ]

Nota: [ ]

**Viajes** **Supervision**

Doble Click en ID para editar Nuevo

	FichaID:	ViajeNo:	CargalnicioHs	CargaFinHs	DFinalEntrada	PesoNeto	Cargalnicio

Enter all the relating to the route sheet, then make click in the button [Record], and then enter the trips done and the supervision of the route if there was some supervision.

#### d.1.1 Load of Trips

To enter the trip that was carried out make click in the button [New] and the following window will appear

The 'Viajes' window contains the following fields and controls:

- Fecha: [Text Box]
- RutaID: [Text Box]
- HRViajeID (toNumber): [Text Box]
- FichaID: [Text Box]
- Carga Inicio:
  - Hs: [Text Box]
  - Km: [Text Box] (value: 0)
  - Lugar: [Text Box]
- Carga Fin:
  - Hs: [Text Box]
  - Km: [Text Box] (value: 0)
  - Lugar: [Text Box]
- ViajeNo: [Text Box]
- Disposicion Final: [Text Box]
- DestinoID: [Dropdown Menu] (value: Duquesa)
- Seleccionar: [Button]
- Hora Entrada: [Text Box]
- Hora Salida: [Text Box]
- Peso Neto: [Text Box] (value: 0)
- Nota: [Text Area]
- [Print] [Refresh] [Buttons]

Enter the hour, kilometer and the place of the point where the load begun and the point where it conclude.

The weight of the trip can be selected from the DB of the final disposal site in Duquesa. For this you should firstly import the data of Duquesa's DB. See the section of "Import of Data of Duquesa". To select the weight of the trip make click in the button [Select] and the following window will appear with the list of the trips carried out by the vehicle according to the "Registers". Select the trip corresponding to that route and make double click in [Registers] and the system will upgrade the weight in the route sheet.

	Ficha	Hora	Peso	Descuento:	Total:	Destino:	Fecha	TipoBasura	Ru
▶	2317	16:31:38	11,940	0	11,940	Duquesa	2006/06/21		1
*									

#### d.1.2 Load of Supervision

The supervision will be carried out by the collector company or by ADN-EMUCD, to load the data of a supervision of the route make click in [Supervision].

The 'Viajes Supervision' window includes:

- Buttons: Doble Click en ID para editar, Nuevo
- Table with columns: ID, ControlHs, ControlLugar, Compania, Ayuntamiento
- [Table Area]
- [Navigation Arrows]

Make click in the button [New] and the following window will appear where you can enter the data of the supervision, to record the registration make click in the button [Record].

### d.2 Print the Routes to be dispatched

Once all the routes that will be dispatched are already generated, the routes list to dispatch can be printed and surrendered to the person in charge of the dispatching the trucks. For this make click in the button [Print Routes to Dispatch] and the following window will appear, verify the data and print the sheet.

**Hoja de Ruta a Despachar**    Recolector: ADN Services    Fecha: Wed, 21/Jun/06

ID	RutaID	SectorID	BarrioID	RutaID	FichaID	Horalnicio	Obs:
<b>Horario</b>		<b>Mañana</b>					
10	C11001	C1	10 Los Cacicazgos	01	2317		
11	C11101	C1	11 Renacimiento	01	2369		
12	C11102	C1	11 Renacimiento	02	2366		
13	C13001	C1	30 Bella Vista	01	2323		
14	C13002	C1	30 Bella Vista	02	2355		
15	C13003	C1	30 Bella Vista	03	2372		

### d.3 Printing of the Routes Sheet

Once it has been loaded all the informations of the routes sheet, you will be able to print a report with the indicators of the collection routes that will help the collectors to a better supervision and adjustments of their respective routes. For this make click in the button [Reports of Routes Sheet] and the following window will appear, verify the data and print the sheet.

**Informe Diario de Hoja de Ruta** Recolector: **ADN Services** Fecha: **Wed, 21/Jun/06**

ID	RutaID	Sector/Barrio/RutaNo	FichaID	Hora(Inicio/Fin/Tot)	Millero(Inicio/Fin/Tot)	Gasoil/Chofer/Ayudante	No Viaje/Peso Total/Promedio
21/06/06	C11001	C1 10 Los Cadcazzgos	01	2317	9:00 16:45 7:45	0 0 0	1 3 1 11,940 11,940
<b>Viajes</b> Nota							
No	FichaID	Carga/Hs/Inicio/Fin/Tot	Carga Km/hiccion/Fin/Tot	Carga Lugar/hicicio/Fin	D Final/Entrada/Salida/P Neto	ton/Ayu/Hs Ton/h's Kg/Km	Hs Ruta DF
1	2317	9:45 15:40 5:55	0 0 0		16:31	11,940 0.67 2.02 0.0	0:51
<b>TpoRecol:</b> 5:55 <b>ton/TpoTotalRecol:</b> 2.02 <b>Km/Gal:</b> 0 <b>kg/Km:</b> 0							
21/06/06	C11101	C1 11 Renacimiento	01	2369	6:31 17:00 10:29	0 0 0	1 3 1 14,780 14,780
<b>Viajes</b> Nota							
No	FichaID	Carga/Hs/Inicio/Fin/Tot	Carga Km/hiccion/Fin/Tot	Carga Lugar/hicicio/Fin	D Final/Entrada/Salida/P Neto	ton/Ayu/Hs Ton/h's Kg/Km	Hs Ruta DF
1	2369	6:48 12:17 5:29	0 0 0		13:11	14,780 0.90 2.70 0.0	0:54
<b>TpoRecol:</b> 5:29 <b>ton/TpoTotalRecol:</b> 2.7 <b>Km/Gal:</b> 0 <b>kg/Km:</b> 0							
21/06/06	C11102	C1 11 Renacimiento	02	2366	6:32	0 0 0	1 3 1 13,740 13,740
<b>Viajes</b> Nota							
No	FichaID	Carga/Hs/Inicio/Fin/Tot	Carga Km/hiccion/Fin/Tot	Carga Lugar/hicicio/Fin	D Final/Entrada/Salida/P Neto	ton/Ayu/Hs Ton/h's Kg/Km	Hs Ruta DF
1	2366	6:58 12:30 5:32	0 0 0		13:37	13,740 0.83 2.48 0.0	1:07
<b>TpoRecol:</b> 5:32 <b>ton/TpoTotalRecol:</b> 2.48 <b>Km/Gal:</b> 0 <b>kg/Km:</b> 0							
21/06/06	C13001	C1 30 Bella Vista	01	2323	6:30	0 0 0	1 3 2 15,710 7,855
<b>Viajes</b> Nota							
No	FichaID	Carga/Hs/Inicio/Fin/Tot	Carga Km/hiccion/Fin/Tot	Carga Lugar/hicicio/Fin	D Final/Entrada/Salida/P Neto	ton/Ayu/Hs Ton/h's Kg/Km	Hs Ruta DF
1	2323	7:00 11:40 4:40	0 0 0		12:30	8,280 0.59 1.77 0.0	0:50
2	2323	13:30 16:48 3:18	0 0 0		18:50	7,430 0.75 2.25 0.0	2:02
<b>TpoRecol:</b> 7:58 <b>ton/TpoTotalRecol:</b> 1.97 <b>Km/Gal:</b> 0 <b>kg/Km:</b> 0							

**d.4 Export the data of the Route Sheet**

All the informations that were entered of the routes sheets can be export in a Microsoft Excel file format to send to the ADN-EMUCD. To export the data firstly assign the export folder (See the section of folders assignment) and then make click in the button [Generate File of Shipment] and the following verification window will appear.



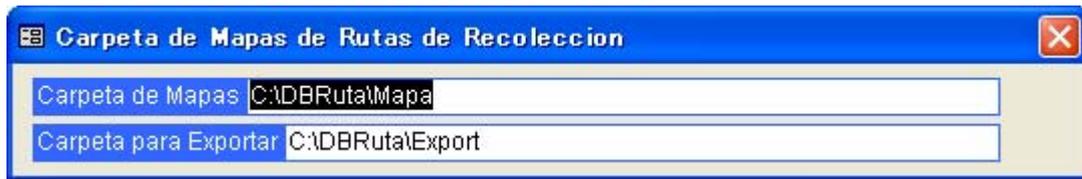
If you are sure make click in the button [Yes] and the system will indicate the result of the export in the following window.



