

**Reference to the call for tenders:  
Life+**

**Owner**  
Heves County

**Consulting engineer**

**Alternative solution proposed by :**  
Mael test validation



# 1. Summary

2.	General information about the software.....	3
2.1.	SEVE origin.....	3
2.2.	Project cycle.....	3
2.3.	The database.....	3
2.4.	Available indicators.....	3
3.	Overview of Solutions.....	5
4.	Results table.....	6
4.1.	Indicator: Energy "process" in Mega-Joule (MJ).....	6
4.2.	Indicator: GHG emissions in tonnes CO2 equivalent.....	7
4.3.	Indicator: Resource conservation in tonnes.....	8
4.4.	Indicator: Tonne.kilometer (t.km).....	9
4.5.	Additional information: Energy equivalents.....	10
5.	Detailed description of solutions.....	11
5.1.	try test.....	11
5.1.1	Base course (AC 32 TS).....	11
5.1.2	Binding course (SMA 16 BS).....	11
5.1.3	Wearing course (SMA 8 S).....	11
5.2.	Environmental solution.....	11
5.2.1	Base course (AC 32 TS).....	11
5.2.2	Binding course (SMA 16 BS).....	12
5.2.3	Wearing course (SMA 8 S).....	12
6.	List of asphalt formulas used.....	13
6.1.	Base.....	13
6.2.	AC22.....	13
6.3.	AC11.....	13
6.4.	Base RAP cold.....	13
6.5.	AC22 RAP low.....	14
6.6.	AC11 RAP low.....	14

## 2. General information about the software

### 2.1. SEVE origin

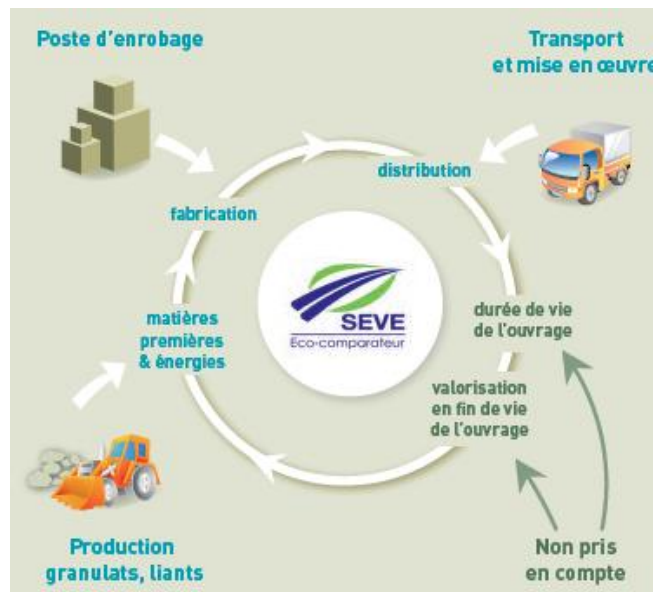
In order to be in a position to bid with a new set of ecologically-minded evaluation criteria, the members of the French Road Builders' Federation (USIRF) have developed a new eco-comparing software tool called SEVE, designed for use by the industry as a whole. In short, SEVE is designed for use during the bidding process to compare the impact of environmentally-friendly technical alternatives with initial specifications. SEVE compares two technical solutions from the analysis of partial life cycle (LCA) of each of them, in the manner defined below. The solution is called the basis one as described in the tender and (or) solutions (s) variant (s).



### 2.2. Project cycle

LCA studies the environmental aspects and potential impacts throughout the life of a product including raw materials, production, transportation, use and disposal. The general principle is defined by the standard NF EN ISO 14040: 2006 [5] and EN ISO 14044: 2006 [6] and the list of environmental indicators included in part of the standard NF P01-010. Companies during the tender can not commit to the frequency of maintenance sequences, so it was decided to work on stroke limited to the partial delivery of the project. It is important to remember:

- The proposed alternatives must offer the same level of service on the same period as the basic solution;
- The tool is an eco-SEVE comparator for comparing two or more solutions as part of the response to tender. It is never possible to use this tool to calculate the environmental impacts of a project so absolute and so it is not adapted to carry out an assessment of greenhouse gas emissions (Carbon Assessment @ OMEGA TP ...).