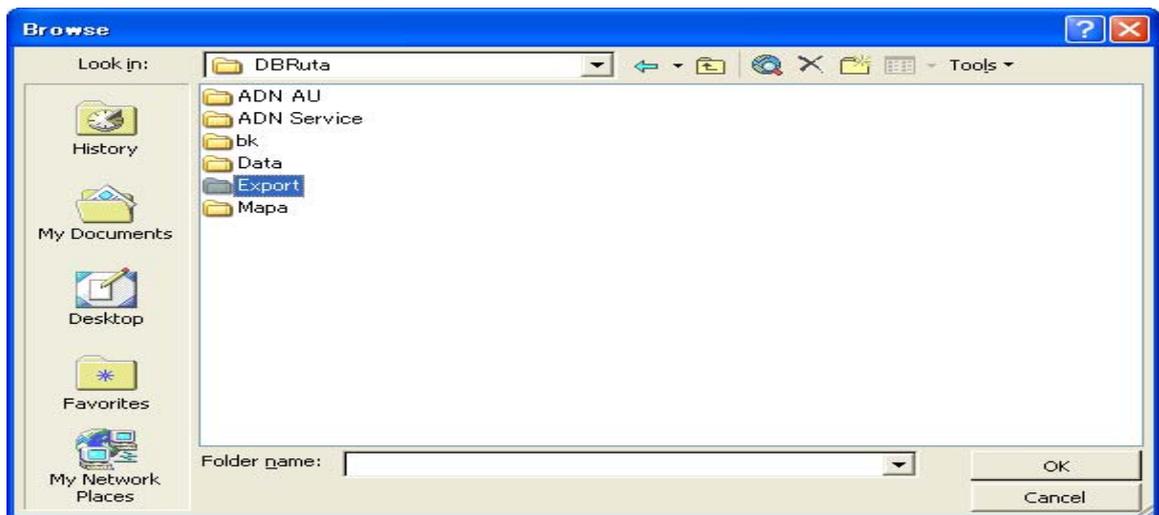
**e. Folder assignment**

2 folders may be assigned in the system, one to keep all the maps of the routes and other to export registrations of the DBRoutes.

To assign the folders in the main menu select [DBRoutes] and then select [Folder Assignment] and the following window will appear.



To assign the maps folder make double click in [Maps Folder] and to assign the export folder make double click in [Folder to Export] and the following window will appear where you can choose the corresponding folder.



#### f. Import Duquesas' data

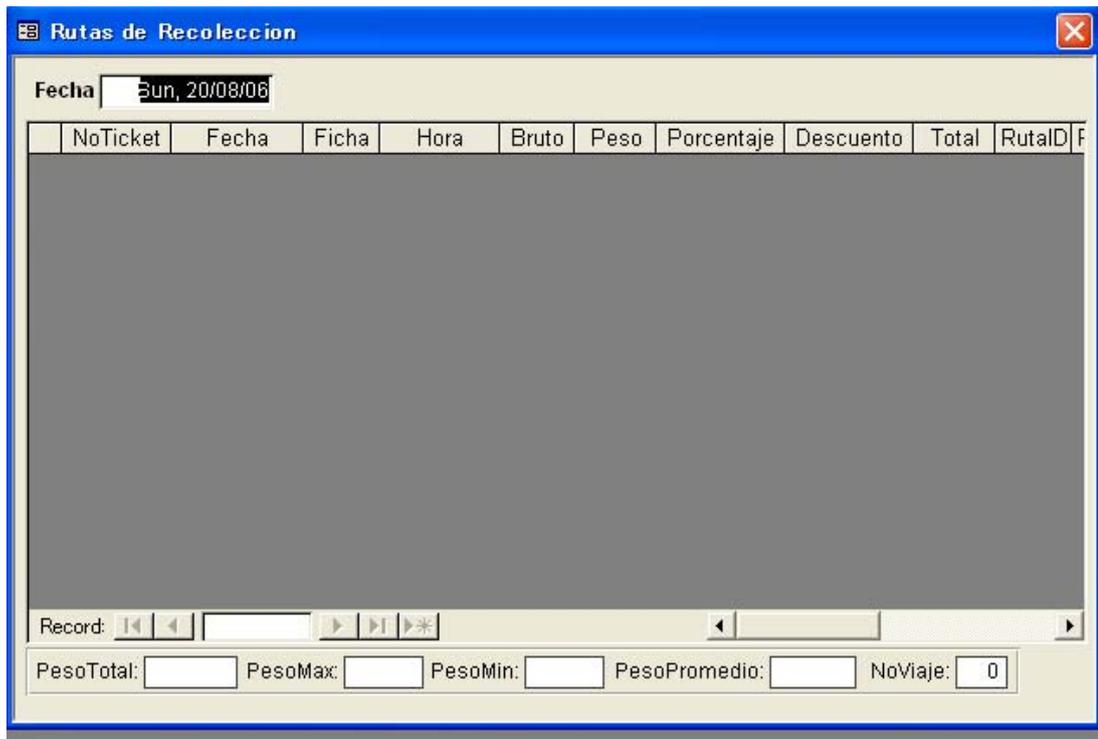
The weight data registered in Duquesa can be exported to the DBRoutes. Firstly you will have to obtain a copy of the registrations of weight of Duquesa and copy it to the PC where the DBRoutes is installed. Then in the main menu select [DBRoutes] and then select [Import Data of Weight] and the following window will appear.



- Select the file that contains the weight data of Duquesa.
- If some collector ID does not coincide with the DBRoutes the button [Upgrade Collector] will be enabled you will be able to carry out the necessary upgrades, if the button is not enabled it means that any change doesn't exist.

- If some Type of Waste ID does not coincide with the DBRoutes the button [Upgrade Type of Waste] will be enabled and you will be able to carry out the necessary upgrades, if the button is not enabled it means that any change doesn't exist.
- The weight data of Duquesa will be temporarily copied in the DBRoutes and the buttons [See Detail and [Verify Data] will be enabled so that all the details of the data that exist in the file of weight of Duquesa can be seen, verify that everything is OK.
- Once all the data are verified make click in the button [Import Registrations] and all the weight data of Duquesa will be imported in the DBRoutes.

To see the data imported in the main menu select [DBRoutes] and then select [Data of Weight] and the following window will appear. Enter the date and will appear all the trips carried out in that date with their respective weight.



**g. Reports**

To print reports of the routes sheets, in the main menu select [Reports] and then select [Monthly Indicators] and the following window will appear.



Enter the interval of dates and then choose the type of reports:

- If you choose collection Indicators, [Summarize] you will obtain a summarized report of the indicators as it is shown in the following window.

### Indicadores de Recoleccion Fecha Desde Sun, 18/06/06 Hasta Sun, 25/06/06

RutaID	Fecha	FichaID	Viaje No	Peso Neto	Hora Inicio	Hora Fin	Tpo Total	Carga Inicio Hs	Carga Fin Hs	Tpo Base Ruta	Tpo Recoleccion	Ruta TonHs	Ruta Ton/Ayu /Hs	DFinal Entrad	Tpo Ruta DF
(Promedio)												2.3			
C11001	C1 Los Caicazgos Ruta 01		4	11,240			9:33			1:09	5:13	1.67	0.56		1:30
C11002	C1 Los Caicazgos Ruta 02		3	10,910			9:30			0:36	5:48	1.94	0.65		1:31
C11101	C1 Renacimiento Ruta 01		3	13,593			10:08			0:13	4:59	2.75	0.92		0:56
C11102	C1 Renacimiento Ruta 02		4	11,230			9:16			0:22	4:23	2.52	0.84		0:51
C12301	C1 Mirador Norte Ruta 01		4	12,045						0:34	4:02	3.01	1.00		1:01
C12401	C1 Mirador Sur Ruta 01		4	9,910						0:24	5:14	1.92	0.64		0:49
C13001	C1 Bella Vista Ruta 01		8	8,614						0:24	4:41	1.87	0.62		1:37
C13002	C1 Bella Vista Ruta 02		5	10,882						0:28	5:34	1.94	0.65		1:05
C13003	C1 Bella Vista Ruta 03		4	13,388						0:23	5:32	2.40	0.80		1:38

- If you choose collection Indicators, [Summarize with detail of Trips] you will obtain a report of the indicators of each trip carried out as it is shown in the following window.

### Indicadores de Recoleccion Fecha Desde Sun, 18/06/06 Hasta Sun, 25/06/06

2006-06-21

RutaID	Fecha	FichaID	Viaje No	Peso Neto	Hora Inicio	Hora Fin	Tpo Total	Carga Inicio Hs	Carga Fin Hs	Tpo Base Ruta	Tpo Recoleccion	Ruta TonHs	Ruta Ton/Ayu /Hs	DFinal Entrad	Tpo Ruta DF
(Promedio)												2.3			
C11001	C1 Los Caicazgos Ruta 01		4	11,240			9:33			1:09	5:13	1.67	0.56		1:30
	19/06/06	2317	1	12,410	6:30	16:00	9:30	7:14	15:00	0:44	7:46	1.60	0.53	17:51	2:51
	21/06/06	2317	1	11,940	9:00	16:45	7:45	9:45	15:40	0:45	5:55	2.02	0.67	16:31	0:51
	23/06/06	2322	1		6:30	17:00	10:30	7:00	7:31	0:30	0:31				
	23/06/06	2317	1	9,370	6:30	17:00	10:30	9:10	15:50	2:40	6:40	1.41	0.47	16:39	0:49
C11002	C1 Los Caicazgos Ruta 02		3	10,910			9:30			0:36	5:48	1.94	0.65		1:31
	20/06/06	2317	1	11,200	7:00	16:30	9:30	7:52	12:36	0:52	4:44	2.37	0.79	14:00	1:24
	22/06/06	2317	1	11,800	6:15			6:45	14:15	0:30	7:30	1.57	0.52	15:16	1:01
24/06/06	2323	1	9,730	6:12			6:38	11:50	0:26	5:12	1.87	0.62	14:00	2:10	
C11101	C1 Renacimiento Ruta 01		3	13,593			10:08			0:13	4:59	2.75	0.92		0:56
	19/06/06	2369	1	11,800	6:30	16:30	10:00	6:50	10:46	0:20	3:56	3.00	1.00	12:00	1:14
	21/06/06	2369	1	14,780	6:31	17:00	10:29	6:48	12:17	0:17	5:29	2.70	0.90	13:11	0:54
	23/06/06	2369	1	14,200	6:49	16:45	9:56	6:53	12:25	0:04	5:32	2.57	0.86	13:06	0:41

#### h. Export data of the Route Sheet

All the collectors must send the data of the route sheet periodically to the ADN-EMUCD. To export the data firstly assign the export folder (See the section of folder assignment) and then in the main menu select [Reports] and then [Export Registrations] and the following window will appear.



Enter the interval of dates and then make click in the button [Excel] and the following verification window will appear.



If you are sure make click in the button [Yes] and the system will indicate the result of the export in the following window.



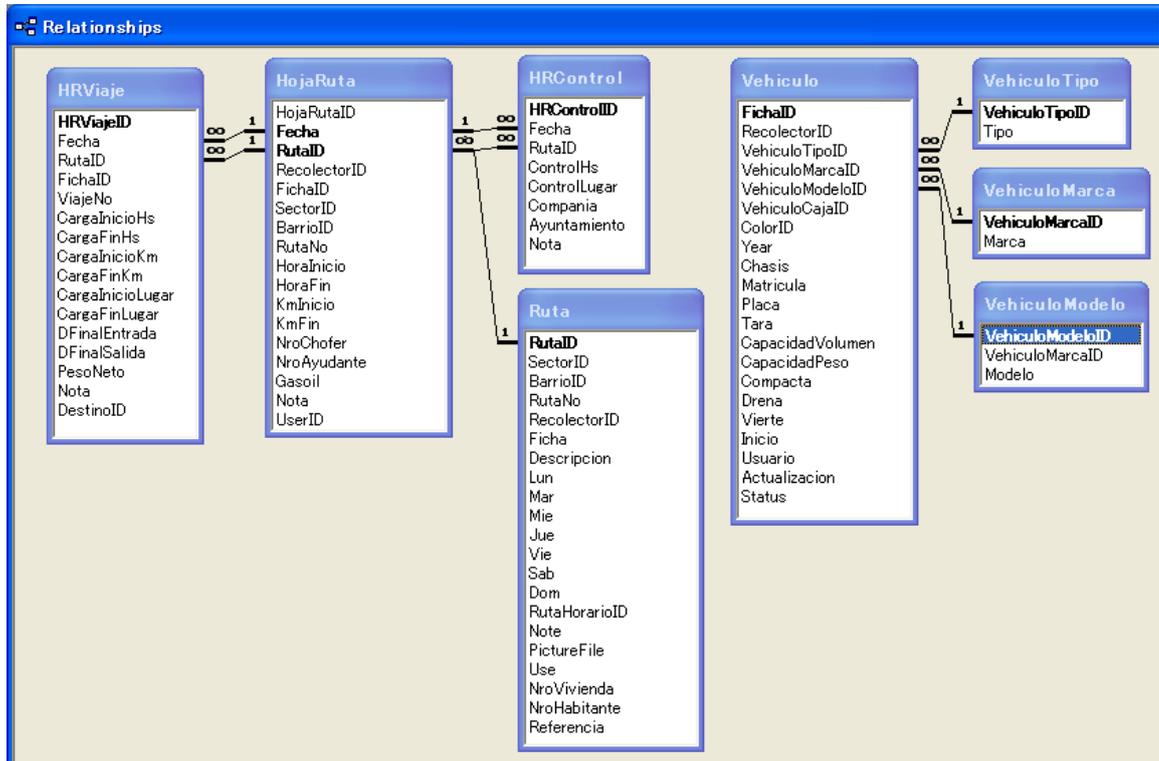
### h.1 Exit the System

To exit the system, in the main menu select [Exit].



i. Tables and Relationship of the DBRoutes

i.1 Relationship of the Tables



i.2 Tables

Neighborhood			
Table for all the neighborhoods of the National District			
Name	Type	Size	Note
BarrioID	Text	2	Neighborhood ID
Barrio	Text	50	Name of the Neighborhood
NoHabitantes	Double	8	Number of inhabitants according to the census 2002
NoViviendas	Double	8	Number of housings according to the census 2002
NoHogares	Double	8	Number of homes according to the census 2002
CircunscripcionID	Text	2	Electoral District ID that belongs to the neighborhood
CensoBarrioID	Text	10	Neighborhood ID del Barrio according to the census 2002

Color			
Table for colors			
Name	Type	Size	Property
ColorID	Long Integer	4	Color ID
Color	Text	20	Name of the color

Destiny			
Destiny table where the load is weight			
Name	Type	Size	Property
DestinoID	Long Integer	4	Destiny ID
Nombre	Text	25	Name of the Destiny
Direccion	Text	50	Address
Tel	Text	25	Telephone
Nota	Memo	-	

Duquesa Collector			
Table for collectors reference in Duquesas' DB			
Name	Type	Size	Property
DuquesaRecolectorID	Long Integer	4	Collector ID of Duquesas' DB
Nombre	Text	50	Name
ADNRecolectorID	Long Integer	4	Collector ID of Duquesas' DB of ADN

Duquesa TypeofWaste			
Table of type of wastes reference in Duquesas' DB			
Name	Type	Size	Property
DuquesaTipoBasuralID	Long Integer	4	Type of waste ID of Duquesas' DB
Nombre	Text	50	Name
ADNTipoBasuralID	Long Integer	4	Type of waste ID of Duquesas' DB of ADN

RouteSheet			
Table for all the route sheets			
Name	Type	Size	Property
HojaRutaID	Long Integer	4	Sequential ID of the route sheet
Fecha	Date/Time	8	
RutaID	Text	6	Collection Route ID
RecolectorID	Long Integer	4	Collector ID
FichaID	Text	15	Record of the vehicle
SectorID	Text	2	Route Sector
BarrioID	Text	2	Route neighborhood
RutaNo	Text	2	Route number
Horainicio	Date/Time	8	Exit hour or dispatch of the vehicle
HoraFin	Date/Time	8	Ending hour of the vehicle trip
Kminicio	Double	8	Initial kilometer
KmFin	Double	8	Ending kilometer
NroChofer	Long Integer	4	Number of drivers
NroAyudante	Long Integer	4	Number of helpers
Gasoil	Long Integer	4	Amount of gas consumed
Nota	Memo	-	
UserID	Long Integer	4	

HRControl			
Table for control or route supervision			
Name	Type	Size	Property
HRControlID	Long Integer	4	Sequential ID
Fecha	Date/Time	8	
RutaID	Text	6	Route ID
ControlHs	Date/Time	8	Supervision time
ControlLugar	Text	25	Place of the supervision
Compania	Yes/No	1	If the control was carried out by the collector
Ayuntamiento	Yes/No	1	If the control was carried out by the ADN
Nota	Memo	-	