### 2.3. The database

The comparison is based on four indicators: the tons of natural materials used in the project, the tons of recycled asphalt (RAP) aggregates in asphalt, energy "process" used by MJ and GHG emissions (in tons CO2 equivalent). The software SEVE is associated with a database of materials, devices, products, ... common to all users and a basic formula of coated specific asphalt plants (means of production of bituminous materials). SEVE can calculate the environmental indicators project based on the cost of specific environmental resources present in these databases. added to the formula:

- Distance and type of transportation of raw materials to the job;
- Type of fuel;
- Tonnage implemented
- % of water content
- Temperature of the asphalt;
- Percentage of RAP added to the formula;

### 2.4. Available indicators



The comparison is performed on 7 quantitative indicators and 2 declarative indicators have been selected under the voluntary agreement signed with the Ministry of Ecology. (It is important to note that this does not reflect the diversity of potential impacts of projects on the environment) Quantitative indicators: They are composed of an impact indicator defined in the NF EN 15 804 standard and corresponding to global warming (t eq CO2) and 6 other flow indicators:

- 1 flow indicator corresponding to the energy " Process " consumed (MJ)
- 5 indicators of flows specific to the public works sector corresponding to: o tonne.kilometer o preservation of the resource decomposed into 4 indicators: - Consumption of natural aggregates (t) Consumption of aggregates d (T) - Consumption of cuttings originating and reused within the project (t) - Consumption of recycled materials (t)
- Declarative indicators: o Water management o Biodiversity management

**The "process energy" indicator (in MJ):**

This is the primary energy process that is the sum of non-renewable energy used in the production of the work. A "primary", the energy input in order to have energy at the end customer. The term "process", the energy actually consumed: it does not recognize the energy field

**The Indicator "GHG emissions" (ton CO2 equivalent) :**

This indicator reflects the impact of climate change. We sum the flux corresponding to the emission of greenhouse gases in the air for all the materials used but also all operations required for the project and all transportation. This indicator takes into account the emissions of CO2, CH4 and N2O missions in CO2 equivalents

**The resource preservation indicator (t)**

• Consumption of natural aggregates (t): This indicator counts the tons of natural aggregates consumed on the construction site, which makes it possible to measure the quantities of natural aggregates saved • Consumption of aggregates of asphalt (T): This indicator records the quantities of re-used asphalt aggregates in the formulation of hot, warm and cold bituminous materials, thus highlighting the true valuation of aggregates and bitumen • Consumption of cuttings Reused in the project (t): This indicator records the quantities of cuttings produced and reused in the project, which highlights the savings in natural aggregates to avoid the permanent disposal of these materials. Recycled (t): This indicator records the tons of recycled materials consumed on site. Of the indicator " cuttings originating and reused within the project " because only recycled materials outside the project are mentioned, with the exception of " aggregates of asphalt ".

**The indicator "Tonne kilometer" (t.km)**

This indicator is a measurement unit for a quantity of transport representing the transportation of one ton over one kilometer and is given in "ton.km". This indicator only applies to road transport trucks taking into account upstream and downstream distances (supply of raw materials + delivery of materials on worksite).

**The water management indicator (4 levels of commitment):**

This indicator reflects the level of commitment of the company in its offer to conserve water resources and to enhance the capacity of companies to use recycled water on projects (water from temporary or final drainage basins And process water).

**The biodiversity conservation indicator (4 levels of commitment):**

At work, companies strive to preserve biodiversity and to preserve the functionality of both terrestrial and aquatic natural environments. The indicator Biodiversity reflects the level of commitment of the company in its offer to preserve this biodiversity.