HRTrips			
Trips carried out in the rout sheet			
Name	Type	Size	Property
HRViajeID	Long Integer	4	Sequential ID
Fecha	Date/Time	8	
RutaID	Text	6	Route ID
FichaID	Text	15	Record of the vehicle
ViajeNo	Long Integer	4	Amount of trips carried out in the route
CargaInicioHs	Date/Time	8	Hour in the beginning point of load
CargaFinHs	Date/Time	8	Hour in the ending point of load
CargaInicioKm	Long Integer	4	Kilometer in the beginning point of load
CargaFinKm	Long Integer	4	Kilometer in the ending point of load
CargaInicioLugar	Text	25	Place of the beginning point of load
CargaFinLugar	Text	25	Place of the ending point of load
DFinalEntrada	Date/Time	8	Entrance hour in the final disposal site
DfinalSalida	Date/Time	8	Exit hour in the final disposal site
PesoNeto	Long Integer	4	Net weight of the load
Nota	Memo	-	
DestinoID	Long Integer	4	Disposal destiny ID

Weight			
Weight table for Duquesas' DB			
Name	Type	Size	Property
NoTicket	Long Integer	4	Ticket No. emitted in Duquesa
Fecha	Date/Time	8	Entrance date
Destino	Long Integer	4	
Recolector	Long Integer	4	Collector ID
Ficha	Text	20	Record of the vehicle
Hora	Date/Time	8	Entrance hour
TipoBasura	Long Integer	4	Type of waste ID
Bruto	Double	8	Gross weight
Peso	Double	8	Net weight of the load
Porcentaje	Double	8	Percentage of the load
Descuento	Double	8	Discount of the load
Total	Double	8	Total of the load
RutaID	Text	6	Route ID

Collector			
Table for the collectors details			
Name	Type	Size	Property
RecolectorID	Long Integer	4	Collector ID
Nombre	Text	50	Collector name
Siglas	Text	15	
RNC	Text	25	
Funciones	Memo	-	
Direccion	Text	150	
Tel	Text	50	
URL	Anchor	-	
Logo	OLE Object	-	
Email	Text	50	
InicioContrato	Date/Time	8	
FinContrato	Date/Time	8	
Status	Yes/No	1	
Use	Yes/No	1	If its valid

Route		Route table	
Name	Type	Size	Property
RutaID	Text	6	Route ID
SectorID	Text	2	Sector of the Route
BarrioID	Text	2	Neighborhood of the route
RutaNo	Text	2	Route number
RecolectorID	Long Integer	4	ID of the collector in charge of the route
Ficha	Text	15	Record of the vehicle that collect the route
Descripcion	Text	50	Details of the route
Lun	Yes/No	1	Collection days
Mar	Yes/No	1	Collection days
Mie	Yes/No	1	Collection days
Jue	Yes/No	1	Collection days
Vie	Yes/No	1	Collection days
Sap	Yes/No	1	Collection days
Dom	Yes/No	1	Collection days
RutaHorarioID	Text	1	Collection route schedule
Note	Memo	-	
PictureFile	Text	50	Name of the maps file
Use	Yes/No	1	In use
NroVivienda	Long Integer	4	Number of housings in the route
NroHabitante	Long Integer	4	Number of inhabitants in the route
Referencia	Text	1	Route reference (residential, ICIS, market)

ScheduleRoute		Reference Table for the route collection schedule	
Name	Type	Size	Property
RutaHorarioID	Text	1	Route schedule ID
Horario	Text	15	Description of the schedule

ReferenceRoute		Reference Table for the type of route (Residential, ICIs, market)	
Name	Type	Size	Property
RutaReferencialID	Text	1	Route reference ID
Referencia	Text	20	Description of the reference

Sector		Table for the route sector (Electoral District)	
Name	Type	Size	Property
SectorID	Text	2	Sector ID
Descripcion	Text	50	Description of the sector

tbFolder		Reference Table for the maps folders and to export the files	
Name	Type	Size	Property
PictureFolderName	Text	100	Name of the folders for the maps
ExportFolderName	Text	100	Name of the folders to export files

Type of Waste		Table for the Type of Waste	
Name	Type	Size	Property
IdTipoBasura	Long Integer	4	Type of Waste ID
TipoBasura	Text	50	Description of the Type of Waste

Vehicle		Table for the registered vehicles	
Name	Type	Size	Property
FichaID	Text	15	Vehicle record
RecolectorID	Long Integer	4	Collector ID
VehiculoTipoID	Long Integer	4	Type of vehicle ID
VehiculoMarcaID	Long Integer	4	ID of the brand of the vehicle
VehiculoModeloID	Long Integer	4	ID of the model of the vehicle
VehiculoCajaID	Long Integer	4	ID of the brand of the load box
ColorID	Long Integer	4	Color ID
Year	Long Integer	4	Manufacturing year
Chasis	Text	50	Number of the vehicle chassis
Matricula	Text	50	Registration
Placa	Text	10	Plate number
Tara	Long Integer	4	Tare weight of the vehicle with the box
CapacidadVolumen	Long Integer	4	Load capacity in volume
CapacidadPeso	Long Integer	4	Load capacity in ton
Compacta	Yes/No	1	If they have compacting system
Drena	Yes/No	1	If they drain
Vierte	Yes/No	1	If it dump
Inicio	Date/Time	8	Registration date
Usuario	Long Integer	4	User ID
Actualizacion	Date/Time	8	Upgrade date
Status	Yes/No	1	If its in use

BoxVehicle		Reference Table of the type of box	
Name	Type	Size	Property
VehiculoCajaID	Long Integer	4	ID of the type of load box
Caja	Text	20	Description

BrandVehicle		Reference Table of the vehicle brand	
Name	Type	Size	Property
VehiculoMarcaID	Long Integer	4	
Marca	Text	20	Description

ModelVehicle		Reference Table of the vehicle model	
Name	Type	Size	Property
VehiculoModeloID	Long Integer	4	ID of the model vehicle
VehiculoMarcaID	Long Integer	4	ID of the vehicle brand
Modelo	Text	25	Description

VehicleType		Reference Table of the type of vehicle	
Name	Type	Size	Property
VehiculoTipoID	Long Integer	4	Type of vehicle ID
Tipo	Text	30	Description

# Annex U

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*Weighbridge Database System  
Users Manual*

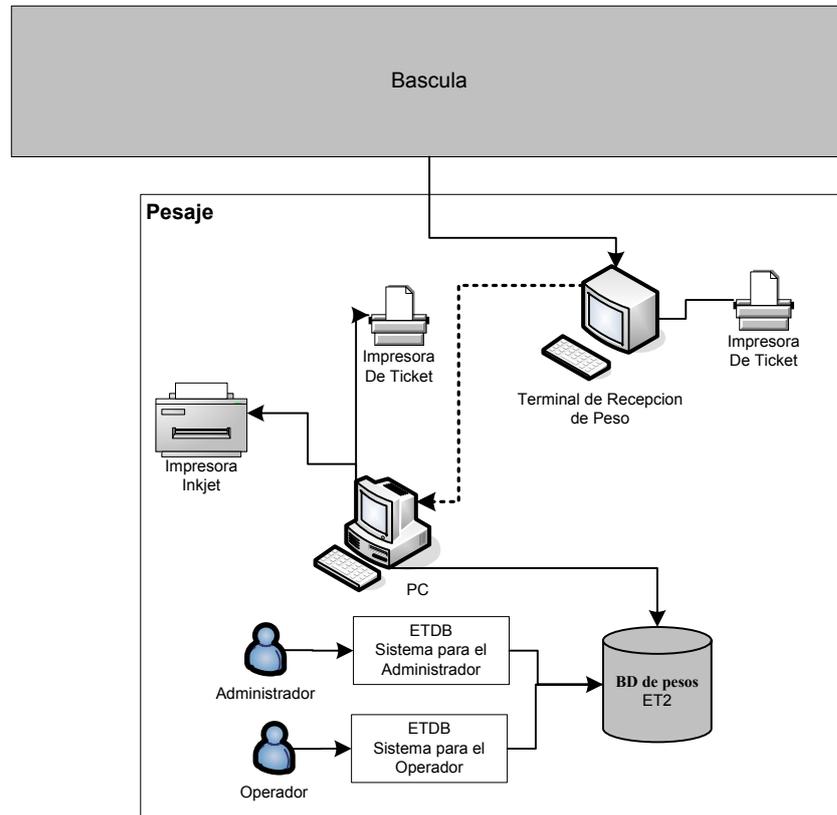
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## U Weighbridge Database System Users Manual

### U.1 Introduction

The weighbridge database system for the transfer station 2 (TS2), has been developed with the purpose of speeding up the registrations of the vehicles that enter in the TS2. The system has been developed with Microsoft Access because is a system very used at the present time and it is of easy maintenance. The general outline is presented in the following figure.