### 3. Overview of Solutions

try test	Environmental solution
Roads and Networks	Roads and Networks
Base course (AC 32 TS)	Base course (AC 32 TS)
Binding course (SMA 16 BS)	Binding course (SMA 16 BS)
Wearing course (SMA 8 S)	Wearing course (SMA 8 S)

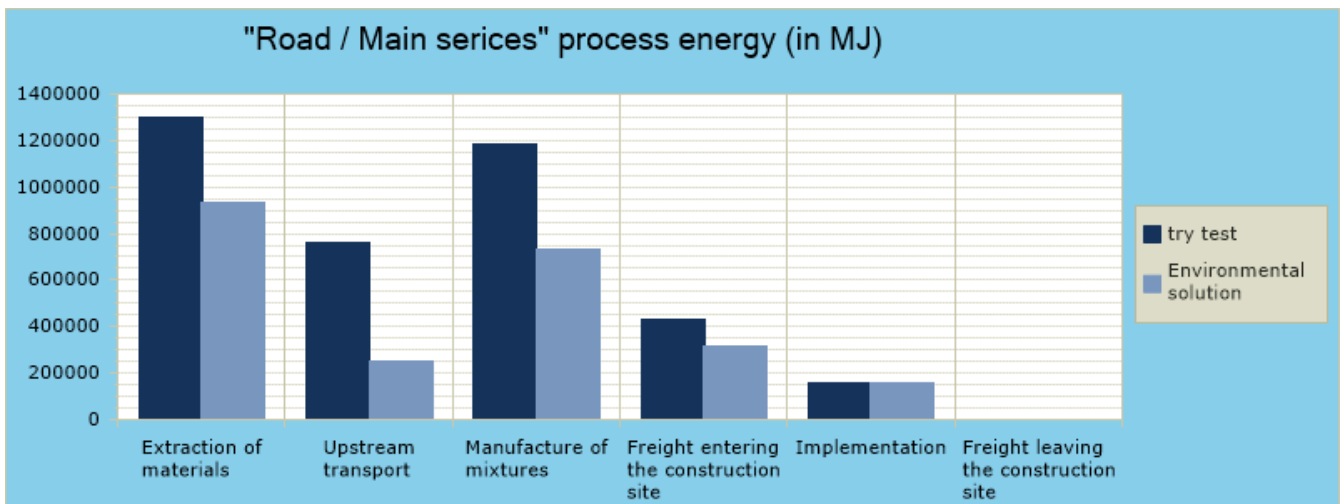
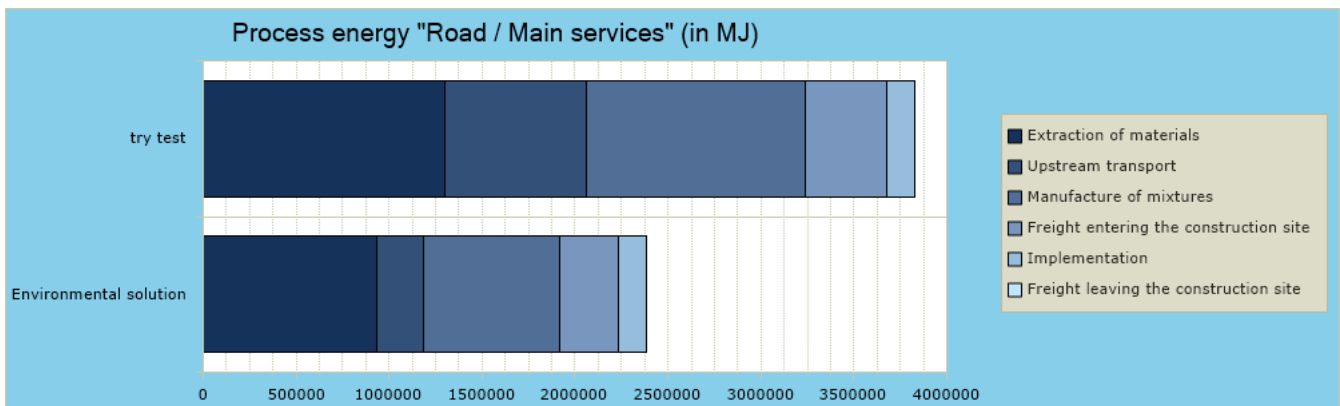
## 4. Results table

### 4.1. Indicator: Energy "process" in Mega-Joule (MJ)

The "process energy" indicator in MJ:

This is the primary process energy which represents the sum of the renewable and non-renewable energies used during the construction of the structure. "Primary" means the energy required upstream to dispose of energy at the end customer. The term "process" is understood to mean the energy actually consumed: therefore, energy energy is not counted.