The system is divided in 2 parts, one for the administrator and the other one for the operator. The administrator will be in charge of registering the vehicles that will enter the TS2, assign the record corresponding to the vehicle and register the Tare Weight. The operator will be the one in charge of registering all the entrances of the vehicles registered previously by the administrator.

### U.2 Installation

Firstly the program "MTC21 Connections" that is a program developed by the weighbridge supplier Mettler Toledo shall be installed. This program is the interface so that the PC can read the data of the Weight Reception Terminal of the Weighbridge. For the details of the installation see the installation manual of the "MTC21 Connections."

To use the TS2DB system the following files shall be installed in a folder of the PC, connected to the Weight Reception Terminal.

Name of the File	Description
ETDB_ADN.mdb	Is the file of DB that will contain all the registrations of the DB
ETDBSysUser_ADN.mdb	The DB system for the operator.

ETDBSysAdm_ADN.mdb	The DB system for the Administrator
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Once the files are copied in the designated folder, it will be linked the DB files. See the section of linking charts in administrator and operator's system.

### U.3 ET2BD – System for the Administrator

#### a. Beginning

To begin the system, execute the file "ETDBSysAdm\_ADN.mdb", from the folder where it was installed. The following window of password of the DB will appear.



Enter the corresponding password and make click in [OK], and the following window of users will appear.



Enter the user's Name and its corresponding password, and make click in [Login] and the main menu of the system will appear.



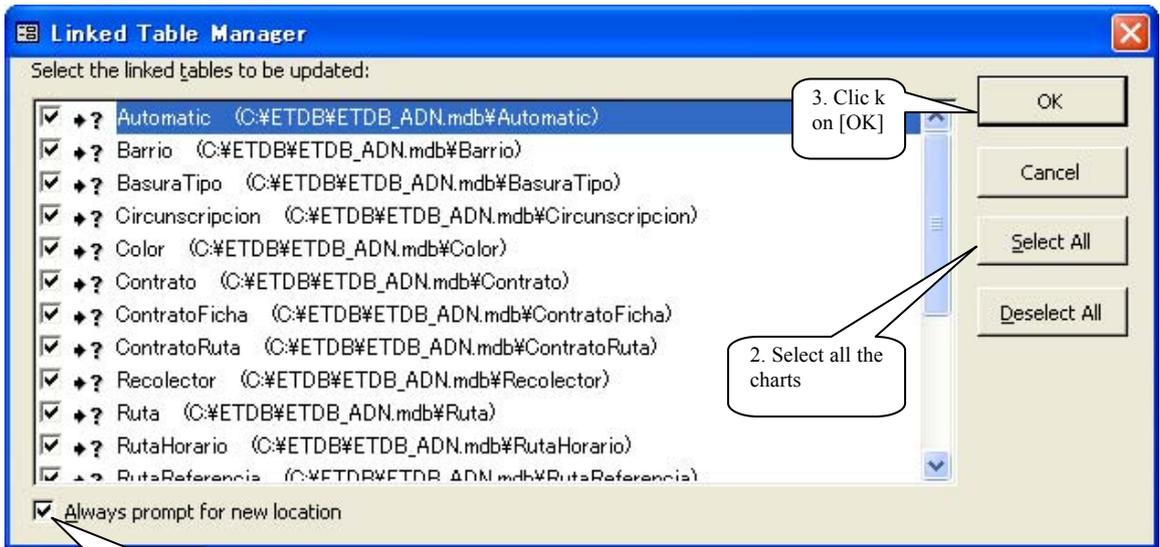
#### b. Link Charts and Compact the DB

##### b.1 Link charts

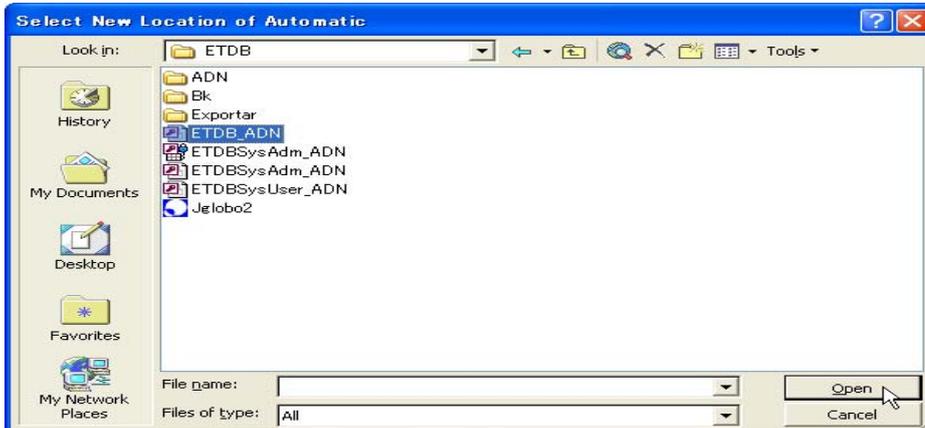
The system "ETDBSysAdm\_ADN.mdb" will be linked with the DB "ETDB\_ADN.mdb", so that it can accede to the data of the DB, for this follow the following steps.



In the main menu select [Linked Table Manager], and the following window will appear.



Follow the steps and the following window will appear where the file should be located, "ETDB\_ADN.mdb."

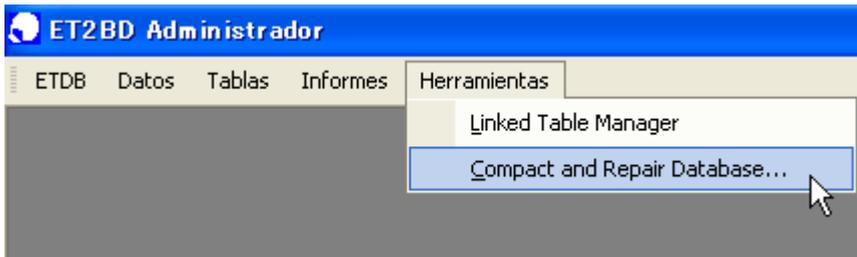


Make click in [Open], and all the charts will be linked and the following window of information will appear and then you would be able to accede to the data of the BD and use the system.



### b.2 Compact the DB

To give maintenance to the DB, the DB should be compacted periodically.

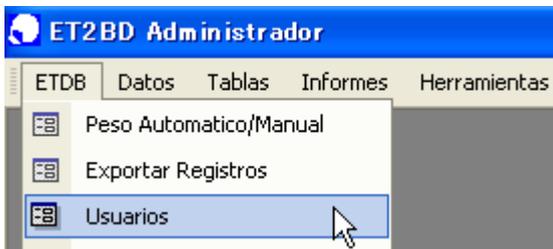


In the main menu select [Compact and Repair Database], this will compact and will give general maintenance to the DB.

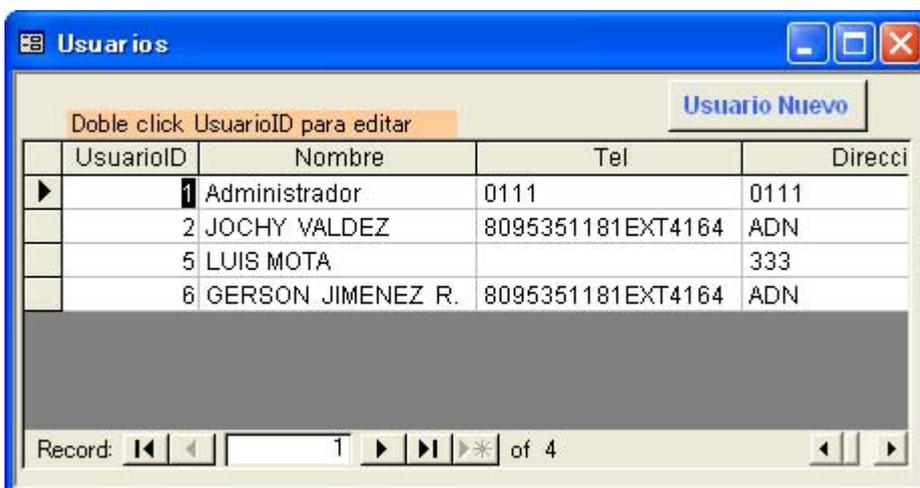
### c. Use of the Administrator System BDET2

#### c.1 Users of the System

To add or edit the data of the users of the system, in the main menu [ETDB], select [Users].



The following window will appear.



### c.1.1 Add a new user

To add a new user make click in the button [New User] and the following window will appear.

Enter the new user's data and then make click in the record button and the new user's data will be recorded. If the new user will be the administrator of the system make click in [Administrator], and if the user will be operator leave it in blank.

### c.1.2 Edit the data of the registered users

In the main window of the users make double click in the [UsuarioID], and the following window will appear with the selected user's data.

Make the corresponding modifications and make click in the button [Record], to keep the changes. If you want to modify the user's password make click in the button [Change Password].

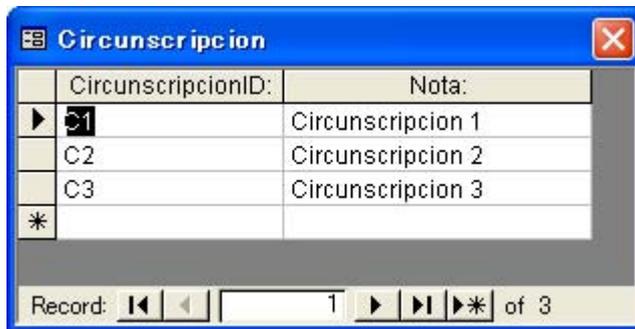
### c.2 System charts

The system will use several data that will be stored in the system charts; the administrator will add the data of the charts and made the corresponding upgrades. To accede to the system, select in the main menu [Charts].



### c.2.1 Electoral District

In this chart the data of the district will be stored, select in the main menu [Charts] and then [District] and the following window will appear.



### c.2.2 Neighborhoods

In this chart will be stored the data of the different neighborhoods inside the district, select in the main menu [Charts] and [Neighborhoods] and the following window will appear.



The screenshot shows a window titled "Barrios" with a table containing 26 rows of neighborhood data. The columns are BarrioID, Circunscripcion, Barrio, NoHabitantes, and NoVivi. The first row is selected, showing BarrioID 01, Circunscripcion C2, Barrio Los Peralejos, NoHabitantes 6032, and NoVivi (partially visible).

BarrioID:	Circunscripcion:	Barrio:	NoHabitantes:	NoVivi
01	C2	Los Peralejos	6032	
02	C2	Palma Real	32506	
03	C2	Arroyo Manzano	3218	
03	C2	San Diego	37	
04	C2	Altos de Arroyo Hondo	9742	
05	C2	Los Ríos	37317	
06	C1	Costa Verde	3464	
07	C1	Honduras del Oeste	8896	
08	C1	Honduras del Norte	9795	
09	C1	Paseo De Los Indios	279	
10	C1	Los Cacicazgos	7445	
11	C1	Renacimiento	9656	
12	C1	Los Restauradores	13723	
13	C1	San Gerónimo	12443	
14	C2	Los Jardines	15374	
16	C2	Nuevo Arroyo Hondo	17104	
17	C2	Cerros De Arroyo Hondo	1357	
18	C2	Viejo Arroyo Hondo	21372	
19	C1	Paraíso	4020	
20	C1	Julieta	15448	
21	C1	Los Prados	10439	
22	C1	El Millón	8407	
23	C1	Mirador Norte	5581	
24	C1	Mirador Sur	3860	
25	C1	Buenos Aires	24587	
26	C1	Miramar	7773	

### c.2.3 Types of Vehicle

In this chart will be stored the different type of vehicles, select in the main menu [Charts] and then [Type of Vehicle] and the following window will appear.



The screenshot shows a window titled "Tipo de Vehiculo" with a list of 9 vehicle types. The first item, "1 Compactador", is selected. The list includes various types such as "Volteo", "Volqueta", "Roll on - Roll off", "Araña", "Cama larga c/barandilla", "Cama larga", "Cama corta c/barandilla", and "Cama corta".

Vehicul	Tipo:
1	Compactador
2	Volteo
3	Volqueta
4	Roll on - Roll off
5	Araña
6	Cama larga c/barandilla
7	Cama larga
8	Cama corta c/barandilla
9	Cama corta

### c.2.4 Brands of the Vehicle

In this chart will be stored the different brands of the vehicles, select in the main menu [Charts] and then [Brand of Vehicle] and the following window will appear.

The screenshot shows a window titled "Marca de Vehiculos" with a table containing the following data:

VehiculoMarcaID:	Marca:
1	Renault
2	Mitsubishi
3	Toyota
4	Chevrolet
5	Mack
6	Crane Carrier
7	Daihatsu
8	Hino
9	Iveco
10	Kia
11	Mercedes Benz

Record: 1 of 16

### c.2.5 Model of the Vehicle

In this chart will be stored the different models of the vehicles, select in the main menu [Charts] and [Model of Vehicle] and the following window will appear.

The screenshot shows a window titled "Modelo de Vehiculo" with a table containing the following data:

VehiculoModeloID:	Marca:	Modelo:
1	Mitsubishi	Canter
2	Chevrolet	Kodiak
3	Mack	MR 690S
4	Mack	MR 686S
5	Crane Carrie	Dump Truck
6	Daihatsu	Hijet
7	Toyota	Dyna
0	Renault	

Record: 1 of 7

### c.2.6 Color

In this chart will be stored the different vehicle colors, select in the main menu [Charts] and then [Color] and the following window will appear.

The screenshot shows a window titled "Color" with a table containing the following data:

ColorID:	Color:
1	Amarillo
2	Azul
3	Blanco
4	Gris
5	Morado
6	Negro
7	Rojo
8	Verde
0	

Record: 1 of 8

### c.3 Registration of Vehicles

So that a vehicle can be weighed by the weighbridge of the transfer station it will be registered, the registrations of the vehicles can only be done by the system administrator. The collector that wants to register its vehicle should carry out all the corresponding steps and then send to the transfer station to register the data of the vehicle and the Tare Weight.

For the registration and maintenance of the data of the vehicles, select in the main menu [Data] and [Vehicle].



The following window will appear where will be able to register new vehicles or edit the data of the registered vehicles.

Ficha:	Empresa:	Tipo:	Marca:	Modelo:	Tara:	Color:	Año:
E00987	Particular	Volqueta	Toyota	Dyna	0		
ET001	FIDEL A FELIZ	Volteo	Daihatsu				1998
ET002	SALVADOR BERROA	Volteo	Nang Ying		3130		1998
ET003	ANA V. MONTE DE OCA	Volteo	Daihatsu		2660		2002
ET004	ELIGIO HERNANDEZ	Volteo	Daihatsu		2600		
ET005	ARTURO SANTANA	Volteo	Daihatsu		2860		
ET006	ANGEL SEPURVEDA	Cama larga	Daihatsu		2730		
ET007	MANUEL ANT. PEÑA	Volteo	Daihatsu		2620		
ET008	ADALBERTO MARTINEZ	Volteo	Daihatsu		2770		
ET009	FAVIO VALDEZ						
ET010	MOISES DE LA MOTA						

#### c.3.1 Register a new vehicle

To register a new vehicle, make click in the button [New Vehicle], and the following window will appear.

Registro de Vehiculo Nuevo

Ficha:

Recolector:  Inicio:

Tipo:   Compacta  Drena  Vierte

Marca:  Modelo:

Matrícula:  Color:

Placa:  Chasis:  Año:

Peso Tara:  Volumen(m3)  Peso Max (ton):

Enter the record number that will be assigned to the vehicle, and then all the data of the vehicle.

To register the tare weight of the vehicle make click in [Upgrade Tare Weight] and the following window will appear.

The Tare Weight can be register in 2 forms, automatic or manual. Automatic is when the Terminal of the weighbridge is connected to the PC of the system and the weight of the weighbridge can be read automatically. And in the manual one the Tare Weight can be entered. The manual form will only be used when the connection of the Terminal of the weighbridge has a problem and the weight data of the weighbridge cannot be read automatically.

Make click in the button [Record] to keep the data of the Tare Weight.

### c.3.2 Edit the data of the registered vehicles

In the main window of [Vehicles], make double click in the record of the vehicle and the following window will appear where the data of the registered vehicles can be modified.