		Process energy (in MJ)							Comparison / Base
		Materials extraction	Upstream transportation	Manufacture of mixtures	Freight entering the site	Implementati on	Freight leaving the site	Total	
try test	Roads and Networks	1 300 324	758 164	1 183 421	432 272	155 200	0	<b>3 829 381</b>	
Environmental solution	Roads and Networks	931 437	254 351	733 815	312 900	155 200	0	<b>2 387 703</b>	<b>-37,6 %</b>

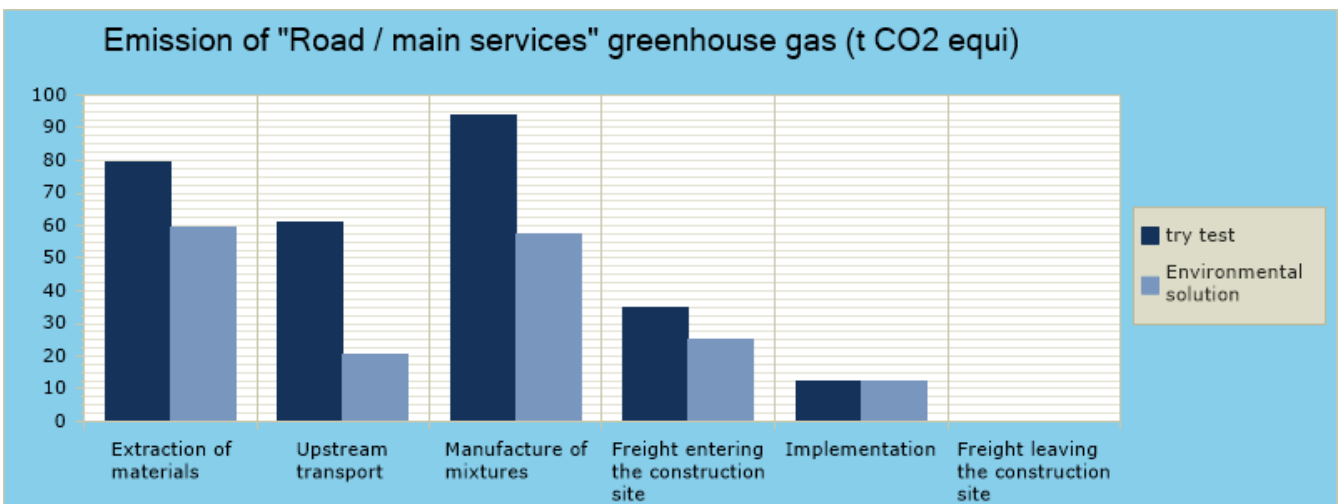
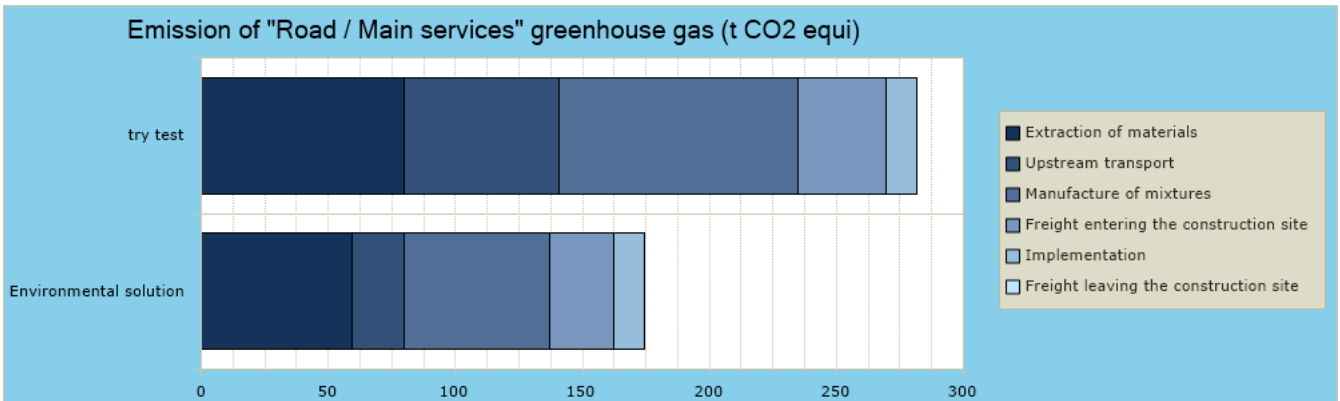