#### c.4 Collectors

All the collectors that will enter to the transfer station will be registered, to register the collectors, in the main menu select [Data] and then [Collectors] and the following window will appear.



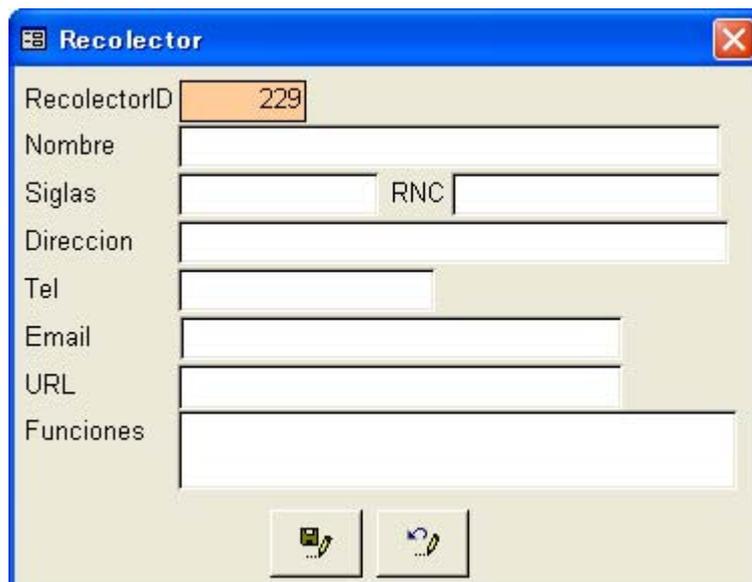
The screenshot shows a window titled "Lista de Recolectores" with a search bar and a "Nuevo" button. Below the search bar is a table with the following data:

IDRecolector:	Nombre:	Siglas:	RNC:
1	Ayuntamiento del Distrito Nacion	ADN	
2	Empresas privadas del D.N.	ADN Privado	
3	ADN Services	ADN Services	
4	ADN Transfer	ADN Transfer	
5	Limpieza y Aseo Urbano	LAU	
6	Sertex	Sertex	
7	Disposición Sanitaria Capital	DSC	112212222
8	Klinetec	Klinetec	
9	Soinca	Soinca	
10	ADN Aseo Urbano	ADN AU	
11	test	test	
100	Particular		
101	ABIGAIL CABRERA		
102	ADALBERTO MARTINEZ		
103	ADELKA NUÑEZ		
104	ADOLFO CEDEÑO		
105	ADRIANA BATISTA M.		

At the bottom of the window, it shows "Record: 1 of 140".

##### c.4.1 New collectors

To add a new collector, make click in the button [New], and the following window will appear.



The screenshot shows a window titled "Recolector" with the following fields:

- RecolectorID: 229
- Nombre: [Empty text box]
- Siglas: [Empty text box]
- RNC: [Empty text box]
- Direccion: [Empty text box]
- Tel: [Empty text box]
- Email: [Empty text box]
- URL: [Empty text box]
- Funciones: [Empty text box]

At the bottom of the window, there are two buttons: a "Record" button (represented by a floppy disk icon) and a "Refresh" button (represented by a circular arrow icon).

Enter all the data of the collectors and click in the button [Record] to store the data of the collector.

**c.4.2 Edit the data of the collector**

In the main window of the [Collector] make double click in the [IDRecolector], and the following window will appear where you will be able to upgrade the data of the collector.



**c.5 Type of waste**

The different types of waste that enter in the transfer station will registered, to register the types of waste, in the main menu select [Data] and then [Type of Waste].



The following screen will appear where you will be able to add and edit the types of waste.



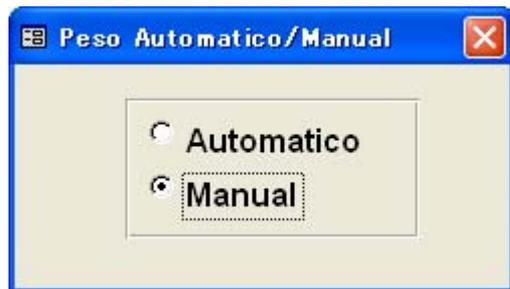
To add a new code of waste in [BasuraTipoID] and then enter the detail and if it will be used by the system make click in [Uses].

To modify it simply modifies the detail of the garbage.

### c.6 Automatic and Manual Weight

The registrations of the weight can be carried out in 2 forms automatic and manual. The automatic one is when the Terminal of the weighbridge is connected to the PC with the system and the reading of the data of the Weight works correctly. But in case that the weighbridge is working and the connection of the Terminal of the weighbridge is connected to the PC, have some problem the data of weight could be loaded manually. Only the administrator of the system will be able to modify this option.

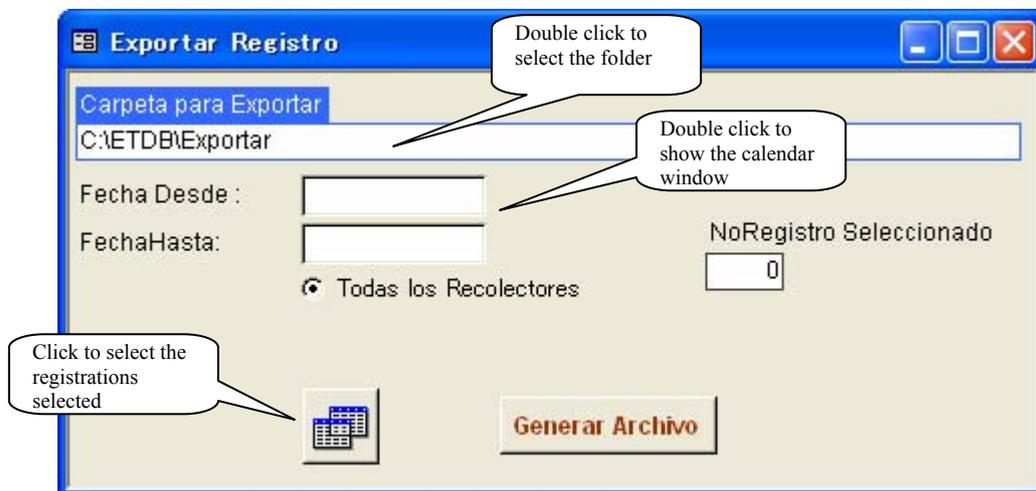
To modify the automatic and manual weight, in the main menu select [ETDB] and then [Automatico/Manual Weight] and the following window will appear.



Select the option of automatic or manual and then close the window.

### c.7 Export Registration

This process exports the registrations from the DB to the Microsoft Excel format, in the main menu select [ETDB] and then [Export Registration] and the following window will appear where the export options can be able chosen.



Firstly select the folder where the registrations will be exported, then choose the date from, until and if you want all the collectors make click in [All the collectors] if not live it in blank and a list chart will appear where you can choose the collector. Make click in the button [Generate File] and all the registrations selected according to the approaches will be exported in the selected portfolio.

### c.8 Reports

To generate reports, in the main menu select [Informs] and the following window will appear.



Select the date wanted for the report, then choose all the collectors or you can choose a specific collector. Then choose the report type and make click in [Previous View].

### c.8.1 Reports by Ticket No.

This report will show all the vehicles that entered in the TS according to the ticket no, with its respective weight and the general total.

*Informe diario por No. Ticket*    *Fecha*    2006/07/01

Ticket	Ficha	Recolector	Ruta	TipoBasura	Hora	PB	PT	PI
						Peso(Kg)		
2554	ET084	DOMINGO RODRIGUEZ		Basura	7:15:34	4,780	3,620	1,160
2555	ET119	ECO REBAPU U. E.		Basura	9:02:01	5,160	2,950	2,210
2556	ET118	ECO REBAPU U. E.		Basura	9:34:22	5,160	3,050	2,110
2557	ET083	ECO SAGUASIGUA		Basura	9:53:13	4,940	2,990	1,950
2558	ET091	FRANCISCO G. SANCHEZ		Basura	9:55:55	5,290	3,010	2,280
2559	ET081	ECO SAGUASIGUA		Basura	10:20:56	5,280	2,870	2,410
2560	ET076	ESCOBA		Basura	10:24:34	5,310	2,810	2,500
2561	ET078	ESCOBA		Basura	10:30:10	4,640	2,870	1,770
2562	ET092	GERMAN VENTURA		Basura	10:39:23	5,500	3,010	2,490

### c.8.2 Reports by Record No.

This report will show the list of data by the record no. of the vehicles that entered in the TS.