## 4.2. Indicator: GHG emissions in tonnes CO2 equivalent

The Indicator "GHG emissions" (ton CO2 equivalent) :

This indicator reports on the impact on climate change. The fluxes corresponding to greenhouse gas emissions into the air are summed for all the materials used but also all the operations required for the project and all transports. This indicator takes into account CO2, CH4 and N2O emissions converted into CO2 equivalent.


		Emissions of greenhouse gases (t CO2 eq)							Comparison / Base
		Materials extraction	Upstream transportation	Manufacture of mixtures	Freight entering the site	Implementation	Freight leaving the site	Total	
try test	Roads and Networks	79,7	61,1	93,8	34,8	12,2	0,0	<b>281,6</b>	
Environmental solution	Roads and Networks	59,4	20,5	57,4	25,2	12,2	0,0	<b>174,7</b>	<b>-38,0 %</b>

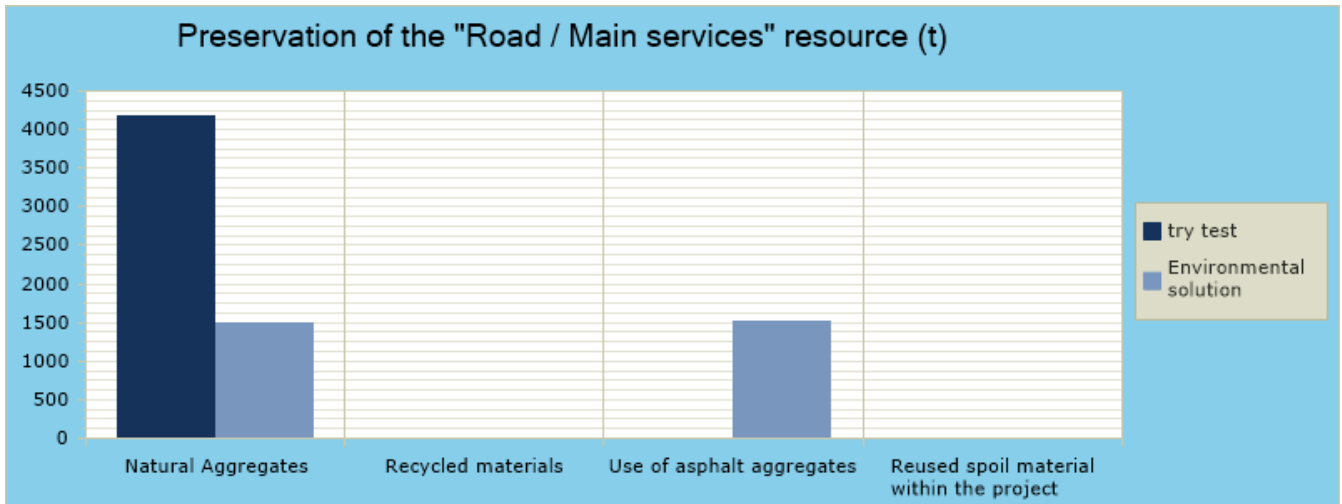


## 4.3. Indicator: Resource conservation in tonnes

### The resource preservation indicator (t)

This indicator records the tons of natural aggregates consumed on the site. Different from the basic solution, this makes it possible to measure the quantities of natural aggregates saved.

		Preservation of the resource (t)			
		Granulats naturels	10ZQSD182	10ZQSD183	10ZQSD184
try test	Roads and Networks	<b>4 167,3</b>	<b>0,0</b>	<b>0,0</b>	<b>0,0</b>
Environmental solution	Roads and Networks	<b>1 493,7</b>	<b>0,0</b>	<b>1 514,6</b>	<b>0,0</b>
Comparison / Base	Environmental solution - try test	<b>-64,2 %</b>	<b>Not applicable</b>	<b>Not applicable</b>	<b>Not applicable</b>



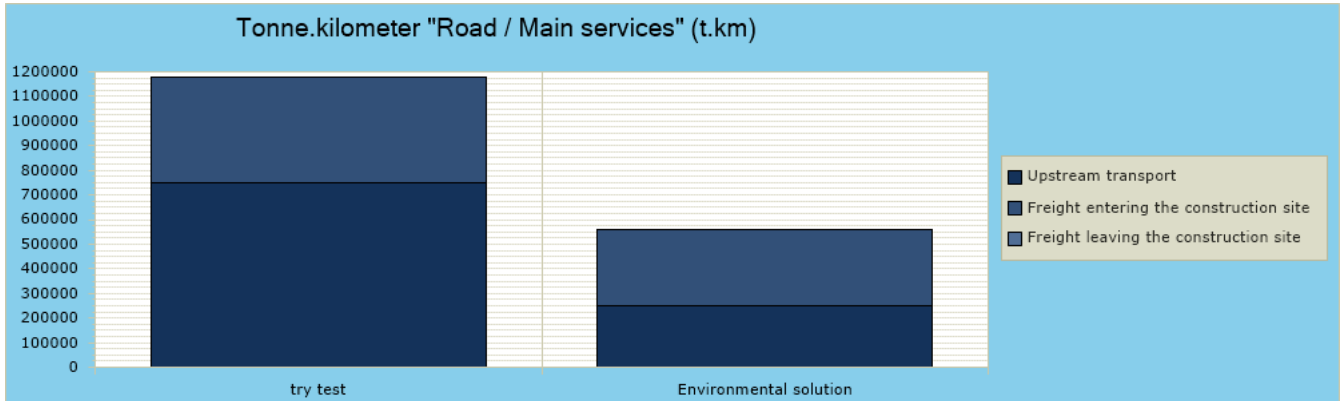


## 4.4. Indicator: Tonne.kilometer (t.km)

### The indicator "Tonne kilometer" (t.km)

This indicator reports on the preservation of the road network or the reduction of discomfort to the user, which translates into tonne-km. This indicator is calculated by multiplying the tonnes transported by the number of kilometers traveled: "the tonne kilometer is a transport unit corresponding to the transport of one tonne over one kilometer".

		Tonne.Kilometer (t.km)			
		Upstream transportation	Freight entering the site	Freight leaving the site	Total
try test	Roads and Networks	750 568,5	427 941,0	0,0	<b>1 178 509,5</b>
Environmental solution	Roads and Networks	251 803,0	309 765,0	0,0	<b>561 568,0</b>
Comparison / Base	Environmental solution - try test	<b>-66,5 %</b>	<b>-27,6 %</b>	<b>Not applicable</b>	<b>-52,3 %</b>



## 4.5. Additional information: Energy equivalents

### The number of induced trucks

The number of induced trucks is calculated by multiplying the tonnage of materials transported by road (downstream + upstream) over an average distance equal to 50 km. The whole is divided by an average truck equivalent to 24t.

Camions Induits	
	10ZQSD194
try test	18 538
Environmental solution	10 245

### The number of roundtrip Paris-Bordeaux car compares

The amount of greenhouse gas emissions can be reduced to a round trip between Paris and Bordeaux by city car (emission of 100g CO<sub>2</sub> / km).

10ZQSD191	
	10ZQSD192
try test	2 347
Environmental solution	1 455

## 5. Detailed description of solutions

### Legend

The texts written in yellow are established by the SEVE user.

The texts written in green correspond to USIRF data entered.

The texts written in blue correspond to resources created and justified by the company.

The texts written in red correspond to created resources without justification.