*Informe por Ficha de Vehiculo*    *Fecha:*    2006/07/01

Ficha	Recolector	Marca	Tipo	Viajes	Total	Maximo	Minimo	Promedio	
					Peso(ton)				
ET074	ESASULSA	Daihatsu	Volteo	2	6.37	3.23	3.14	3.19	
ET076	ESCOBA	Daihatsu	Volteo	2	4.60	2.90	2.10	2.30	
ET078	ESCOBA	Daihatsu	Volteo	2	3.21	1.77	1.44	1.61	
ET080	ECOSAGUASIGUA	Daihatsu	Volteo	2	4.79	2.87	1.92	2.40	
ET081	ECOSAGUASIGUA	Daihatsu	Volteo	2	4.68	2.41	2.27	2.34	
ET083	ECOSAGUASIGUA	Daihatsu	Volteo	2	4.23	2.28	1.95	2.12	
ET084	DOMINGO RODRIGUEZ			2	3.70	2.54	1.16	1.85	
ET091	FRANCISCO G. SANCHEZ	Daihatsu	Volteo	1	2.28	2.28	2.28	2.28	
ET092	GERMAN VENTURA	Daihatsu	Volteo	1	2.49	2.49	2.49	2.49	
ET097	ALBERTO HAWKING	Mitsubishi	Compactador	1	2.10	2.10	2.10	2.10	
ET118	ECOREBAPU U. E.	Daihatsu	Volteo	2	4.17	2.11	2.06	2.09	
ET119	ECOREBAPU U. E.	Daihatsu	Volteo	2	4.74	2.53	2.21	2.37	
<b>Totales(ton)</b>					<b>21</b>	<b>47.36</b>	<b>3.23</b>	<b>1.16</b>	<b>2.26</b>

### c.9 Exit the System

To exit the system you can choose 2 options, or finish the session or leave the system completely. In the main menu select [Close Session] or [Exit].



## U.4 ET2BD – System for the Operator

### a. Beginning

To begin the system of the operator, execute the file "ETDBUser\_ADN.mdb", from the folder where it was installed. The following window of session beginning will appear.



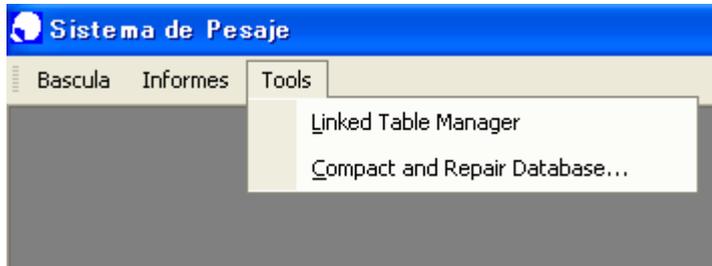
Enter the user's Name and their corresponding password, and make click in [Login] and the main menu of the system will appear.



**b. Link charts and compact DB**

**b.1 Link charts**

As the weight of the administrator, the weight system of the operator should be linked to the charts with the file "ETDB\_ADN", for this in the main menu choose [Tools] and then [Linked Table Manager] and follow the same steps of the weight system of the administrator.



**b.2 Compact the DB**

To give maintenance to the DB, the DB should be compacted periodically, for this in the main menu select [Tools] and then [Compact and Repair Database].

**b.3 Use of the ET2BD Operator System**

**b.4 Registration of the vehicles entrances**

To register the entrance of the vehicle with their respective weight, in the main menu it select [Weighbridge] and then [Entrance], and the following window will appear.

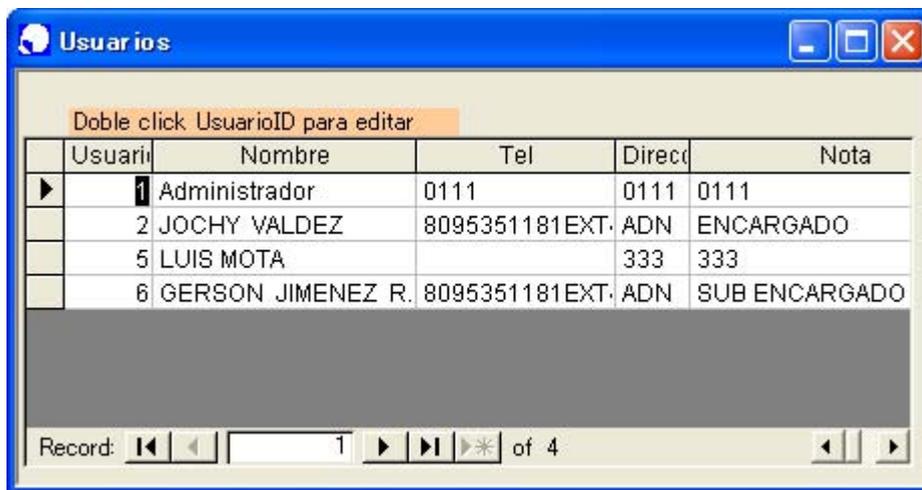
PesoBruto(kg)	PesoVehiculo(kg)	PesoNeto(kg)
0	2,850	0

Ficha: ET100  
 Marca/Modelo/Tipo: Daihatsu Volteo  
 Recolector: JOSE LUIS LA PAZ  
 RutaID:   
 Tipo Basura:   
 Fecha:   
 Hora:   
 OK Cancelar  
 UserID: Administrador Status: A **Peso Automatico**

- Enter the record of the vehicle, if the vehicle is registered the system will show the corresponding data of the vehicle, if the record of the vehicle is not registered the system will indicate that the vehicle is not registered, register the vehicle first.
- Enter the code of the route of where the waste comes.
- Enter the type of waste.
- Verify that the weight of the weighbridge is stable and then make click in [OK], if not you can make click in [Cancel] and cancel the entrance.
- Verify that the ticket printer is on and prepared and then print the ticket.
- Once the ticket is printed follow the same steps with the next vehicle.

### b.5 Users

With the system of the operator the users will be able to modify their data and their respective password but they won't be able to add new users. For this select in the main menu [Weighbridge] and then [Users] and the following window will appear.



To modify the data make double click in [UsuarioID] and then the following window will appear where the user's data can be modified.



### b.6 Reports

As the weight system of the administrator, 2 types of reports can be generated, by Ticket No. and by Records of the vehicles. Follow the same steps of the weight system of the

administrator.

### b.7 Reprint of the ticket

In the case that is required to reprint a registered ticket previously, in the main menu select [Reports] and then [Reprint Ticket].

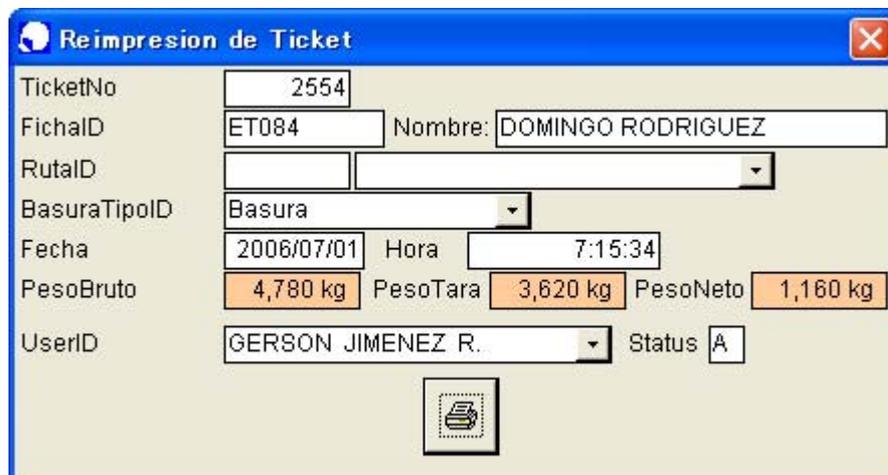


The following window will appear.



Enter the date and the vehicle Record No. that you want to reprint, and then make click in the button [Search], if the respective data exist will appear in the window if not it means that the ticket of the date and record selected don't exist.

To reprint the ticket, make double click in [TicketNo] and the following window will appear.



Verify that the data and that the printer are on and then make click in the button [Print] and the ticket will be reprinted.

### b.8 Exit the System

To exit the system you can choose 2 options, or finish the session or leave the system completely. In the main menu select [Close Session] or [Exit].