### 5.1. try test

#### 5.1.1 Base course (AC 32 TS)

Incoming materials	Quantity	Work unity	Density	Unit environmental cost	Transportation
Base	2687	t	-	See list of formulas used	Transport by semi truck 24t : 95km

Pieces of equipment	Quantity	Work unity	Unit environmental cost
<b>(Equipment spreads)</b> Paving spread 200 t/day	7	Day	USIRF base : " Paving spread 200 t/day "
Small paver (< 200 t/day)	1	Unit	USIRF base : " Small paver (< 200 t/day) "
Vibrating tandem V1	1	Unit	USIRF base : " Vibrating tandem V1 "
Sprayer	3	Day	USIRF base : " Sprayer "
Sweeper	3	Day	USIRF base : " Sweeper "

#### 5.1.2 Binding course (SMA 16 BS)

Incoming materials	Quantity	Work unity	Density	Unit environmental cost	Transportation
AC22	1078	t	-	See list of formulas used	Transport by semi truck 24t : 98km

Pieces of equipment	Quantity	Work unity	Unit environmental cost
<b>(Equipment spreads)</b> Paving spread 200 t/day	4	Day	USIRF base : " Paving spread 200 t/day "
Small paver (< 200 t/day)	1	Unit	USIRF base : " Small paver (< 200 t/day) "
Vibrating tandem V1	1	Unit	USIRF base : " Vibrating tandem V1 "

#### 5.1.3 Wearing course (SMA 8 S)

Incoming materials	Quantity	Work unity	Density	Unit environmental cost	Transportation
AC11	684	t	-	See list of formulas used	Transport by semi truck 24t : 98km

Pieces of equipment	Quantity	Work unity	Unit environmental cost
<b>(Equipment spreads)</b> Paving spread 200 t/day	3	Day	USIRF base : " Paving spread 200 t/day "
Small paver (< 200 t/day)	1	Unit	USIRF base : " Small paver (< 200 t/day) "
Vibrating tandem V1	1	Unit	USIRF base : " Vibrating tandem V1 "

## 5.2. Environmental solution

#### 5.2.1 Base course (AC 32 TS)

Incoming materials	Quantity	Work unity	Density	Unit environmental cost	Transportation
Base RAP cold	1801	t	-	See list of formulas used	Transport by semi truck 24t : 95km

Pieces of equipment	Quantity	Work unity	Unit environmental cost
<b>(Equipment spreads)</b> Paving spread 200 t/day	7	Day	USIRF base : " Paving spread 200 t/day "
Small paver (< 200 t/day)	1	Unit	USIRF base : " Small paver (< 200 t/day) "
Vibrating tandem V1	1	Unit	USIRF base : " Vibrating tandem V1 "
Sprayer	3	Day	USIRF base : " Sprayer "
Sweeper	3	Day	USIRF base : " Sweeper "

## 5.2.2 Binding course (SMA 16 BS)

Incoming materials	Quantity	Work unity	Density	Unit environmental cost	Transportation
AC22 RAP low	964	t	-	See list of formulas used	Transport by semi truck 24t : 98km

Pieces of equipment	Quantity	Work unity	Unit environmental cost
<b>(Equipment spreads)</b> Paving spread 200 t/day	4	Day	USIRF base : " Paving spread 200 t/day "
Small paver (< 200 t/day)	1	Unit	USIRF base : " Small paver (< 200 t/day) "
Vibrating tandem V1	1	Unit	USIRF base : " Vibrating tandem V1 "

## 5.2.3 Wearing course (SMA 8 S)

Incoming materials	Quantity	Work unity	Density	Unit environmental cost	Transportation
AC11 RAP low	451	t	-	See list of formulas used	Transport by semi truck 24t : 98km

Pieces of equipment	Quantity	Work unity	Unit environmental cost
<b>(Equipment spreads)</b> Paving spread 200 t/day	3	Day	USIRF base : " Paving spread 200 t/day "
Small paver (< 200 t/day)	1	Unit	USIRF base : " Small paver (< 200 t/day) "
Vibrating tandem V1	1	Unit	USIRF base : " Vibrating tandem V1 "



## 6. List of asphalt formulas used

### 6.1. Base

PlantAsphalt plant (Mobile plant)			Location of the plant	
Fuel for plantLignite - 0%				
Manufacturing temperature:180 °C				
Products	%	Water content (%)	Unit environmental cost	Transportation
Bitumen (asphalt cement) 20/30	6%	0%	USIRF base : " Bitumen (asphalt cement) 20/30 "	Transport by 24t tanker truck : 50km
Added Filler	17%	1%	USIRF base : " Added Filler "	Transport by semi truck 24t : 150km
Natural aggregates	77%	1%	USIRF base : " Natural aggregates "	Transport by semi truck 24t : 200km

### 6.2. AC22

PlantAsphalt plant (Mobile plant)			Location of the plant	
Fuel for plantFuel oil - 100%				
Manufacturing temperature:180 °C				
Products	%	Water content (%)	Unit environmental cost	Transportation
Bitumen (asphalt cement) 20/30	8%	0%	USIRF base : " Bitumen (asphalt cement) 20/30 "	Transport by 24t tanker truck : 50km
Added Filler	17%	1%	USIRF base : " Added Filler "	Transport by semi truck 24t : 150km
Natural aggregates	75%	1%	USIRF base : " Natural aggregates "	Transport by semi truck 24t : 200km

### 6.3. AC11

PlantAsphalt plant (Mobile plant)			Location of the plant	
Fuel for plantFuel oil - 100%				
Manufacturing temperature:175 °C				
Products	%	Water content (%)	Unit environmental cost	Transportation
Bitumen (asphalt cement) 20/30	5%	0%	USIRF base : " Bitumen (asphalt cement) 20/30 "	Transport by 24t tanker truck : 50km
Added Filler	15%	1%	USIRF base : " Added Filler "	Transport by semi truck 24t : 100km
Natural aggregates	80%	1%	USIRF base : " Natural aggregates "	Transport by semi truck 24t : 100km

### 6.4. Base RAP cold

PlantAsphalt plant (Mobile plant)			Location of the plant	
Fuel for plantFuel oil - 100%				
Manufacturing temperature:90 °C				
Products	%	Water content (%)	Unit environmental cost	Transportation
Bitumen (asphalt cement) 20/30	6%	0%	USIRF base : " Bitumen (asphalt cement) 20/30 "	Transport by 24t tanker truck : 50km
Added Filler	17%	1%	USIRF base : " Added Filler "	Transport by semi truck 24t : 150km
Natural aggregates	22%	1%	USIRF base : " Natural aggregates "	Transport by semi truck 24t : 200km
Reclaimed asphalt (RAP)	55%	2%	USIRF base : " Reclaimed asphalt (RAP) "	-

## 6.5. AC22 RAP low

PlantAsphalt plant (Mobile plant)		Location of the plant		
Fuel for plantLignite - 0%				
Manufacturing temperature:145 °C				
Products	%	Water content (%)	Unit environmental cost	Transportation
Bitumen (asphalt cement) 20/30	8%	0%	USIRF base : " Bitumen (asphalt cement) 20/30 "	Transport by 24t tanker truck : 50km
Added Filler	17%	1%	USIRF base : " Added Filler "	Transport by semi truck 24t : 150km
Natural aggregates	30%	1%	USIRF base : " Natural aggregates "	Transport by semi truck 24t : 200km
Reclaimed asphalt (RAP)	45%	2%	USIRF base : " Reclaimed asphalt (RAP) "	-

## 6.6. AC11 RAP low

PlantAsphalt plant (Mobile plant)		Location of the plant		
Fuel for plantFuel oil - 100%				
Manufacturing temperature:145 °C				
Products	%	Water content (%)	Unit environmental cost	Transportation
Bitumen (asphalt cement) 20/30	5%	0%	USIRF base : " Bitumen (asphalt cement) 20/30 "	Transport by 24t tanker truck : 50km
Added Filler	15%	1%	USIRF base : " Added Filler "	Transport by semi truck 24t : 100km
Natural aggregates	60%	1%	USIRF base : " Natural aggregates "	Transport by semi truck 24t : 100km
Reclaimed asphalt (RAP)	20%	2%	USIRF base : " Reclaimed asphalt (RAP) "	-